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October 17, 2016

Mr. Gordon Criswell
Talen Montana—Environmental & Engineering Compliance Dept.
P.O. Box 38
Colstrip, MT 59323

**RE: INITIAL SAFETY FACTOR ASSESSMENT REPORT, UNITS 3 & 4 EHP SURFACE IMPOUNDMENTS, COLSTRIP STEAM ELECTRIC STATION, COLSTRIP, MONTANA**
**PROJECT NO: 16419**

Dear Mr. Criswell:

As requested by Talen Montana, the attached report summarizes the initial safety factor assessments performed for Units 3 & 4 surface impoundment of the Colstrip Steam Electric Station (CSES) in Colstrip, Montana. We have prepared this report to comply with new coal combustion residual (CCR) regulations published in the Federal Register on April 17, 2015, specifically to Title 40 CFR §257.73(e).

Safety factor assessments were performed on critical cross-sections of embankments surrounding surface impoundments at the Units 3 & 4 Effluent Holding Pond (EHP). Calculated factors of safety for these embankments achieve the required safety factors specified by §257.73(e)(1)(i) through (iv) and indicate stability. Engineering services relevant to the annual inspection and monitoring were conducted by or under the direct supervision of a Montana registered Professional Engineer.

If you have any questions about this report, or if we may provide other services to you, please contact us.

Respectfully submitted,

**JORGENSEN GEOTECHNICAL, LLC**

Colter H. Lane, E.I., M.S.

Ray Womack, P.E., P.G.

# INITIAL SAFETY FACTOR ASSESSMENTS
# COLSTRIP STEAM ELECTRIC STATION UNITS 3 & 4
# COLSTRIP, MONTANA

**Prepared for:**

**Mr. Gordon Criswell**
**Talen Montana**
**Environmental & Engineering Compliance Dept.**
**P.O. Box 38**
**Colstrip, MT 59323**

**Prepared by:**


**PO Box 9550**
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**October 17, 2016**

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## 1.0 INTRODUCTION AND CERTIFICATION

Regulations addressing disposal of the Coal Combustion Residuals (CCR) from electric utilities (Title 40 of the Code of Federal Regulations, Part 257, Subpart D) were published in the federal register on April 17, 2015 and became effective on October 19, 2015. Section 257.73(e)(1) requires the owner or operator to conduct safety factor assessments on surface impoundments containing CCR material to document whether calculated factors of safety achieve the minimum stability safety factors for several loading conditions. Loading conditions and required safety factors are shown in Table 1-1. These loading conditions are to be applied to the critical cross-section(s) of each embankment, where the critical cross-section is defined as the cross-section most susceptible of all cross-sections to structural failure based on appropriate engineering considerations.

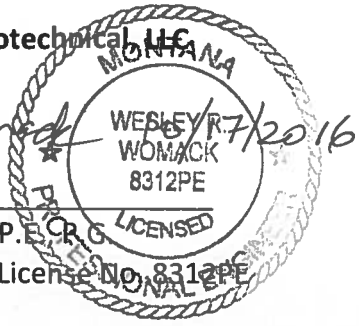
**Table 1-1: Safety Factor Requirements Summary**

| Loading Condition | Described in Section | Required Safety Factor |
|---|---|---|
| Static, Long-term, Maximum Storage Pool | §274.73(e)(1)(i) | 1.50 |
| Static, Maximum Surcharge Pool | §274.73(e)(1)(ii) | 1.40 |
| Seismic | §274.73(e)(1)(iii) | 1.00 |
| Liquefaction | §274.73(e)(1)(iv) | 1.20 |

The Colstrip Steam Electric Station (CSES) in Colstrip, Montana deposits and stores CCR produced by Units 3 & 4 in surface impoundments in an area called the Units 3 & 4 Effluent Holding Pond (EHP) located approximately 3.5 miles southeast of the plant. This report summarizes the findings of the initial safety factor assessment of surface impoundments at the EHP. Calculated factors of safety for embankments and dikes surrounding CCR surface impoundments of the CSES Units 3 & 4 exceed the required safety factors summarized above and indicate stability under the required loading conditions. Results of the safety factor assessments are presented in Section 5.0.

I, Wesley Raymond Womack, a registered Professional Engineer in the State of Montana (License No. 8312PE), certify that the ***Initial Safety Factor Assessments*** performed for surface impoundments of the Colstrip Steam Electric Station Units 3 & 4 meet the requirements of ***§257.73(e)(1) Periodic safety factor assessments***. This certification is made to comply with the specific requirement of §257.73(e)(2).

**Jorgensen Geotechnical, LLC**




7/2016

Ray Womack, P.E., C.P.G.
Montana P.E. License No. 8312PE

## 2.0 REVIEW OF PAST STABILITY ANALYSES

Since Bechtel's original design (Bechtel, 1982) numerous stability analyses have been performed on the CSES Units 3 & 4 surface impoundments by Hydrometrics, Womack & Associates (WAI), and Jorgensen Geotechnical (JG). These reports provide valuable information regarding the internal and external geometry and material parameters of the facility's embankments. JG reviewed the following reports and data sources related to slope stability modeling for input into the initial safety factor assessment of the Units 3 & 4 surface impoundments:

- Bechtel, 1979. "Second Stage Evaporation Pond Design Report." Prepared by Bechtel Power Corporation, December 1979.
- Bechtel, 1982. "Effluent Holding Pond Design Report." Prepared by Bechtel Power Corporation, October 1982.
- Hydrometrics, 2000. "Units 3 & 4 EHP Saddle Dam – Saddle Dam Geotechnical Report." Prepared by Hydrometrics, Inc., July 2000.
- Hydrometrics, 2001. "Units 3 & 4 Saddle Dam – Remedial Measures, Preliminary Design Report." Prepared by Hydrometrics, Inc., February 2001.
- WAI, 2007a. "Units 3 & 4 Clearwell [B-Cell] – Geotechnical Investigation Report." Prepared by Womack & Associates, Inc., September 2007.
- WAI, 2007b. "C/G Cell Dike Improvements, Memorandum." Prepared by Womack & Associates, Inc., October 2007.
- WAI, 2009a. "Units 3 & 4 – C/CW [*C/J*] Dike Piezometers and Slope Stability." Prepared by Womack & Associates, Inc., May 2009.
- WAI, 2009b. "Units 3 & 4 Main Dam – Memorandum of 3/4 EHP Main Dam Observations and Stability Review Update." Prepared by Womack & Associates, Inc., May 2009.
- WAI, 2009c. "C-Cell – Old Clearwell (C/CW) [*C/J*] Divider Dike Buttress Slope Stability." Prepared by Womack & Associates, Inc., August 2009.
- WAI, 2009d. "Units 3 & 4 Saddle Dam – Geotechnical Investigation Report for EPA Recommended Corrective Measures at the Colstrip Power Plant." Prepared by Womack & Associates, Inc., December 2009.
- WAI, 2010. "Units 3 & 4 Main Dam – Geotechnical Investigation Report for EPA Recommended Corrective Measures at the Colstrip Power Plant." Prepared by Womack & Associates, Inc., February 2010.
- WAI, 2011a. "Geotechnical Investigation Report – CP 102 EHP Dam Raise Project, Stage 2 Dam Raise – Inboard Embankment Fill." Prepared by Womack & Associates, Inc., January 2011.
- WAI, 2011b. "Units 3 & 4 C-Cell Divider Dike – Slope Stability Report" Prepared by Womack & Associates, Inc., July 2011.
- WAI, 2014. "C-Cell Divider Dike Stability Assessment—Units 3 & 4 EHP." Prepared by Womack & Associates, Inc., December 2014.
- Jorgensen, 2016a. "Geotechnical Investigation and Embankment Stability Report—Revision 1." Prepared by Jorgensen Geotechnical, LLC, March 2016.

Additional references are listed in Section 8.0.

## 3.0 SLOPE STABILITY METHODOLOGY

Safety factors for the loading conditions described in §274.73(e)(1)(i) through (iii) may be produced with two-dimensional limit equilibrium stability modeling. Slope stability analyses described in this report were performed using GEO-SLOPE International's SLOPE/W limited equilibrium program (GeoStudio 2012, V8.15). Reports produced by SLOPE/W of the settings, model and slip surface geometry, and calculated strengths applied to slices within the critical slip surfaces are attached in Appendix B. Slope stability models were developed and analyses were performed using the following methodology:

### 3.1 Analyses

The Morgenstern-Price limit equilibrium method, which considers both moment and force equilibrium, was used to compute structural stability factors of safety for each cross-section. Limit equilibrium analyses do not indicate complex failure mechanisms nor do these sites require computation of displacements; specialized analytical methods are not necessary.

According to the requirements of §257.73(e), stability factors of safety are to be calculated for the following loading conditions:

1. **Static Factor of Safety: Long-Term, Maximum Storage Pool - §274.73(e)(1)(i)**

The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of steady-state seepage. For cells of the Units 3 & 4 EHP impounding water, modeled water level elevations are the maximum storage pool under normal operations, as summarized in Table 3-1. Calculated factors of safety for this loading condition are summarized in Section 5.1.

**Table 3-1: Maximum Storage Pool Elevations**

| SURFACE IMPOUNDMENT | WATER LEVEL ELEVATION |
|---|---|
| H-Cell | 3,289-ft |
| F-Cell | 3,287-ft |
| B-Cell | 3,287-ft |

J-Cell was lined during the summer of 2016 and will receive CCR material as paste. The Maximum Storage Pool loading case has been applied to the Main and Saddle Dams bordering J-Cell when analyzing the stability of the outboard face. Paste in J-Cell is modeled at an elevation of 3,285-ft. Similarly, G-Cell will be lined in the future and receive CCR material utilizing dry storage methods. The Maximum Storage Pool loading case was examined for cross-sections of the Saddle Dam bordering G-Cell when the stability of the outboard face is considered. Paste is modeled at an elevation of 3,283-ft within G-Cell.

Many of the embankments bordering J-Cell and G-Cell were modeled assuming existing conditions as this resulted in a more conservative case. Stability factors of safety of the

embankment face in the direction of either J-Cell or G-Cell are currently the lowest they will be. Deposition of CCR material increases factors of safety over time by adding resisting load to the face of the embankment. Factors of safety for existing conditions are calculated for cross-sections A-A', B-B', C-C', D-D', E-E', L-L', M-M', N-N', O-O', and P-P' (see Table 5-2).

In the case of several embankments at the EHP, the embankment serves as a divider dike between surface impoundments. Water in a surface impoundment acts as load resisting failure on the inboard face of the embankment. The most conservative evaluation of the embankment face then is to assume the pond is empty. As such, in order to assess critical conditions, safety factors were calculated assuming the surface impoundment on the downstream side of the analyzed embankment face is dry. This is the case in cross-sections I-I', J-J', K-K', and Q-Q'.

CCR material is deposited as paste into C-Cell. Water impounded in C-Cell comes from precipitation, water left from the evaporators, and water decanting from the paste and plant operations are currently limiting the volume of water in the cell. In the six months between April and October 2016, C-Cell water surface elevations ranged from 3,267.7-ft and 3,273.4-ft and, due to paste elevations within the cell, is generally contained within the southwest quadrant of the surface impoundment. Paste is assumed to be limiting loss of water from C-Cell by seepage into other portions of the EHP. In particular, a stand pipe piezometer in the C-J Dike (JC-15-06 SP) does not indicated seepage through the embankment. Thus, C-Cell water levels are not incorporated into the stability modeling.

**2. Static Factor of Safety: Maximum Surcharge Pool - §274.73(e)(1)(ii)**

The maximum surcharge pool is considered a temporary water surface elevation that is higher than the maximum storage pool. This represents a condition in which the CCR surface impoundment is, for instance, passing a design flood surcharge and is considered temporary. Therefore, this loading condition has a lower required factor of safety (FS ≥ 1.40). Water levels used in the models are summarized in Table 3-2. Calculated factors of safety for this loading condition are summarized in Section 5.2.

**Table 3-2: Maximum Surcharge Pool Elevations**

| SURFACE IMPOUNDMENT | WATER LEVEL ELEVATION |
|---|---|
| H-Cell | 3,292-ft |
| F-Cell | 3,290-ft |
| B-Cell | 3,290-ft |
| J-Cell | 3,288-ft* |
| G-Cell | 3,286-ft* |

* Maximum Surcharge water levels are modeled in J-Cell and G-Cell as a surcharge load above paste elevations of 3,285-ft and 3,283-ft, respectively.

As described above, water levels in C-Cell are not incorporated into the models. Thus, Maximum Surcharge Pool analyses of cross-sections J-J' and K-K' in the direction of B-Cell, L-L' and M-M' in the direction of J-Cell, and O-O' and P-P' in the direction of G-Cell are identical to that of the Maximum Storage Pool condition and the calculated factors of safety are not presented twice.

The results of the analysis indicate there is no influence of the elevation of the impounded water on the stability of the downstream face of the embankment. Critical slip surfaces are not impacted by surcharge from impounded water or CCR material (J-Cell, G-Cell, and C-Cell) and calculated factors of safety for the modeled Maximum Surcharge Pool condition (Table 5-3) are the same as those for the Maximum Storage Pool condition (Table 5-1).

### 3. Seismic Factor of Safety - §274.73(e)(1)(iii)

All embankments surrounding CCR surface impounds must be able to withstand a design earthquake without damage to the embankment or to the foundation that would cause the impoundment to discharge its contents. Seismic loading conditions have been calculated using a peak ground acceleration (PGA) with a 2% probability of exceedance in 50 years, equivalent to a return period of 2,500 years.

Seismic factors of safety have been evaluated using a pseudo-static approach where inertial forces from seismic accelerations are applied statically to the model. These forces are assumed to be proportional to the weight of the sliding mass times a horizontal seismic coefficient $k_h$. A seismic coefficient of $k_h$ = ½PGA has been used in this assessment with a 20% reduction in the shear strength of soil materials (Hynes-Griffin and Franklin, 1984). Seismic loads have been applied to the critical slip surface determined by static analysis for each cross-section as is it assumed to be the most stressed region within the slope (Abramson et al., 2002). Factors of safety for this loading condition are summarized in Section 5.3.

The seismic loading condition was applied assuming a Maximum Storage Pool condition (Table 5-4) or existing conditions (Table 5-5), whichever resulted in a more conservative analysis (see discussion in Section 3.1.1). Factors of safety for existing conditions are calculated for cross-sections A-A', B-B', C-C', D-D', E-E', L-L', M-M', N-N', O-O', and P-P'.

## 3.2 Geometry

In general, internal and external geometry have been taken from previous stability analyses performed by this office and others (see Section 2.0). When necessary, external geometry was updated from the most recent topographic data provided by Talen Montana. Where previous stability analyses were unavailable, internal model geometry was developed using construction drawings and mapping from the original Bechtel reports (1982, 1985a, 1985b) in addition to knowledge of construction practice at the EHP and experience with local geology. Cross-sections were chosen as 1) what appear to be the most critical section based on appropriate engineering considerations and 2) where the most data were available (i.e., sections through areas with subsurface exploration data). Cross-section locations are shown on Figure 1 and figures showing model geometry are in Appendix A.

**Figure 1: Units 3 &4 EHP Cross-Section Location Map**

Slip surfaces are generated within the model using entry and exit specification. Circular slip surfaces were selected, as they are found to be the most critical in homogenous slopes. Many of the embankments are keyed into the underlying foundation soil or rock and foundation materials are too strong to be susceptible to translational failure. Entry and exit zones on the ground surface were selected using engineering judgement based on where critical slip surfaces are anticipated to daylight and we verified that minimum factors of safety are located within these zones. In addition to the downstream face of the Main and Saddle Dams, factors of safety have also been calculated for the inboard faces under existing conditions (i.e., limited water and CCR material) as indicated in Table 5-2 and Table 5-4. Critical slip surfaces of each analysis are indicated on the figures of Appendix A.

### 3.3 Material Parameters

Properties of embankment, foundation, and CCR materials were characterized using a Mohr-Coulomb strength model and are summarized in Table 3-3.

**Table 3-3: Material Strength Parameters – Units 3 & 4 EHP**

| MATERIAL | UNIT WEIGHT | | EFFECTIVE FRICTION ANGLE, Φ' | EFFECTIVE COHESION, C' |
|---|---|---|---|---|
| | MOIST (PCF) | SAT. (PCF) | | |
| EMBANKMENT FILL* | 125 | 130 | 33° | 50 psf |
| CLAY CORE* | 125 | 130 | 28.5° | 0 psf |
| DRAIN* | 130 | 135 | 35° | 0 psf |
| FOUNDATION SOIL* | 112 | 124 | 28° (SD and H-Cell)<br>31° (MD and F-Cell) | 0 psf |
| CLINKER ASH** | 120.4 | 125 | 26.6° | 950 psf |
| FLY ASH SLURRY** | 100 | 103.4 | 28° | 700 psf |
| PASTE† | 102 | 112 | 35° | 0 psf |
| BOTTOM ASH FILL† | 90 | 100 | 40° | 50 psf |
| CLINKER FILL‡ | 130 | - | 40° | 50 psf |
| BEDROCK | IMPENETRABLE | | | |

* Bechtel, 1982

** WAI, 2011a

† WAI, 2009c; Golder, 2001

‡ WAI, 2011b

- Denotes material parameter not applied in models

Site-specific field and laboratory results compare well with Bechtel's original design parameters of embankment and foundation soils and Bechtel's shear strength parameters were used for modeling these materials (Bechtel, 1979). Clinker "ash," or soil-like clinker, was observed during

subsurface investigation at the EHP Saddle Dam and soil parameters for this material were selected from the Phase 2 Dam Raise Report (WAI, Stage 2 Dam Raise, 2011).

Strength parameters of CCR materials stored in surface impoundments and used in construction of embankment buttressing were adopted from laboratory testing performed by in previous investigations and reports. See the footnotes of Table 3-3 for references.

Effective stress parameters are used as required loading conditions are long-term and excess pore pressures are not anticipated. Cyclic loading from seismic accelerations may cause a reduction in soil shear strength and soil strength has been reduced by 20% in pseudo-static analyses (Abramson et al, 2002).

A small amount of cohesion (c' = 50 psf) was assumed for the Embankment Fill, Clinker Fill, and Bottom Ash Fill in some of the cross-sections. The critical slip surface (lowest factor of safety) generated using a cohesionless material will consistently approach an infinite slope condition (i.e., representing only ravel or very thin failure surfaces). A little cohesion drives the slip surfaces deeper into the embankment material to represent more reasonable (larger and more dangerous) anticipated failure mechanisms. In fact, in unsaturated conditions soils will exhibit "apparent cohesion" due to soil suction (negative pore pressures) and the small amount of cohesive strength added to the model is not unreasonable.

Sandstones, siltstones, and claystones underlying embankments have all been considered Bedrock and are modeled as "Impenetrable". Slip surfaces encountering the edge of bedrock material follow the surface of the bedrock. Slices with bases on bedrock assume base shear strength (i.e., resistance) based on the shear strength parameters of the material immediately above the bedrock.

In effective stress analyses, materials are assigned total unit weights and pore water pressures are accounted for using internal pressures calculated from a piezometric line. Total unit weights of materials are modeled using moist unit weights above measured water surface elevations and saturated unit weights below measured water surface elevations. Piezometers within the embankments are being monitored on a monthly basis as part of §257.83(a)(iii) of the new CCR regulations and results from monitoring have been incorporated into the model.

### 3.4 Phreatic Surface

F-Cell and H-Cell have membrane liners (Geosyntec, 2016d) and vibrating wire piezometers installed in these embankments have not detected seepage within embankment material. Therefore, a phreatic surface has not been applied. Piezometric lines have been added to models for the EHP Main and Saddle Dams based on surface water elevations measured in piezometers and standpipes installed in the embankments (Jorgensen, 2016b).

Impounded water is modeled as a surcharge load of 62.4 pcf applied "normal" to the liner surface of the pond. Water surfaces within the surface impoundments are modeled according to the elevations discussed in Sections 3.1.1 and 3.1.2 (Table 3-1 and Table 3-2).

Critical slip surfaces generated in the stability models do not encounter saturated materials or piezometric lines (see stability model cross-section figures in Appendix A). In general, seepage pressures do not affect the stability models of the Units 3 & 4 facilities.

### 3.5 Seismicity

CSES facilities are in an area of low seismic activity and predicted accelerations are relatively low. Online tools exist to select a site specific PGA for the CSES facilities (USGS Seismic Design Maps Application, 2014). These are based on USGS seismic hazard maps published in 2008, which form the basis of seismic loads for the ASCE 7-10 Minimum Design Loads for Buildings and Other Structures. The CSES facility (approximate Latitude = 45.9$^{o}$ N and Longitude = 106.6$^{o}$ W) has a site specific PGA with 2% probability of exceedance in 50-years of 0.047g, according to Figure 22-7 of the ASCE 7-10.

The USGS seismic hazard maps were updated in 2014 to account for new methods, models, and data that have been obtained since the 2008 maps were released. According to Figure 7 of Petersen, et al. (2014), PGA values for Colstrip have increased by 0.01g to 0.05g on the updated maps. Accordingly, seismicity is conservatively assessed in the stability models using a PGA = 0.06g and $k_h$ = 0.03g.

## 4.0 LIQUEFACTION EVALUATION

A liquefaction evaluation is required by §274.73(e)(1)(iv) if dikes are constructed of soils susceptible to liquefaction. In general, liquefaction requires three things: 1) loose, cohesionless soils, 2) saturated conditions, and 3) high enough seismicity to drive ground shaking and increase pore water pressures in soil materials.

Conditions of the embankments of the Units 3 & 4 surface impoundments are as follows:

1. Materials: Embankment material (i.e., shell and core materials, compacted bottom ash fill) is too stiff and fine-grained to be susceptible to liquefaction. Foundation materials underlying the embankments also have too many fines to be liquefiable. SPT blow counts observed at Units 3 & 4 embankments are too high to predict liquefaction at this site.
2. Saturation: Although seepage has been detected within embankment materials by piezometers, saturated conditions exist very low in the embankment resulting in relatively small differences in the soil's total stress ($\sigma_v$) and effective stress ($\sigma_v'$), which is an important component of the soil's cyclic stress ratio (CSR) in current liquefaction evaluation methods (Boulanger and Idriss, 2014, Idriss and Boulanger, 2008).
3. Seismicity: The PGA with a probability of exceedance of 2% in 50 years is conservatively estimated for embankment analysis at CSES facilities as 0.06g. Low accelerations yield low values of CSR and are not expected to produce liquefaction.

Therefore, embankments and dikes constructed at the Units 3 & 4 EHP are not constructed with soils that are susceptible to liquefaction and factors of safety against liquefaction have not been calculated.

## 5.0 SAFETY FACTOR ASSESSMENT RESULTS SUMMARY

The results of stability analyses are summarized in Table 5-1 through Table 5-5. Cross-section figures of the slope stability models are in Appendix A.

### 5.1 Results of Loading Condition: Static, Long-Term, Maximum Storage Pool

Calculated factors of safety for this loading condition must equal or exceed 1.50 per §274.73(e)(1)(i). Stability analysis results of each cross-section indicate factors of safety that exceed the requirements.

**Table 5-1: Results Summary – Static, Maximum Storage Pool**

| Embankment | Stability Section | Direction | Calculated Factor of Safety |
|---|---|---|---|
| Main Dam | A-A’ | Outboard (North) | 2.08 |
| Saddle Dam | B-B’ | Outboard (NW) | 2.19 |
| | C-C’ | Outboard (East) | 2.34 |
| | D-D’ | Outboard (East) | 2.35 |
| | E-E’ | Outboard (East) | 2.44 |
| Southeast EHP Embankment | F-F’ | Outboard (SE) | 1.91 |
| | G-G’ | Outboard (SE) | 2.07 |
| Western EHP Embankment | H-H’ | Outboard (West) | 2.04 |
| B-F Divider Dike | I-I’ | F-Cell (South)* | 3.99 |
| | | B-Cell (North)* | 3.79 |
| B-C Divider Dike | J-J’ | B-Cell (West)* | 3.57 |
| | K-K’ | B-Cell (West)* | 3.22 |
| G-J Divider Dike | N-N’ | G-Cell (South)† | 2.83 |
| C-H Divider Dike | Q-Q’ | H-Cell (South)* | 3.34 |
| | | C-Cell (North) | 1.98 |

* Factors of safety were conservatively calculated assuming the cell toward which the analysis was performed was dry (see discussion in Section 3.1.1.)

† G-Cell modeled as dry, J-Cell modeled with Maximum Storage Pool condition with paste elevation of 3,285-ft.

**Table 5-2: Results Summary – Static, Existing Conditions**

| Embankment | Stability Section | Direction | Calculated Factor of Safety |
|---|---|---|---|
| Main Dam | A-A' | Inboard (South) | 2.18 |
| Saddle Dam | B-B' | Inboard (SE) | 2.59 |
| | C-C' | Inboard (West) | 3.21 |
| | D-D' | Inboard (West) | 2.95 |
| | E-E' | Inboard (West) | 2.20 |
| C-J Divider Dike | L-L' | J-Cell (North) | 2.85 |
| | M-M' | J-Cell (North) | 3.04 |
| G-J Divider Dike | N-N' | J-Cell (North) | 3.22 |
| C-G Divider Dike | O-O' | G-Cell(East) | 1.64 |
| | P-P' | G-Cell(East) | 1.71 |

### 5.2 Results of Loading Condition: Static, Maximum Surcharge Pool

Calculated factors of safety for this loading condition must equal or exceed 1.40 per §274.73(e)(1)(ii). Critical slip surfaces generated by the stability models are not influenced by changes in loading due to higher water surface elevations within the surface impoundments and calculated factors of safety for this loading condition are same as for that of the Maximum Storage Pool condition (Table 5-1). Refer to the discussion in Section 3.1.2. Stability analysis results of each cross-section indicate factors of safety that exceed the requirements.

**Table 5-3: Results Summary – Static, Maximum Surcharge Pool**

| Embankment | Stability Section | Direction | Calculated Factor of Safety |
|---|---|---|---|
| Main Dam | A-A’ | Outboard (North) | 2.08 |
| Saddle Dam | B-B’ | Outboard (NW) | 2.19 |
| | C-C’ | Outboard (East) | 2.34 |
| | D-D’ | Outboard (East) | 2.35 |
| | E-E’ | Outboard (East) | 2.44 |
| Southeast EHP Embankment | F-F’ | Outboard (SE) | 1.91 |
| | G-G’ | Outboard (SE) | 2.07 |
| Western EHP Embankment | H-H’ | Outboard (West) | 2.04 |
| F-B Divider Dike | I-I’ | F-Cell (South) | 3.99 |
| | | B-Cell (North) | 3.79 |
| G-J Divider Dike | N-N’ | G-Cell (South)† | 2.83 |
| C-H Divider Dike | Q-Q’ | C-Cell (North) | 1.98 |

† G-Cell modeled as dry, J-Cell modeled with Maximum Surcharge Pool condition with paste elevation of 3,285-ft and water surcharge elevation of 3,288-ft.

### 5.3 Results of Loading Condition: Seismic, Maximum Storage Pool

Calculated factors of safety for this loading condition must equal or exceed 1.00 per §274.73(e)(1)(iii). Stability analysis results of each cross-section indicate factors of safety that exceed the requirements.

**Table 5-4: Results Summary – Seismic, Maximum Storage Pool**

| Embankment | Stability Section | Direction | Calculated Factor of Safety |
|---|---|---|---|
| Main Dam | A-A’ | Outboard (North) | 1.44 |
| Saddle Dam | B-B’ | Outboard (NW) | 1.51 |
| | C-C’ | Outboard (East) | 1.61 |
| | D-D’ | Outboard (East) | 1.62 |
| | E-E’ | Outboard (East) | 1.67 |
| Southeast EHP Embankment | F-F’ | Outboard (SE) | 1.38 |
| | G-G’ | Outboard (SE) | 1.53 |
| Western EHP Embankment | H-H’ | Outboard (West) | 1.47 |
| F-B Divider Dike | I-I’ | F-Cell (South)* | 2.70 |
| | | B-Cell (North)* | 2.54 |
| B-C Divider Dike | J-J’ | B-Cell (West)* | 2.42 |
| | K-K’ | B-Cell (West)* | 2.18 |
| G-J Divider Dike | N-N’ | G-Cell (South)† | 1.94 |
| C-H Divider Dike | Q-Q’ | H-Cell (South)* | 2.27 |
| | | C-Cell (North) | 1.41 |

* Factors of safety were conservatively calculated assuming the cell toward which the analysis was performed was dry (see discussion in Section 3.1.1.)

† G-Cell modeled as dry, J-Cell modeled with Maximum Storage Pool condition with paste elevation of 3,285-ft.

**Table 5-5: Results Summary – Seismic, Existing Conditions**

| Embankment | Stability Section | Direction | Calculated Factor of Safety |
|---|---|---|---|
| Main Dam | A-A' | Inboard (South) | 1.52 |
| Saddle Dam | B-B' | Inboard (SE) | 1.80 |
| | C-C' | Inboard (West) | 2.20 |
| | D-D' | Inboard (West) | 2.01 |
| | E-E' | Inboard (West) | 1.52 |
| C-J Divider Dike | L-L' | J-Cell (North) | 1.94 |
| | M-M' | J-Cell (North) | 2.72 |
| G-J Divider Dike | N-N' | J-Cell (North) | 2.18 |
| C-G Divider Dike | O-O' | G-Cell(East) | 1.54 |
| | P-P' | G-Cell(East) | 1.21 |

### 5.4 Loading Condition: Liquefaction

Liquefaction requirements are described in §274.73(e)(1)(iv). It has been determined that embankments and dikes of the Units 3 & 4 surface impoundments are constructed of soils not susceptible to liquefaction (see discussion in Section 4.0). Soils are not anticipated to liquefy in a seismic event and factors of safety have not been calculated.

## 6.0 CONCLUSIONS

In general, embankment dams surrounding the Units 3 & 4 surface impoundments were designed and constructed using conservative approaches to stability. In particular, the embankment slopes are not steep and the highest embankments (EHP Main and Saddle Dams) employed zoned construction with drains and filters to prevent piping. Placement of fill appears to have been carefully controlled. Most of the embankments evaluated in this report are adjacent to surface impoundments with membrane liners and seepage has not been observed. Therefore, embankments are expected to be stable and their performance has, in fact, been good.

The stability analyses indicate that the analyzed embankments are stable under existing soil shear strength and soil moisture conditions. Calculated factors of safety exceed the minimums required by §257.73(e)(1) of Title 40 of the Code of Federal Regulations, Part 257, Subpart D.

## 7.0 LIMITATIONS

This report has been prepared based the data available, which includes, but is not limited to, borehole and test pit logs recorded by this office and others, piezometric data collected by this office and others, and topographic mapping data provided to us by others. Data collected by others has generally been relied upon without independent verification of accuracy. Although the database of information for the Colstrip Steam Electric Station is very large and has been found to be reliable, there is inherent uncertainty in engineering analyses based on subsurface data. In addition, subsurface conditions may be affected as a result of plant operations or construction. Should subsurface conditions be different than those assumed for the analyses described in this report, whether through the addition of data or by changing conditions, this office must be notified immediately in order to revise our analyses.

These services have been performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in this area under similar conditions. No other warranty is made or implied.

## 8.0 ADDITIONAL REFERENCES

*See Section 2.0 for a list of references related to stability analysis.*

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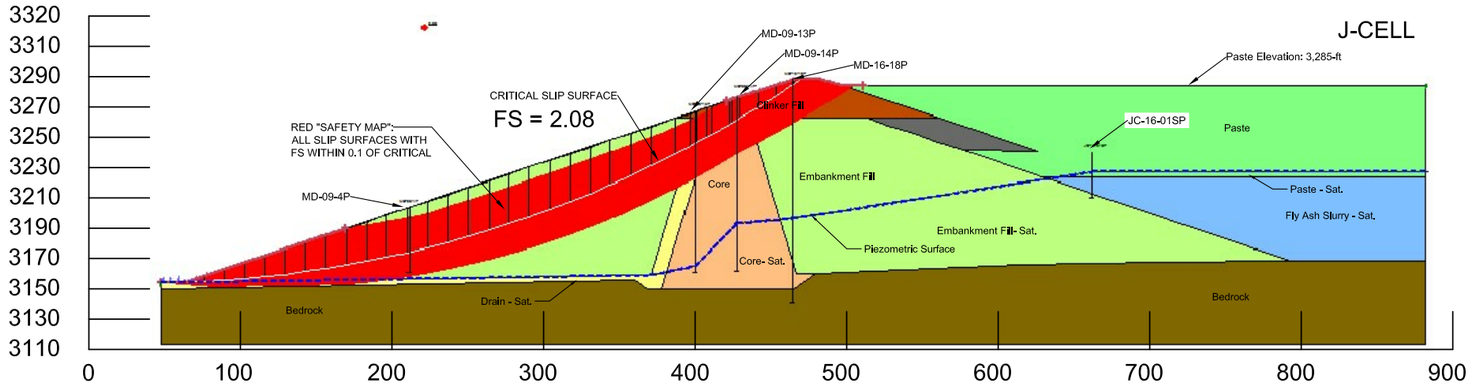
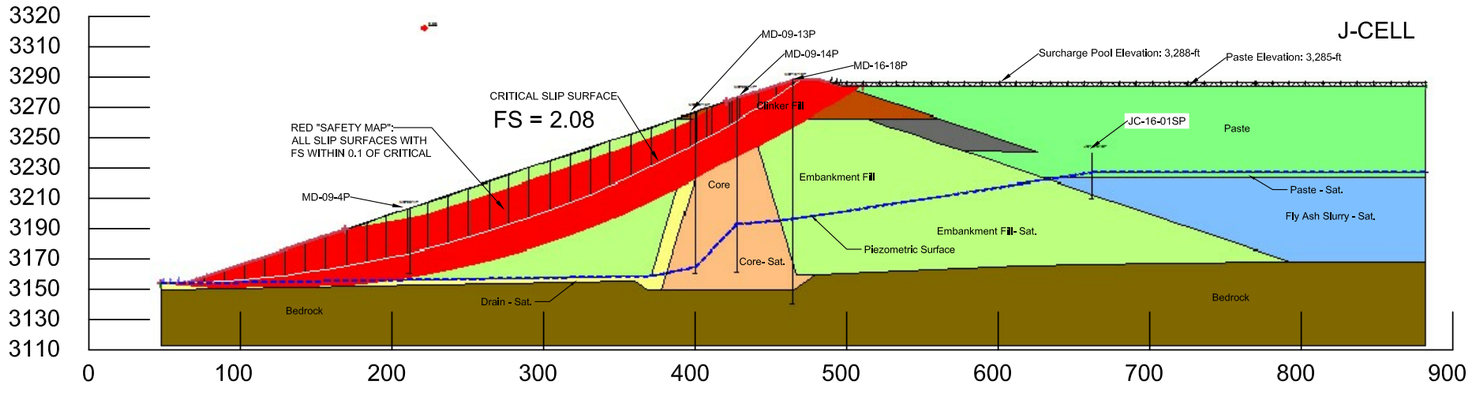
# APPENDIX A

# Stability Model Cross-Section Figures




CROSS-SECTION A-A' OUTBOARD STATIC MAXIMUM STORAGE POOL

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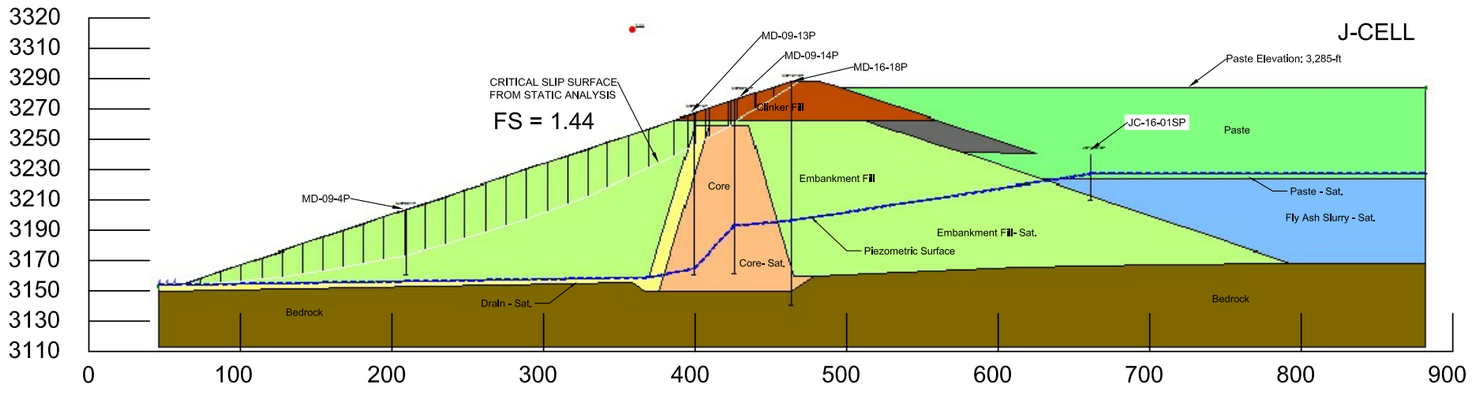


CROSS-SECTION A-A' OUTBOARD SEISMIC

SCALE:
VERTICAL: 1" = 100'
HORIZONTAL: 1" = 100'

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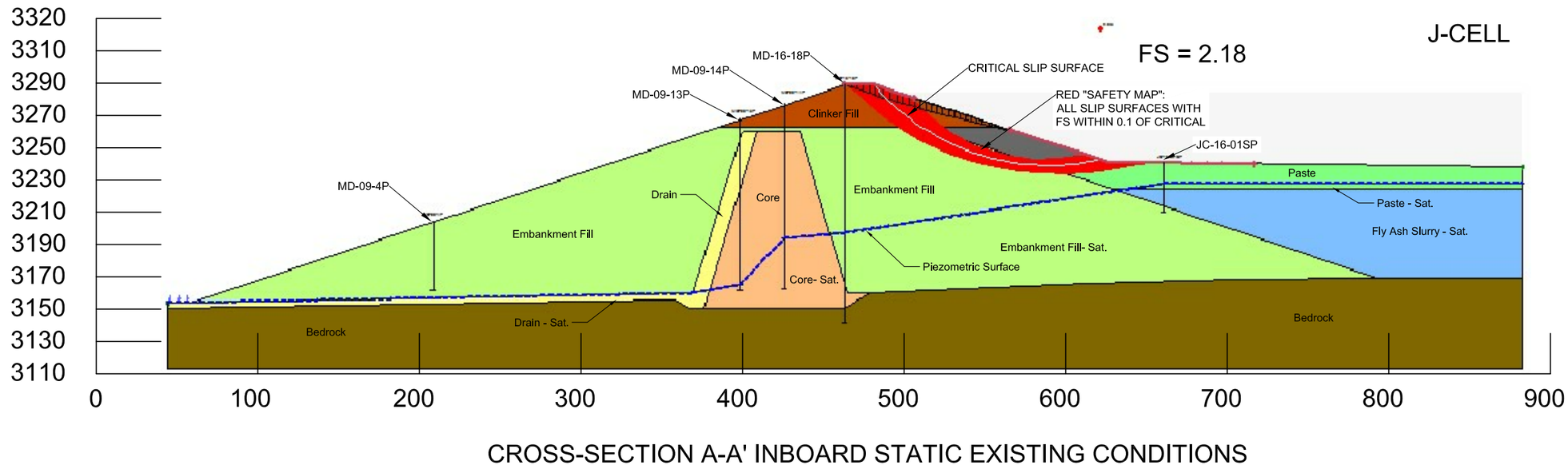


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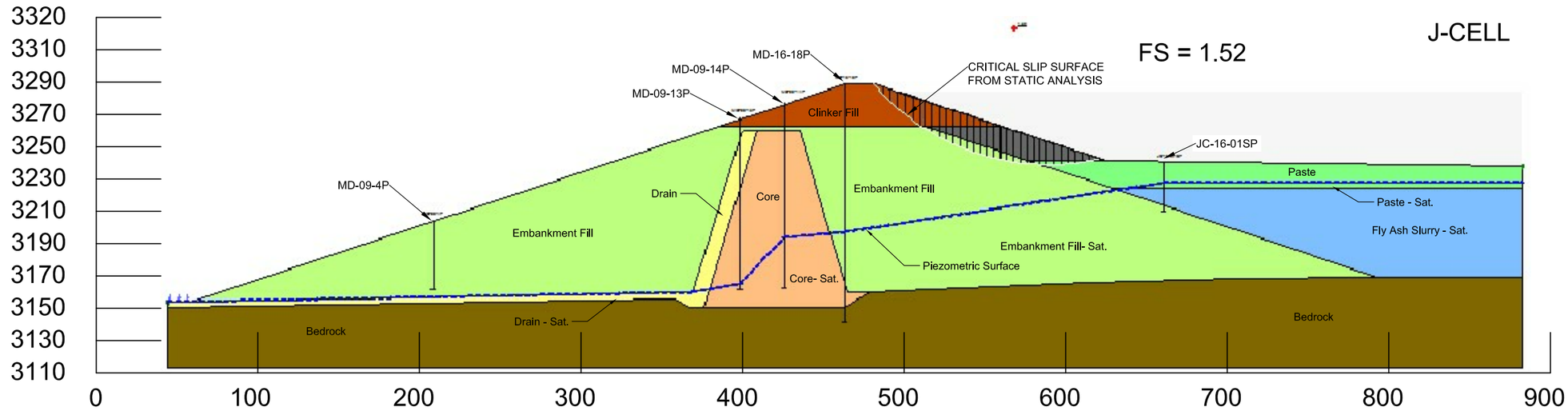


CROSS-SECTION A-A' INBOARD SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 75'
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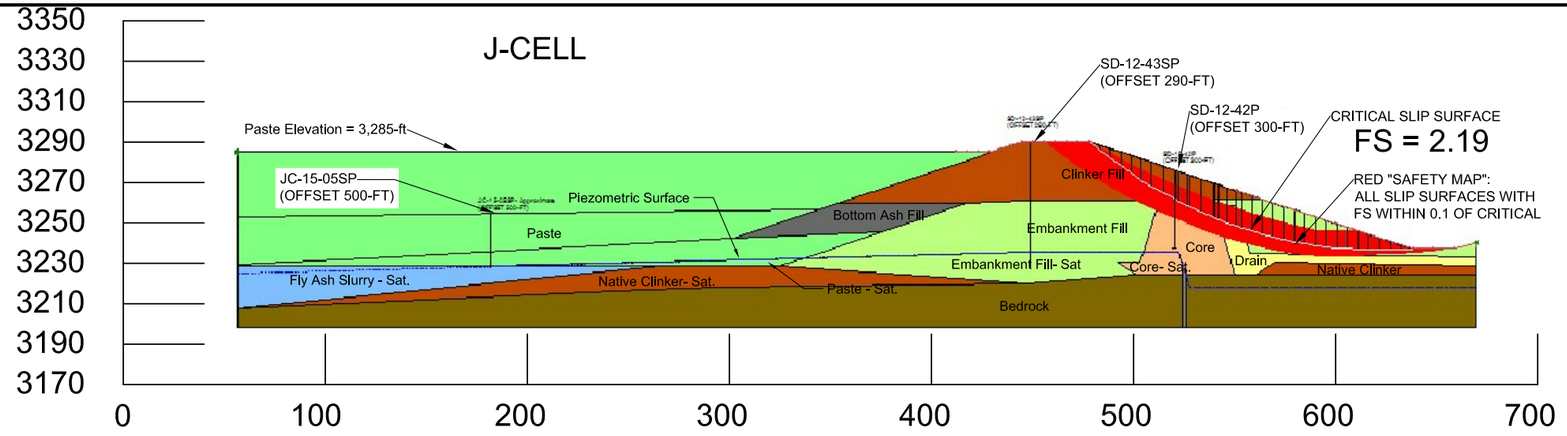
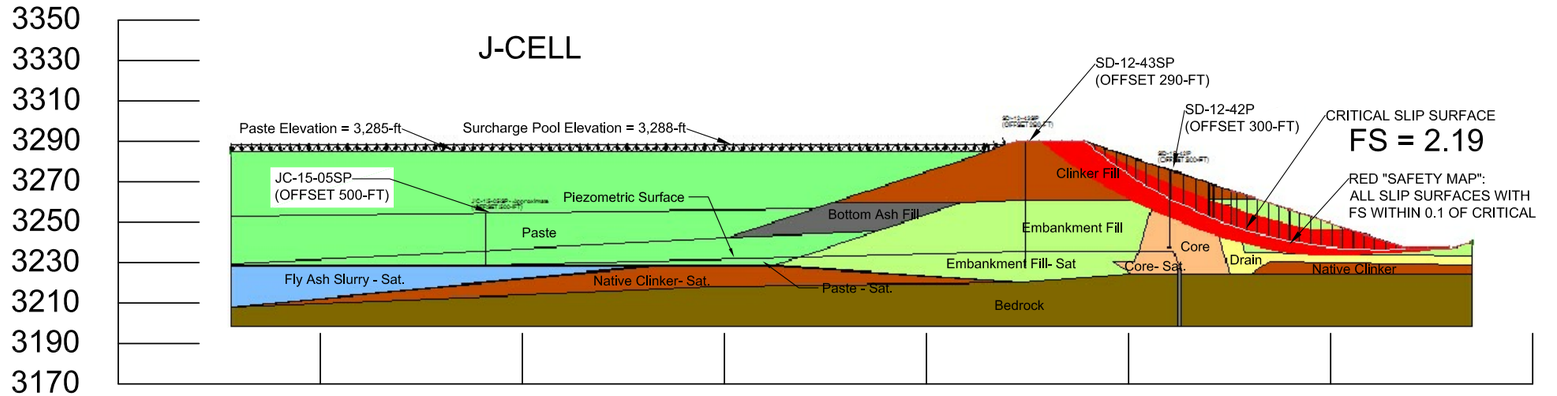
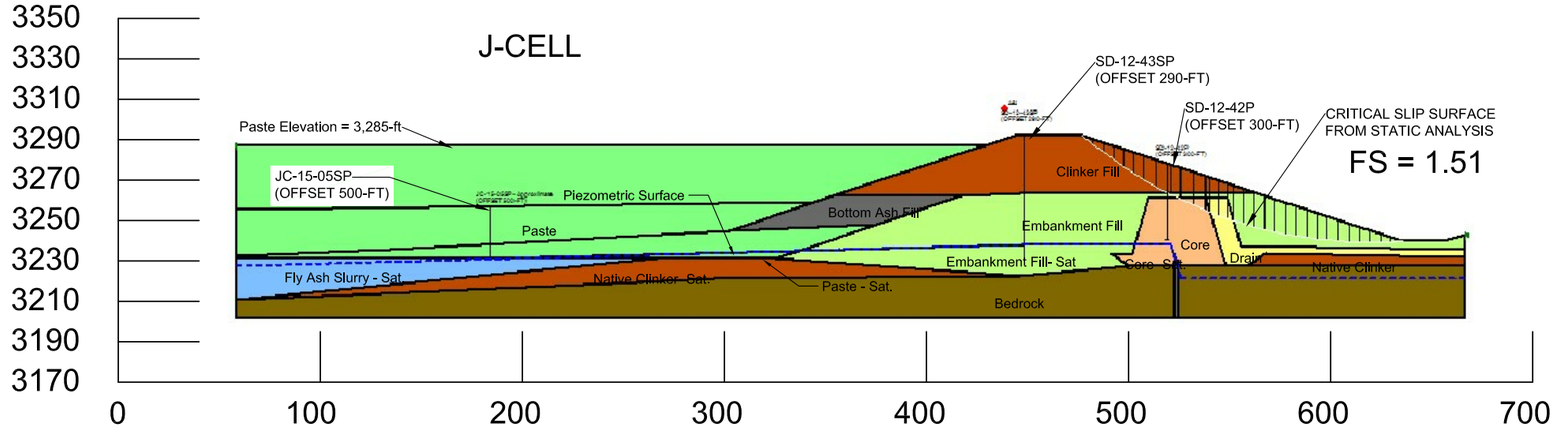



CROSS-SECTION B-B' OUTBOARD STATIC MAXIMUM STORAGE POOL




CROSS-SECTION B-B' OUTBOARD STATIC MAXIMUM SURCHARGE POOL




CROSS-SECTION B-B' OUTBOARD SEISMIC

SCALE:
VERTICAL: 1" = 75'
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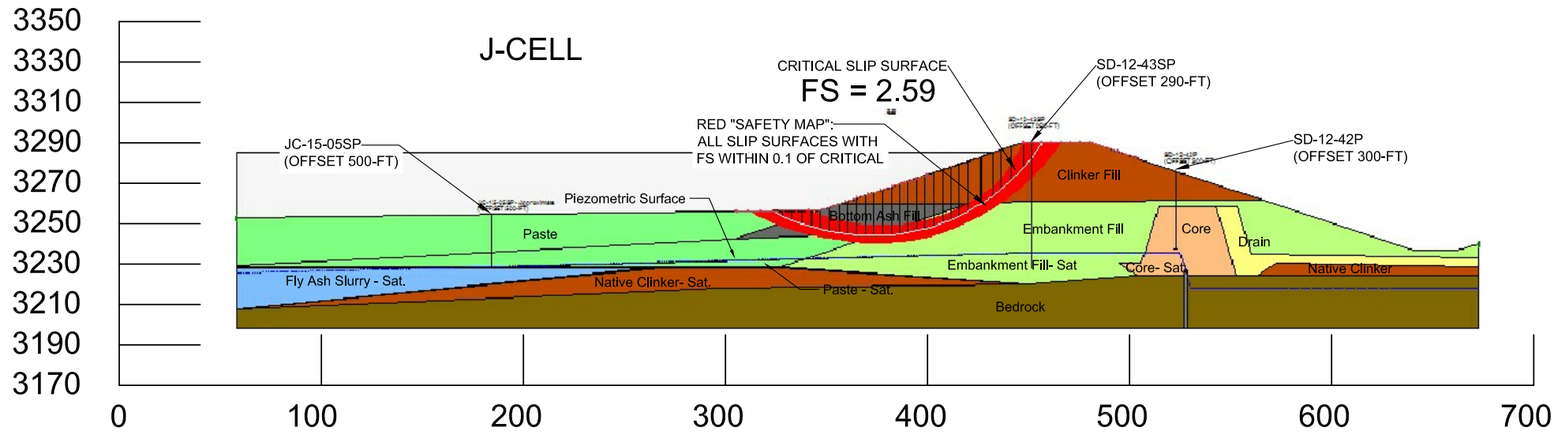


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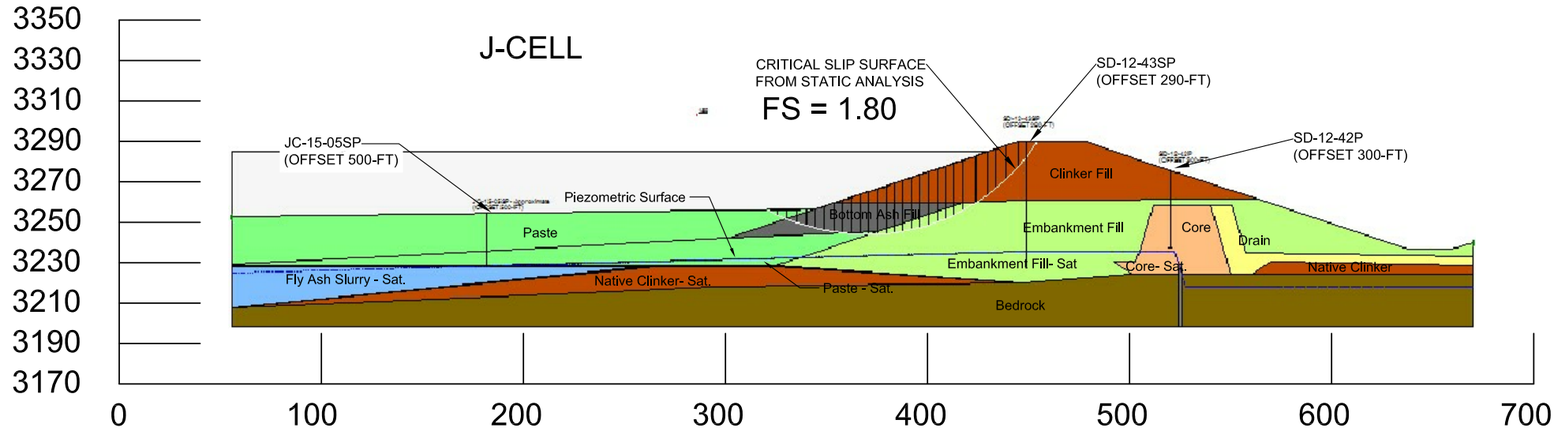


CROSS-SECTION B-B' INBOARD SEISMIC EXISTING CONDITIONS

SCALE:
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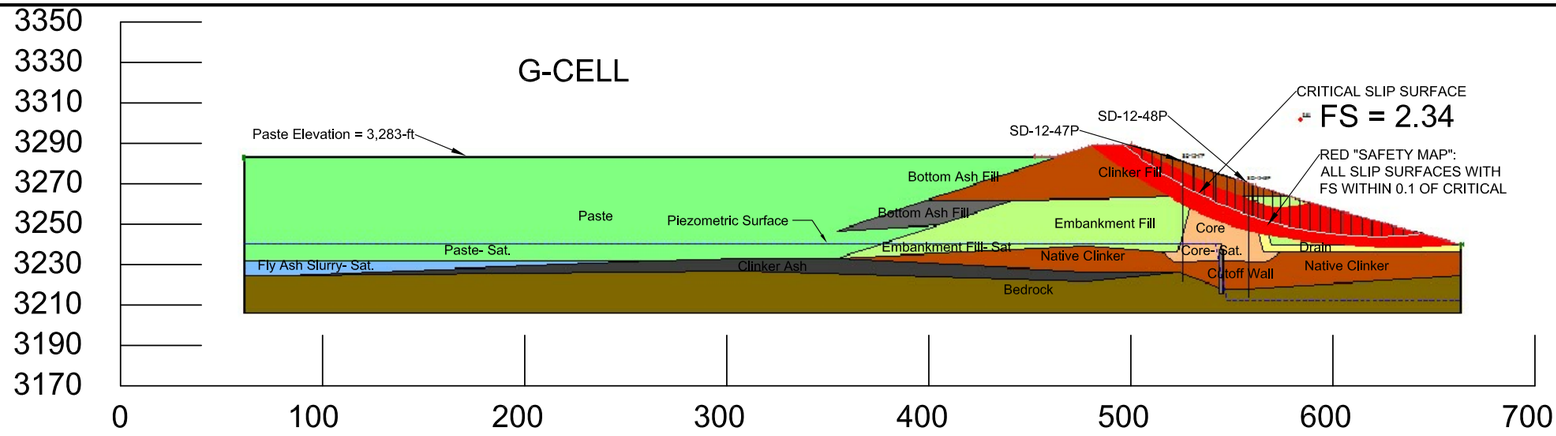
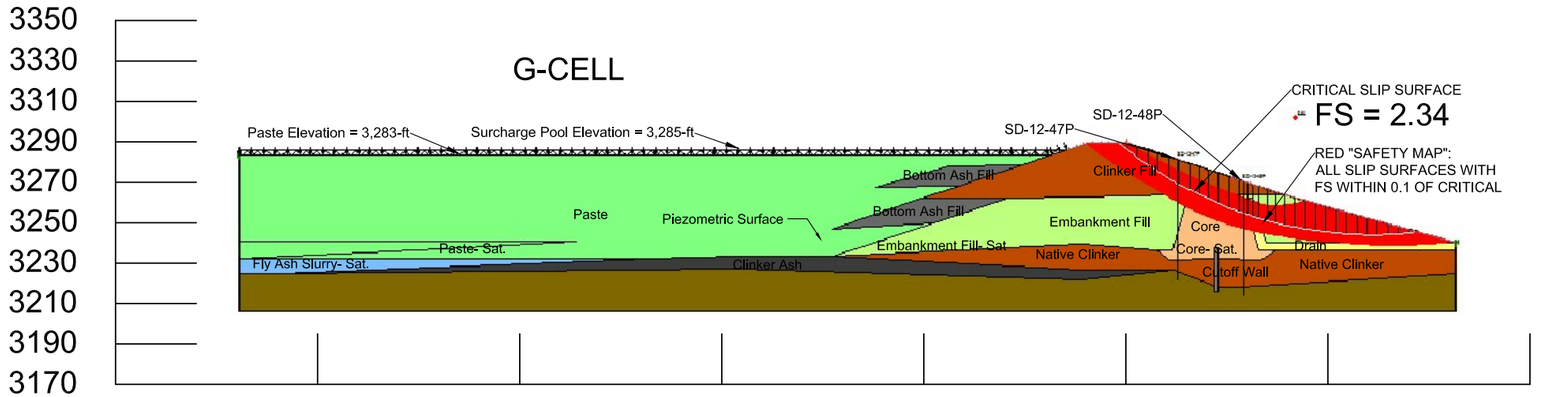



CROSS-SECTION C-C' OUTBOARD STATIC MAXIMUM STORAGE POOL

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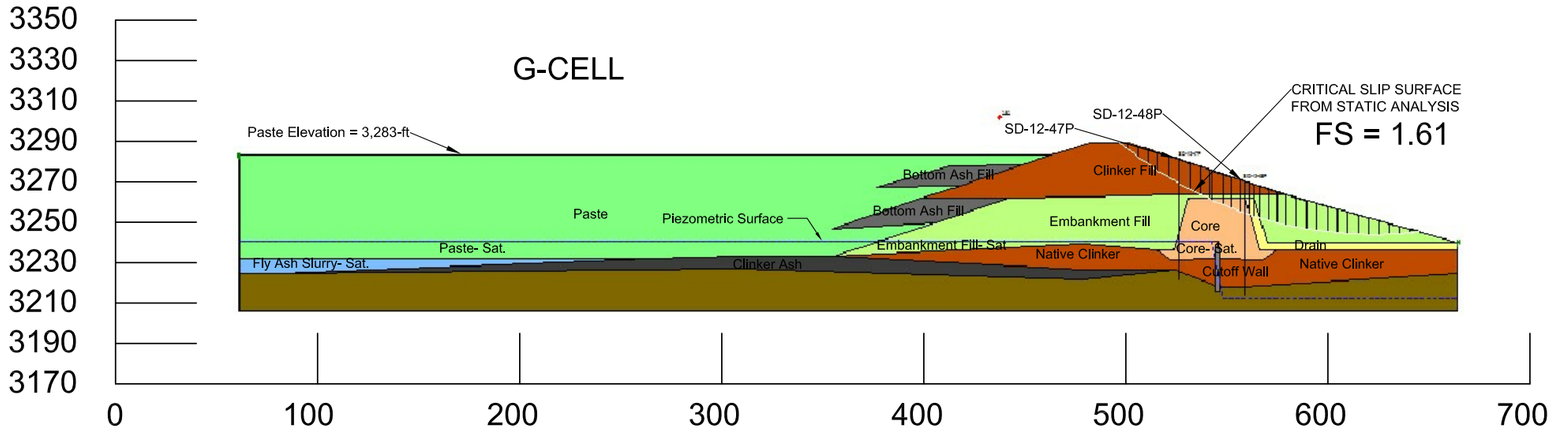


CROSS-SECTION C-C' OUTBOARD SEISMIC

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VERTICAL: 1" = 75'
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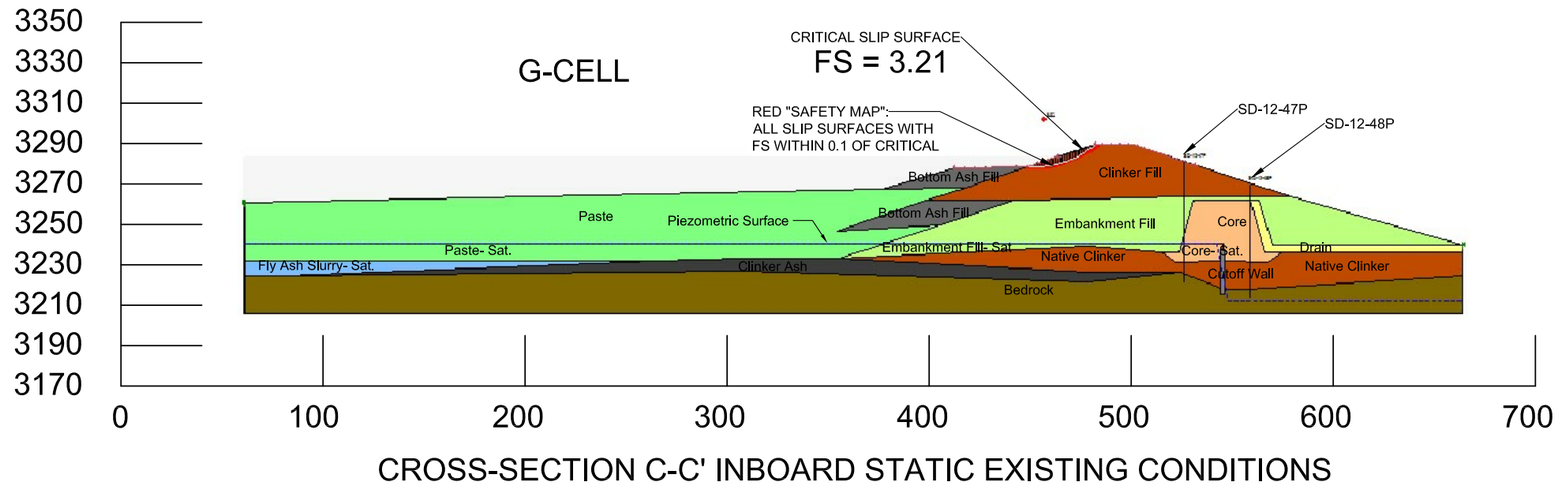


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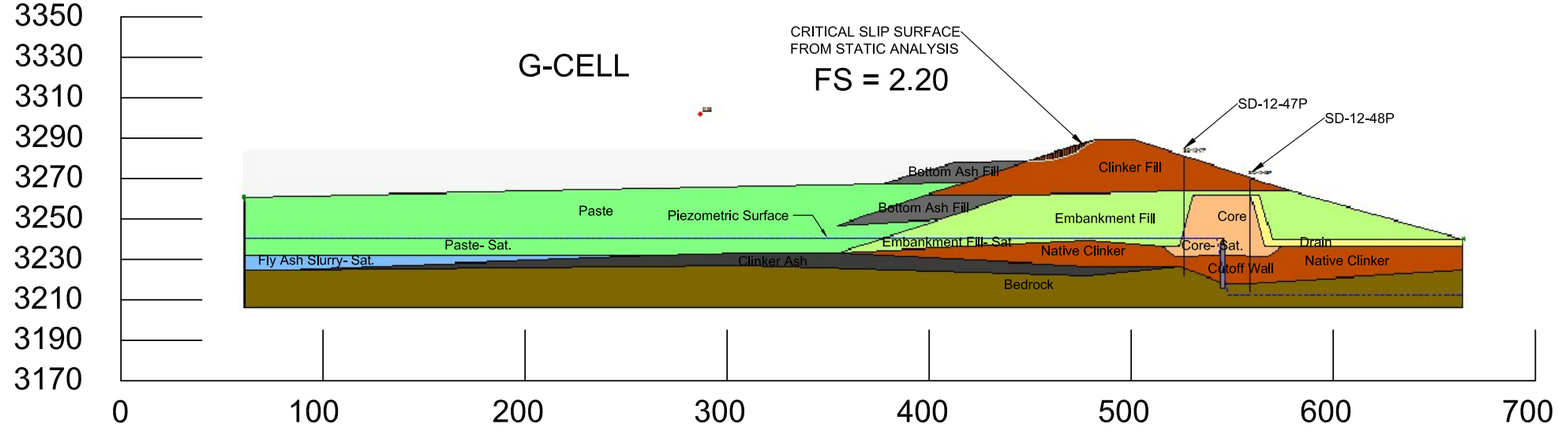


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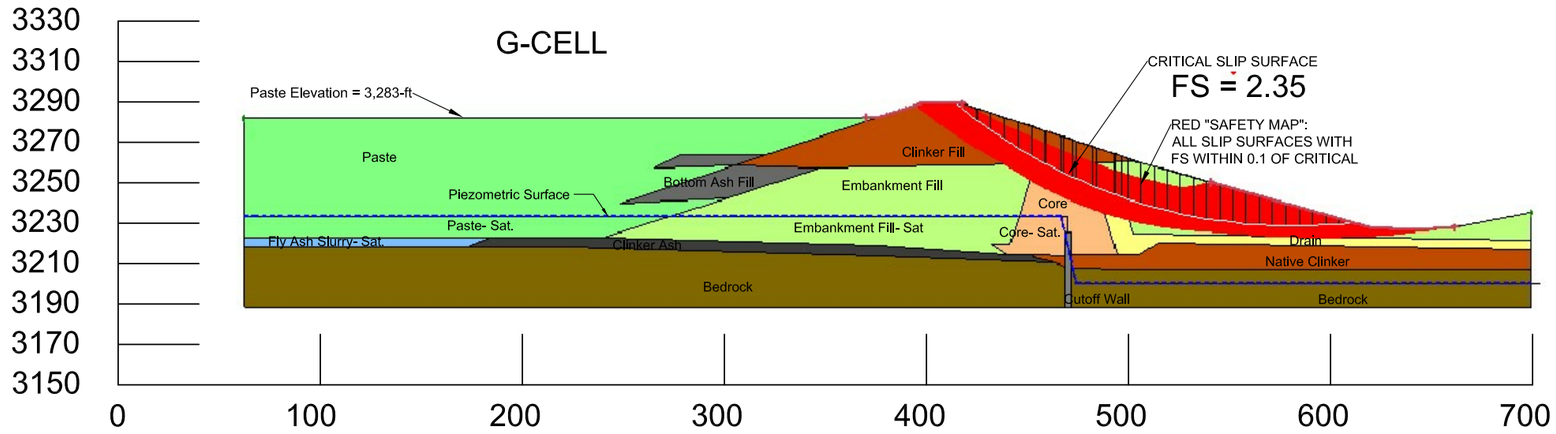


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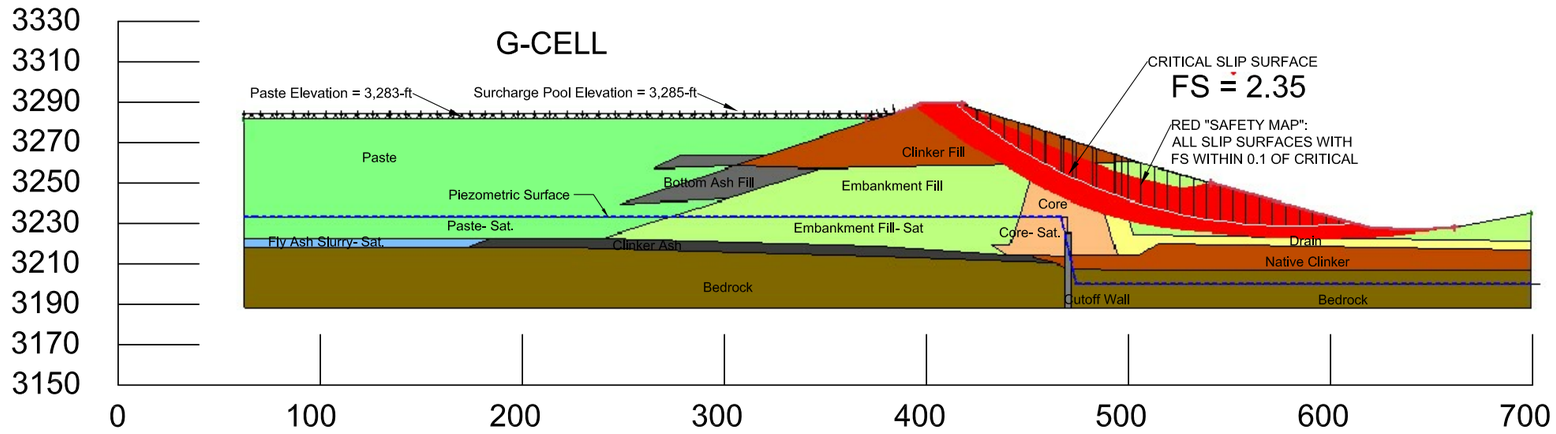


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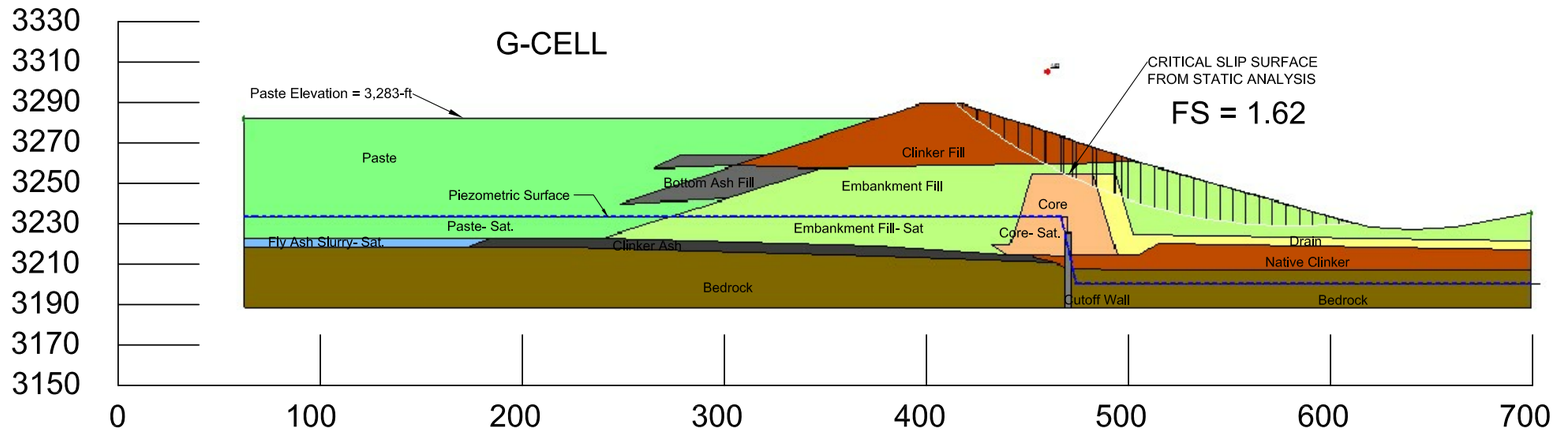


CROSS-SECTION D-D' OUTBOARD SEISMIC

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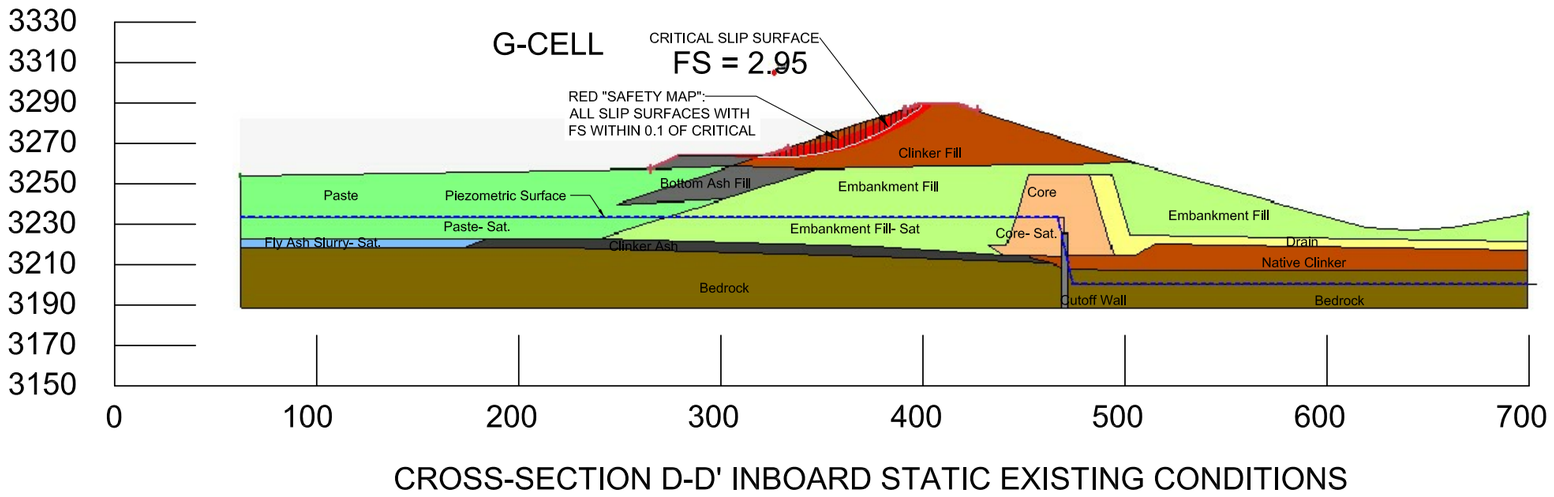


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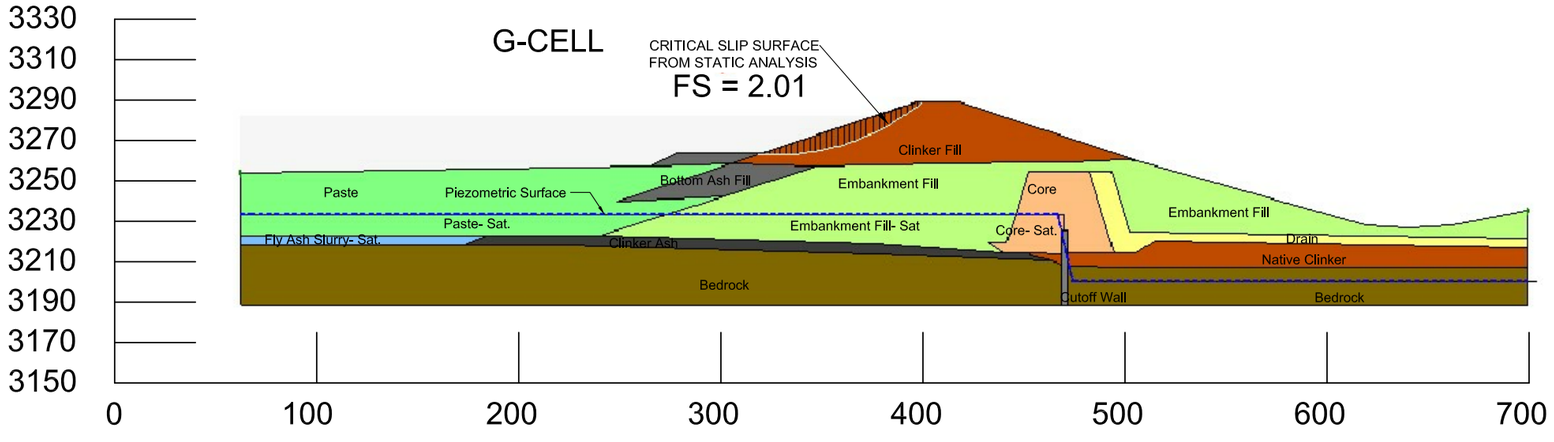


CROSS-SECTION D-D' INBOARD SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 75'
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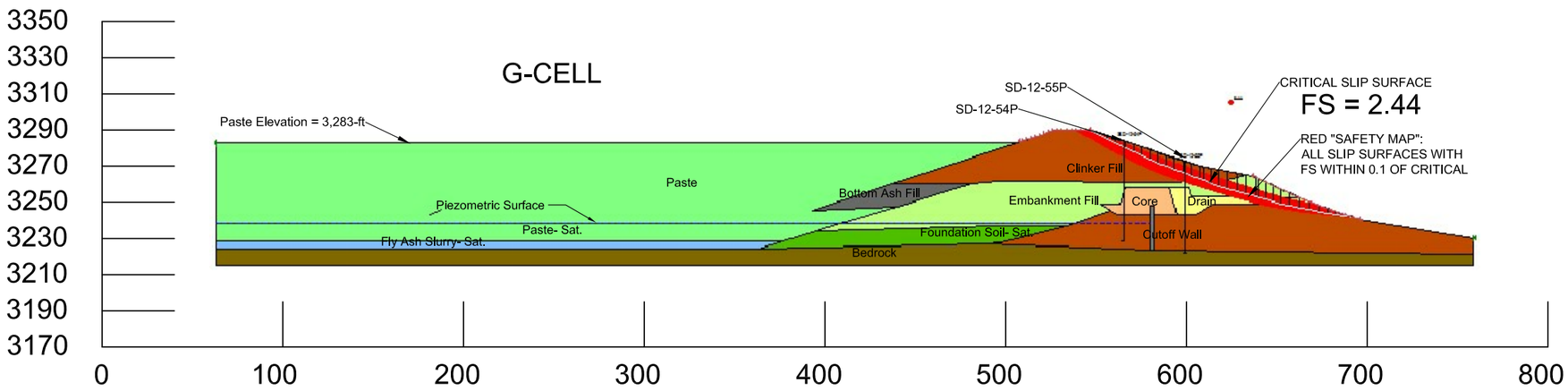


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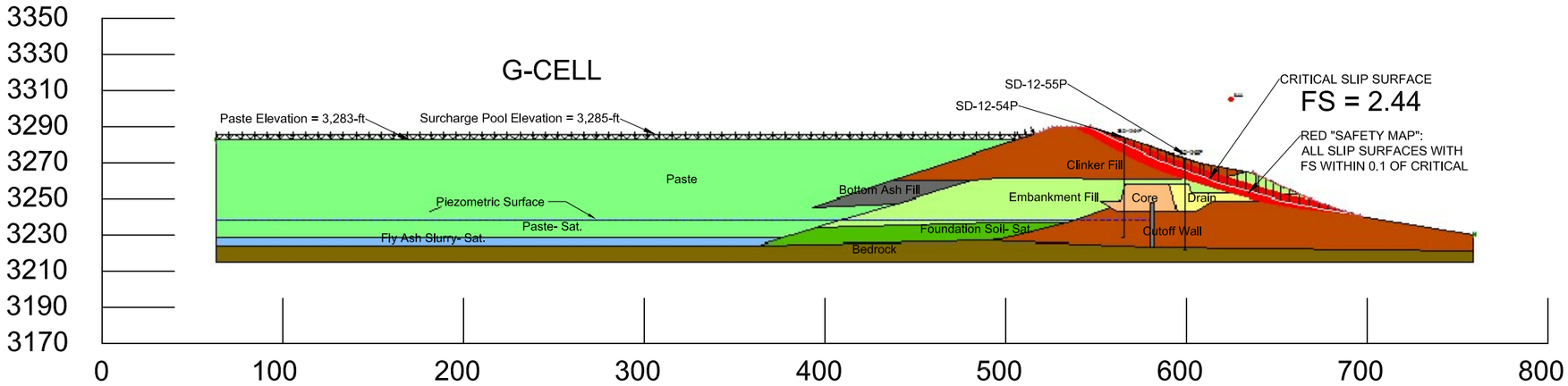


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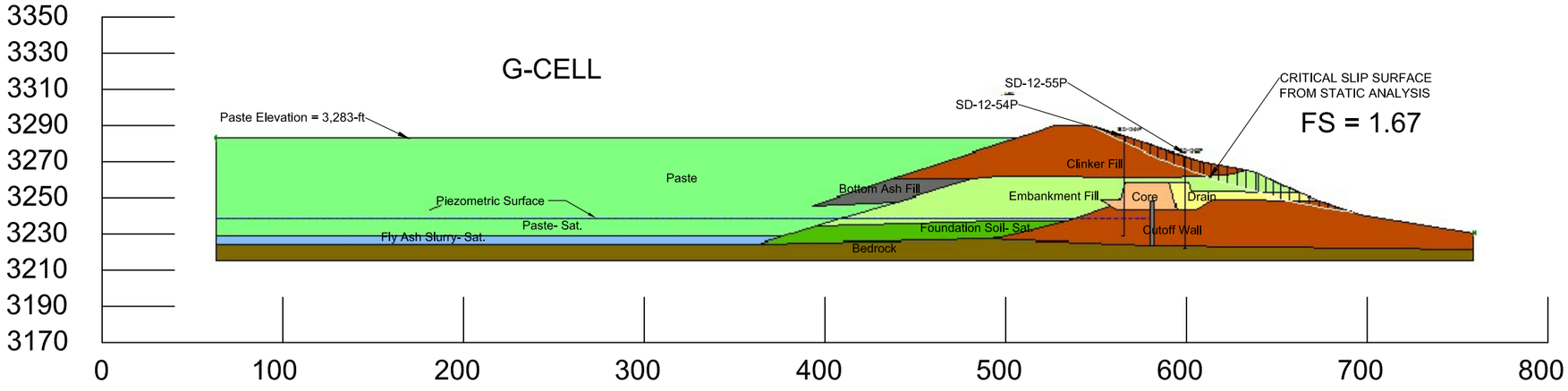


CROSS-SECTION E-E' OUTBOARD SEISMIC

SCALE:
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CROSS-SECTION E-E'
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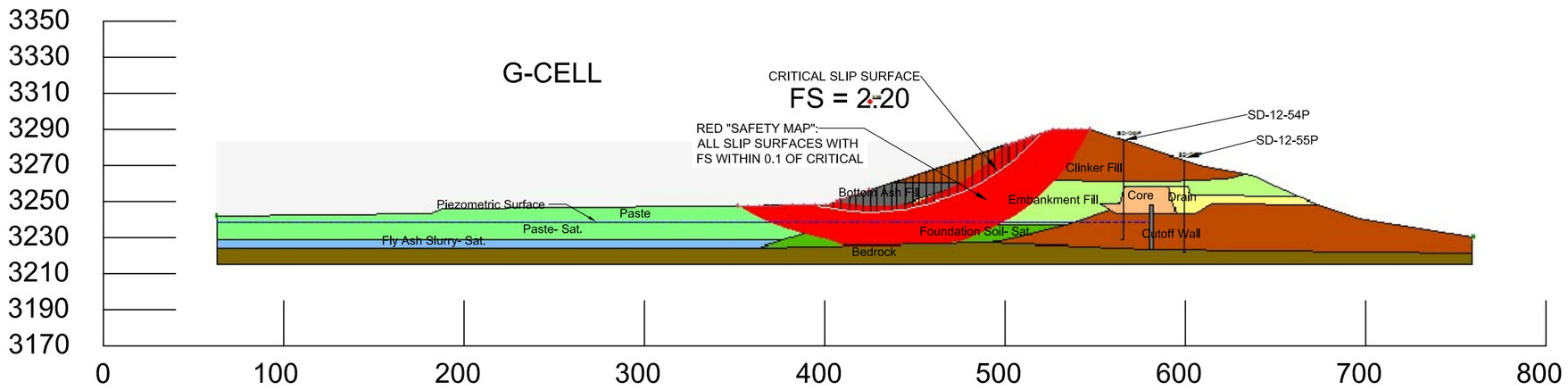
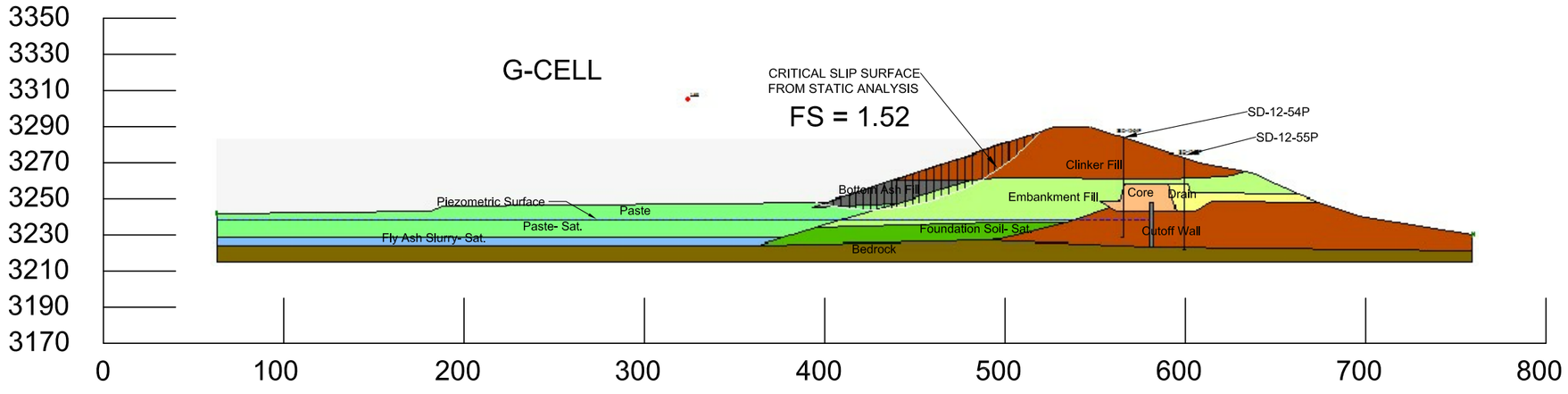



CROSS-SECTION E-E' INBOARD STATIC EXISTING CONDITIONS




CROSS-SECTION E-E' INBOARD SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 75'
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INBOARD FACE
EXISTING CONDITIONS

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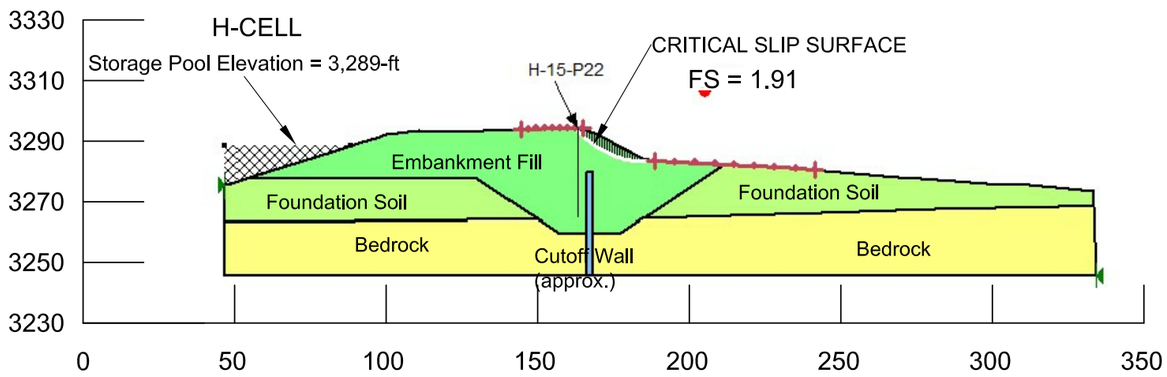
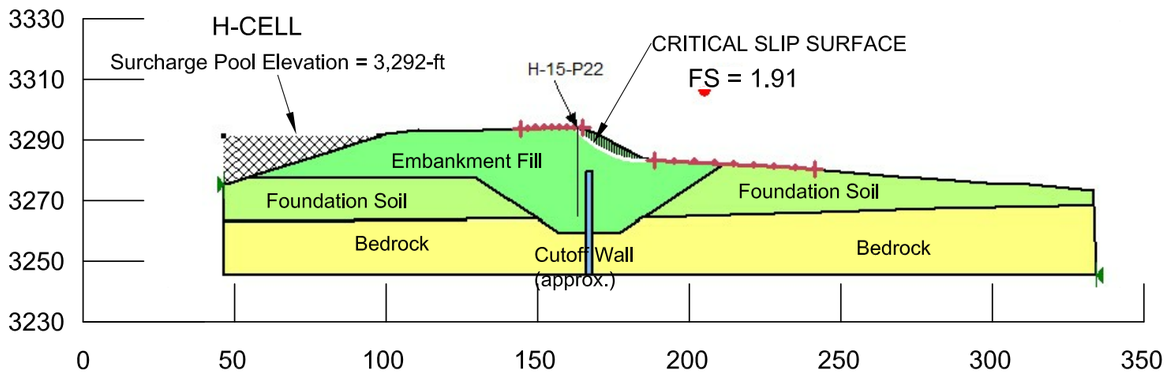
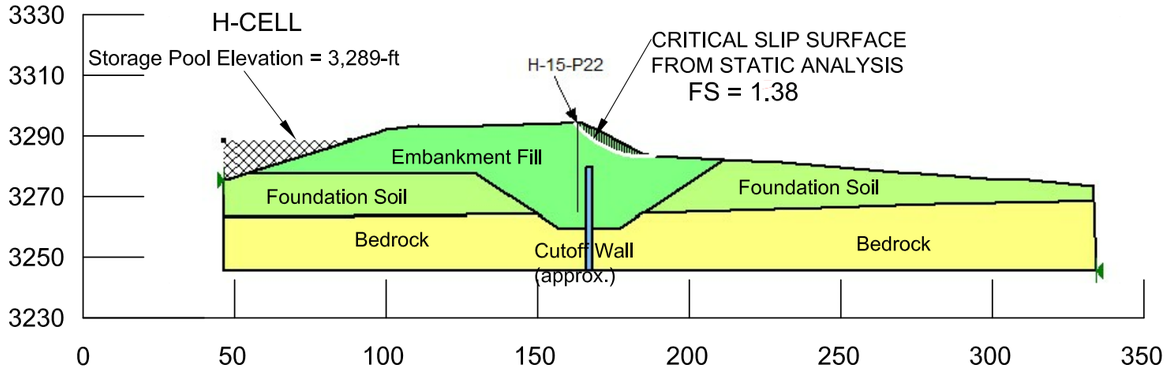



CROSS-SECTION F-F' OUTBOARD STATIC
MAXIMUM STORAGE POOL




CROSS-SECTION F-F' OUTBOARD STATIC
MAXIMUM SURCHARGE POOL




CROSS-SECTION F-F' OUTBOARD SEISMIC

SCALE:
VERTICAL: 1" = 50'
HORIZONTAL: 1" = 50'

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ELECTRIC STATION
COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
CROSS-SECTION F-F'
OUTBOARD FACE

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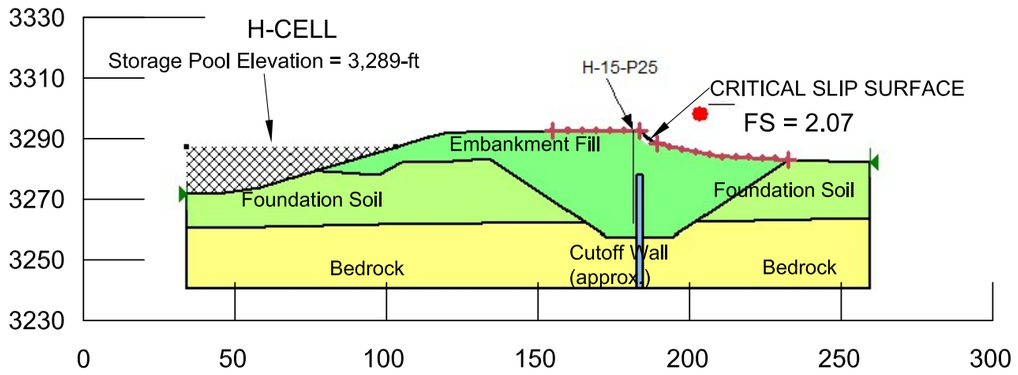
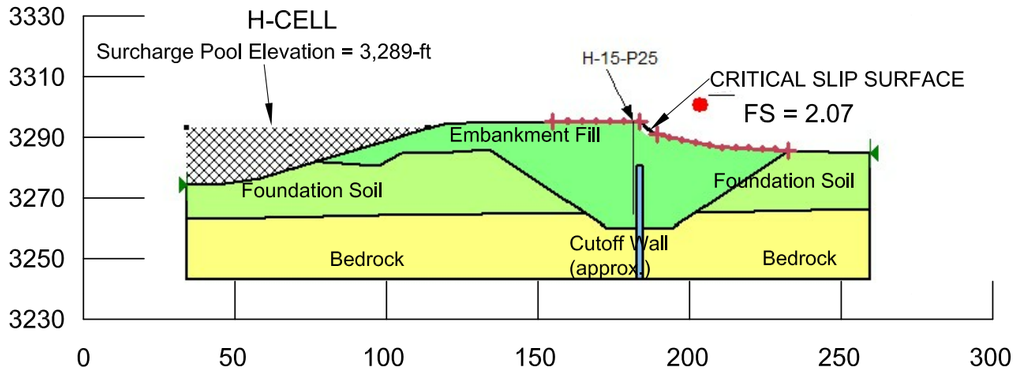
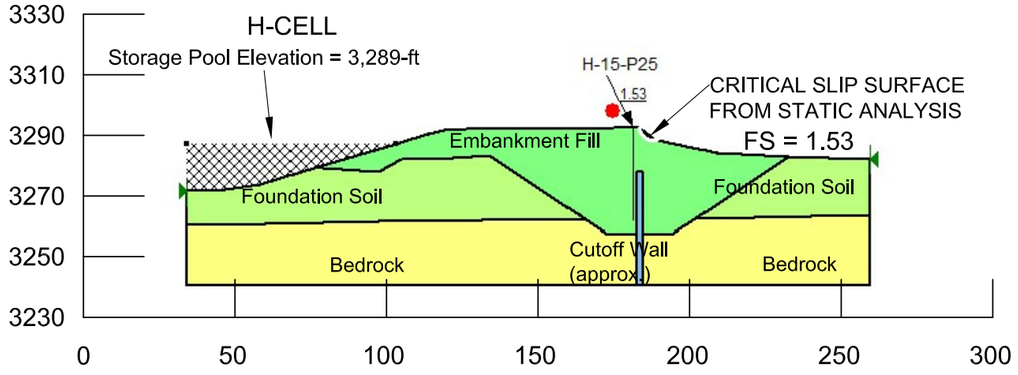



CROSS-SECTION G-G' OUTBOARD STATIC
MAXIMUM STORAGE POOL




CROSS-SECTION G-G' OUTBOARD STATIC
MAXIMUM SURCHARGE POOL




CROSS-SECTION G-G' OUTBOARD SEISMIC

SCALE:
VERTICAL: 1" = 50'
HORIZONTAL: 1" = 50'

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COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
CROSS-SECTION G-G'
OUTBOARD FACE

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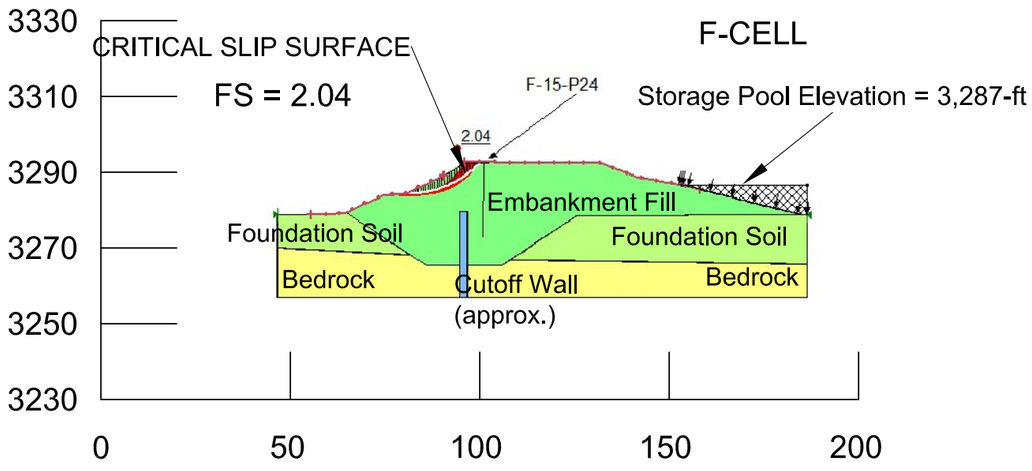
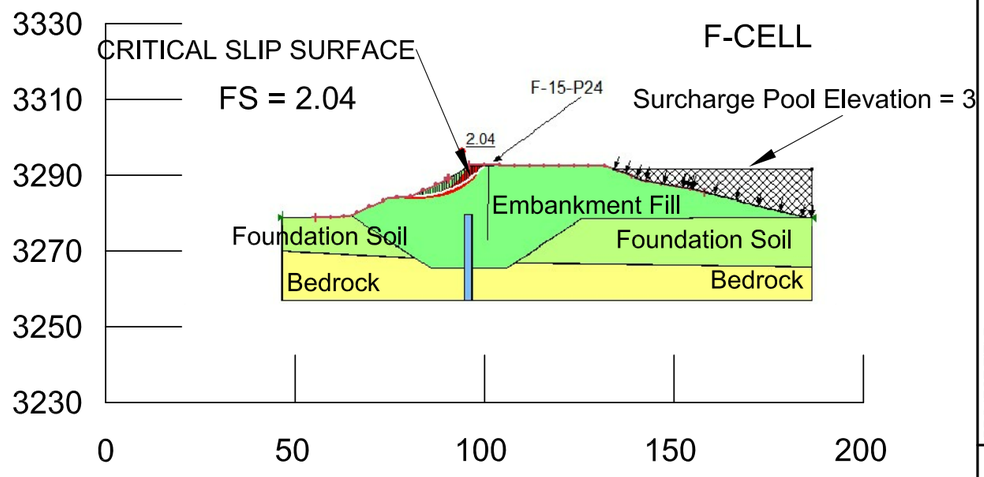
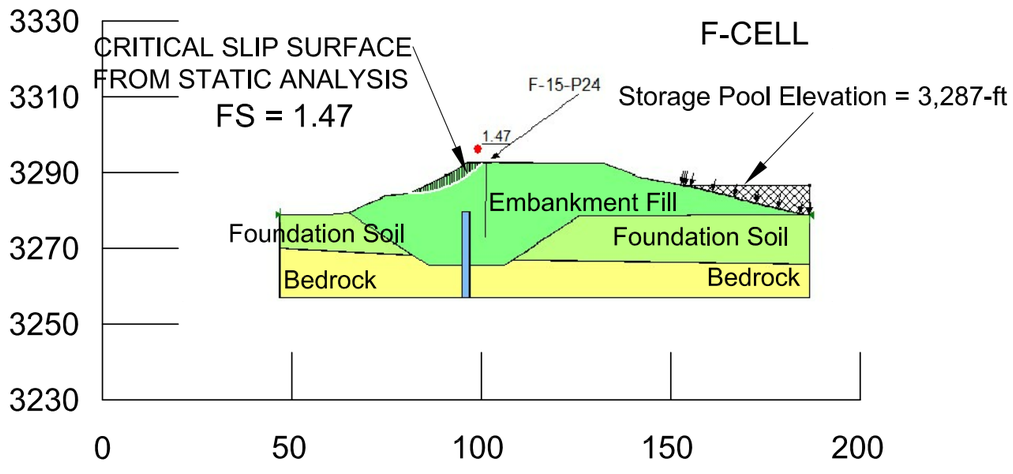



CROSS-SECTION H-H' OUTBOARD STATIC
MAXIMUM STORAGE POOL




CROSS-SECTION H-H' OUTBOARD STATIC
MAXIMUM SURCHARGE POOL




CROSS-SECTION H-H' OUTBOARD SEISMIC

SCALE:
VERTICAL: 1" = 40'
HORIZONTAL: 1" = 40'

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COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
CROSS-SECTION H-H'
OUTBOARD FACE

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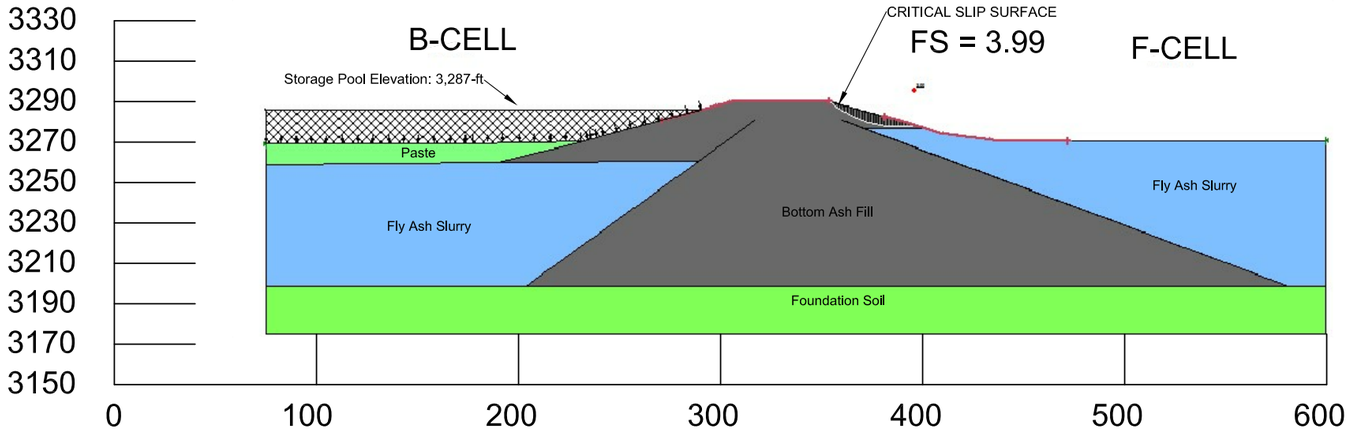
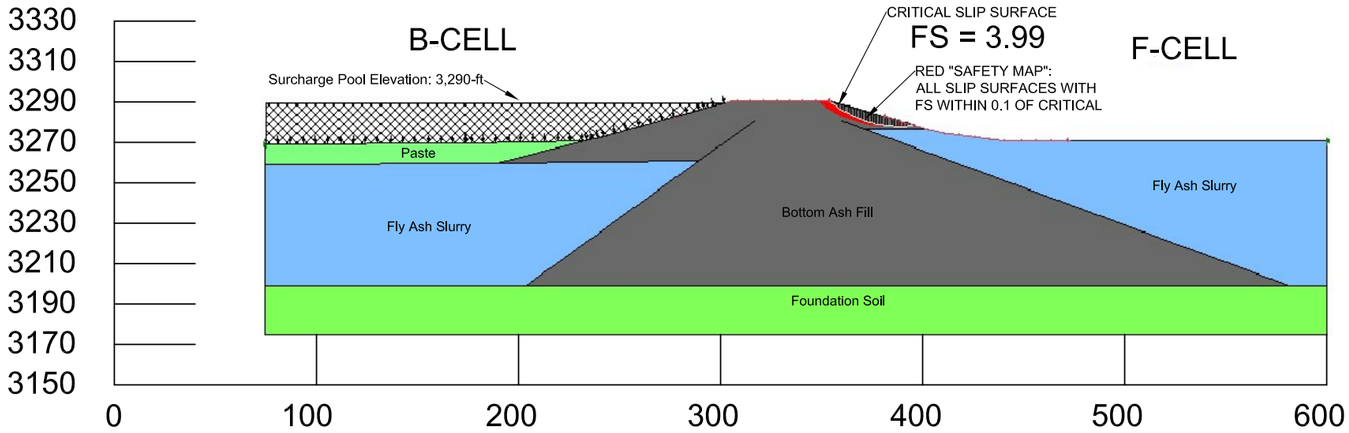
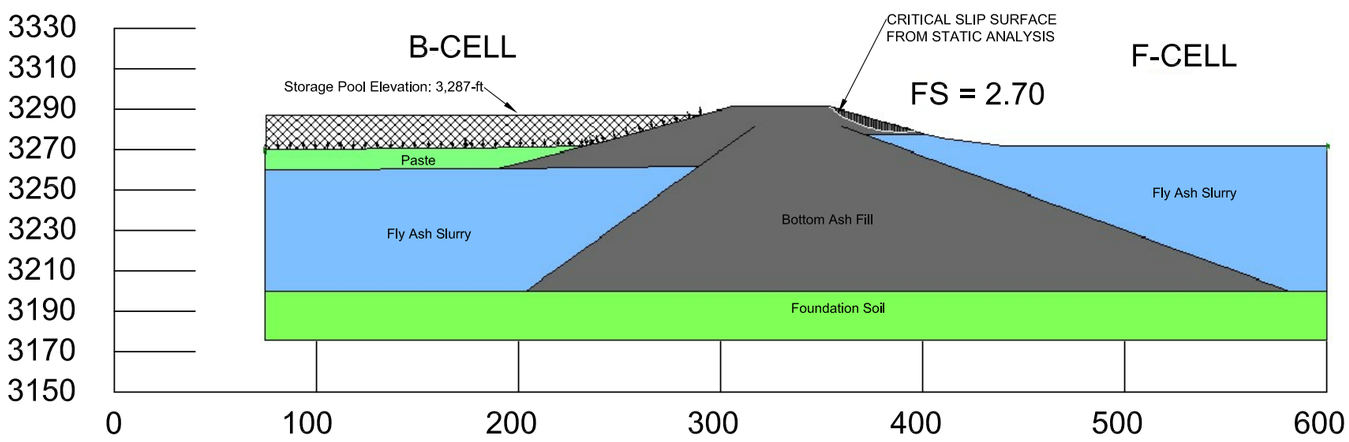



CROSS-SECTION I-I' F DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION I-I' F DIRECTION STATIC MAXIMUM SURCHARGE POOL




CROSS-SECTION I-I' F DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 75'
HORIZONTAL: 1" = 75'

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SHEET TITLE:
STABILITY MODEL
CROSS-SECTION I-I'
F-CELL DIRECTION

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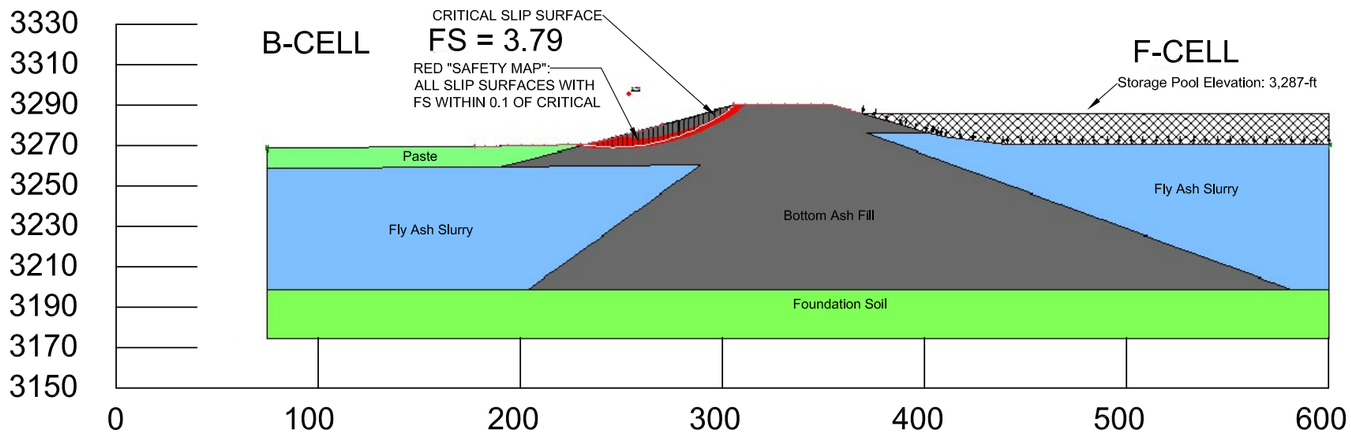
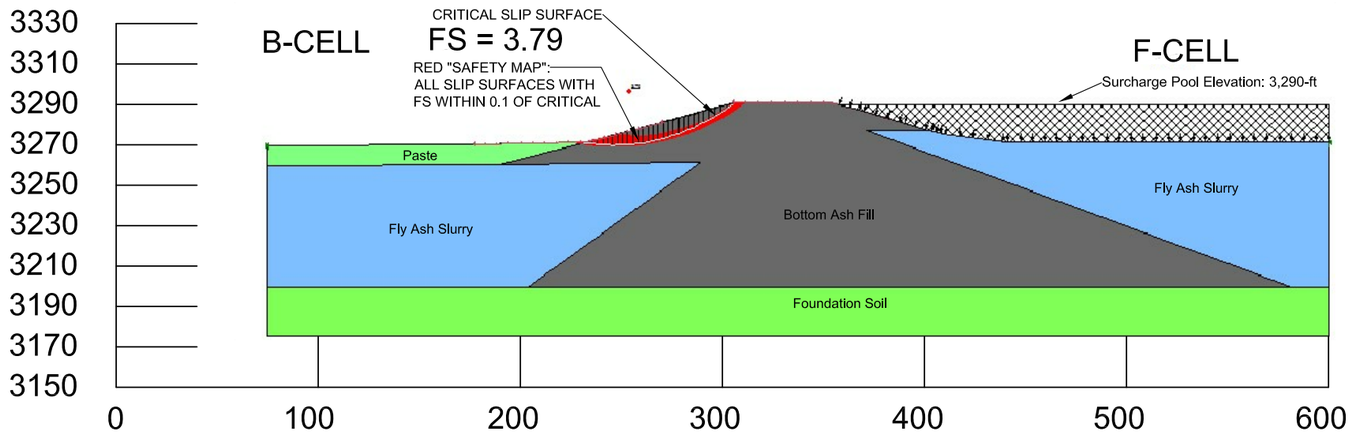
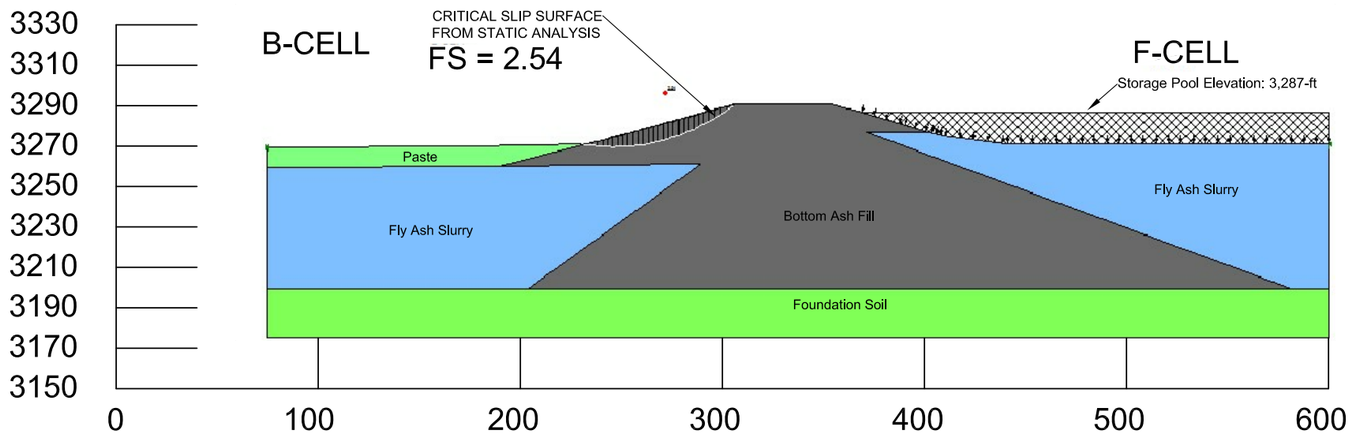



CROSS-SECTION I-I' B DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION I-I' B DIRECTION STATIC MAXIMUM SURCHARGE POOL




CROSS-SECTION I-I' B DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 75'
HORIZONTAL: 1" = 75'

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SHEET TITLE:
STABILITY MODEL
CROSS-SECTION I-I'
B-CELL DIRECTION

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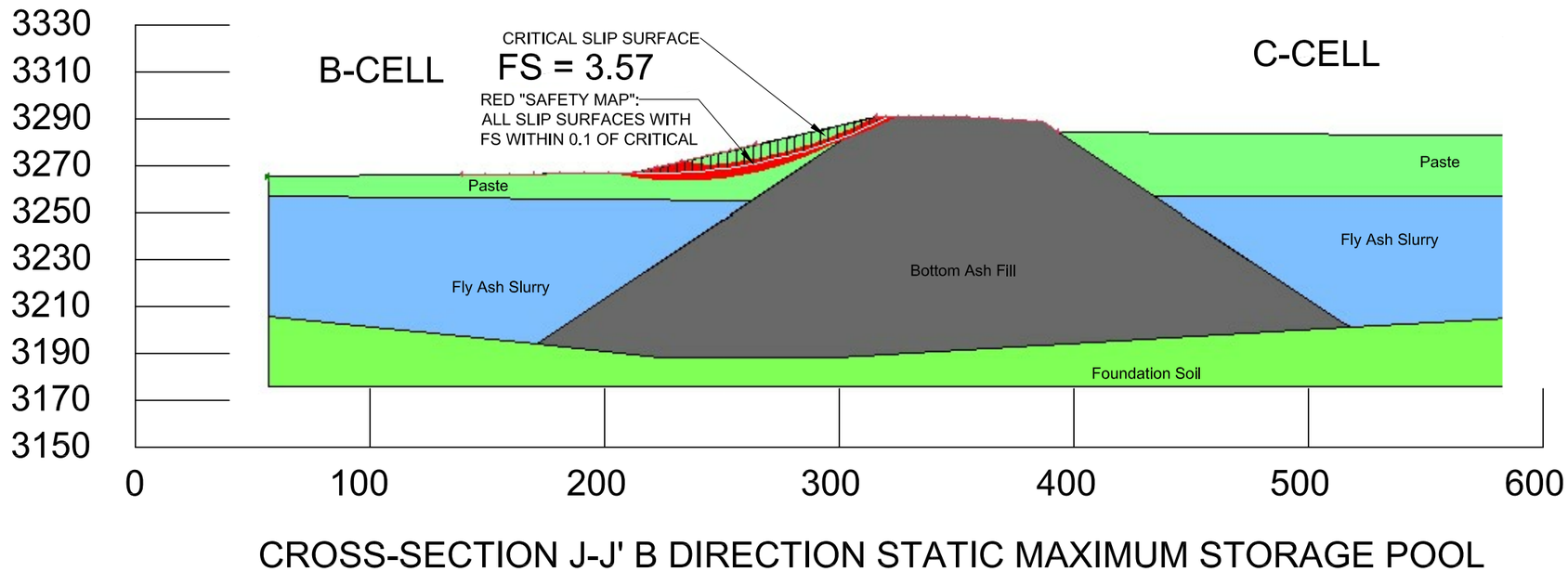
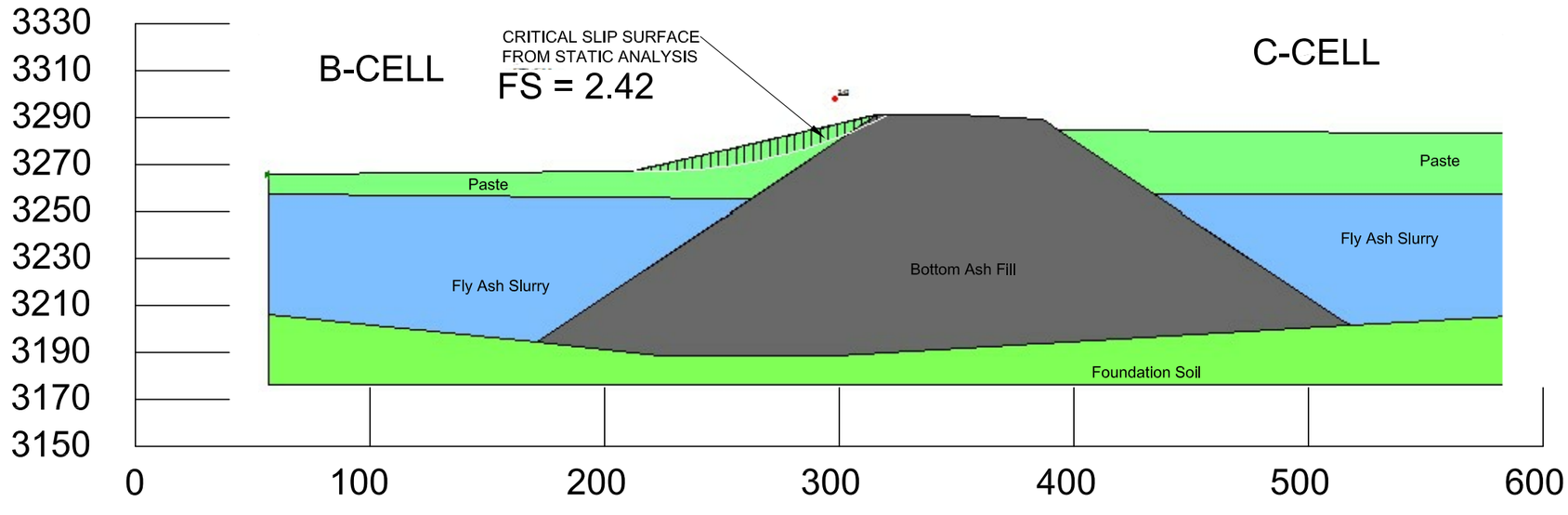



CROSS-SECTION J-J' B DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION J-J' B DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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SHEET TITLE:
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CROSS-SECTION J-J'
B-CELL DIRECTION

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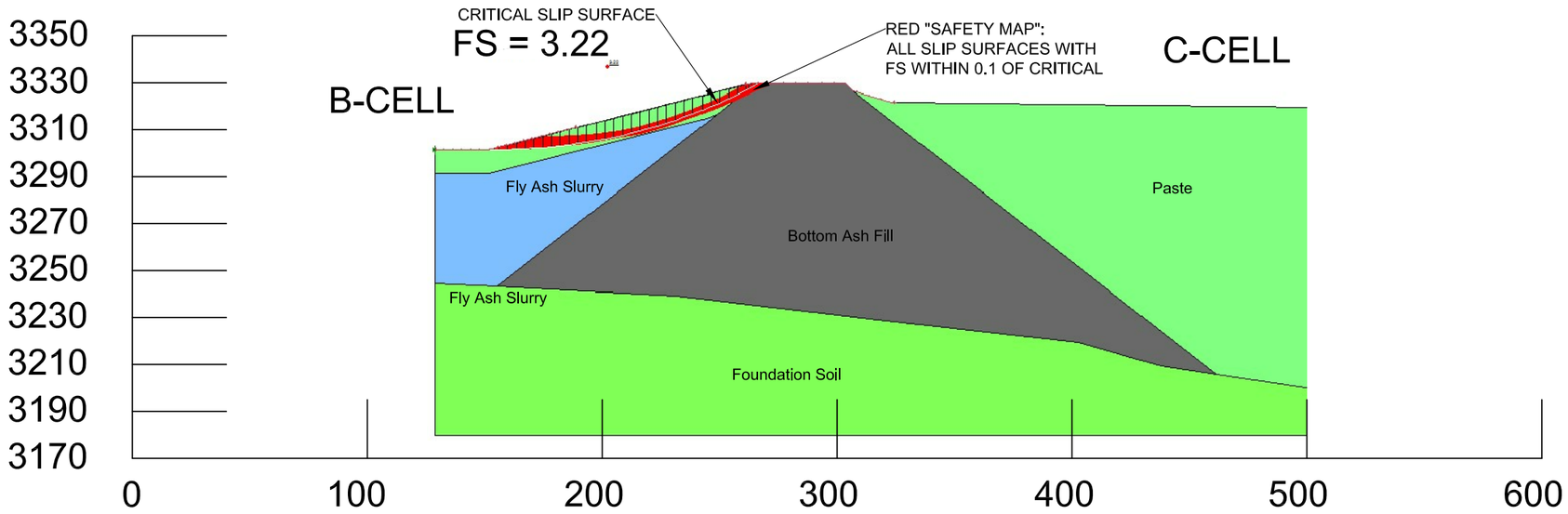
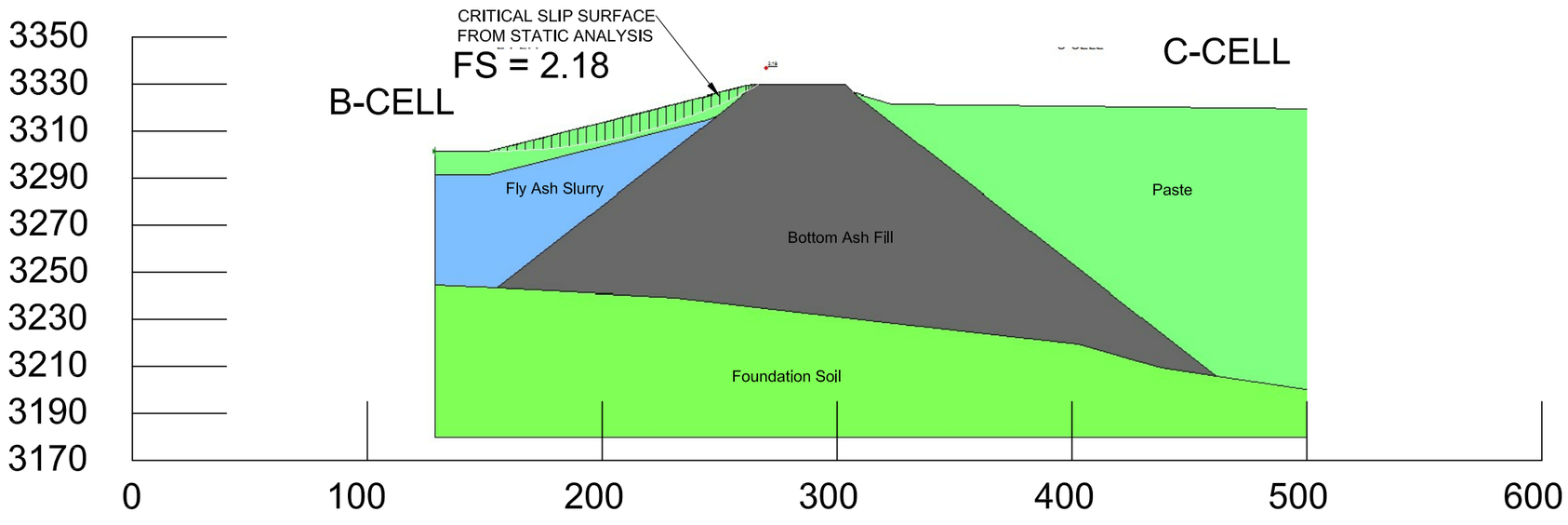



CROSS-SECTION K-K' B DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION K-K' B DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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CROSS-SECTION K-K'
B-CELL DIRECTION

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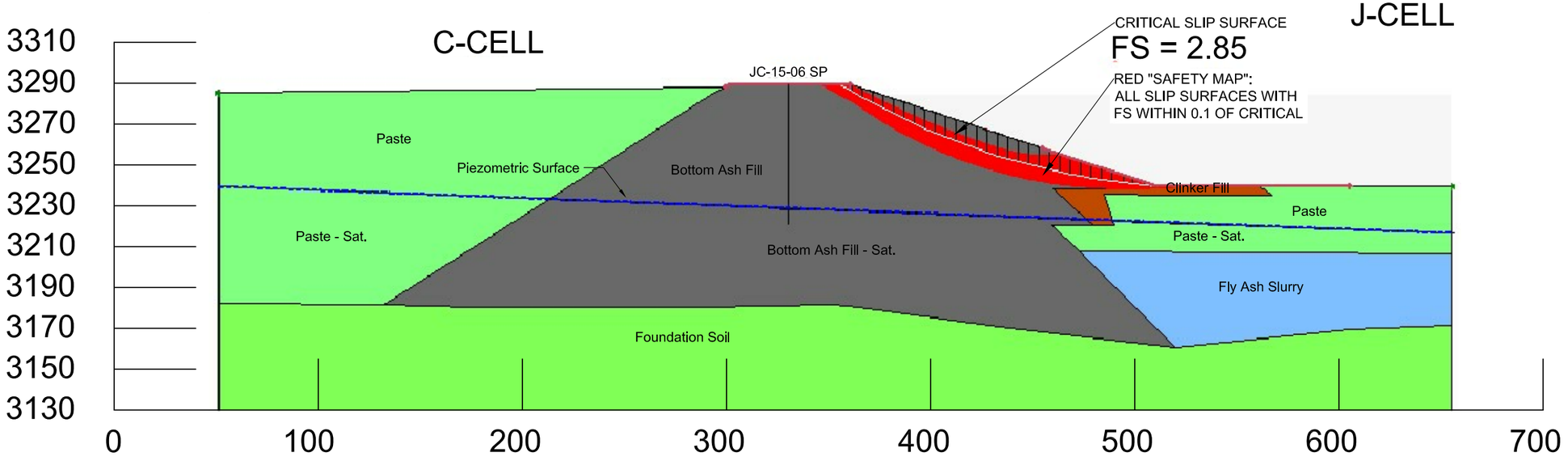
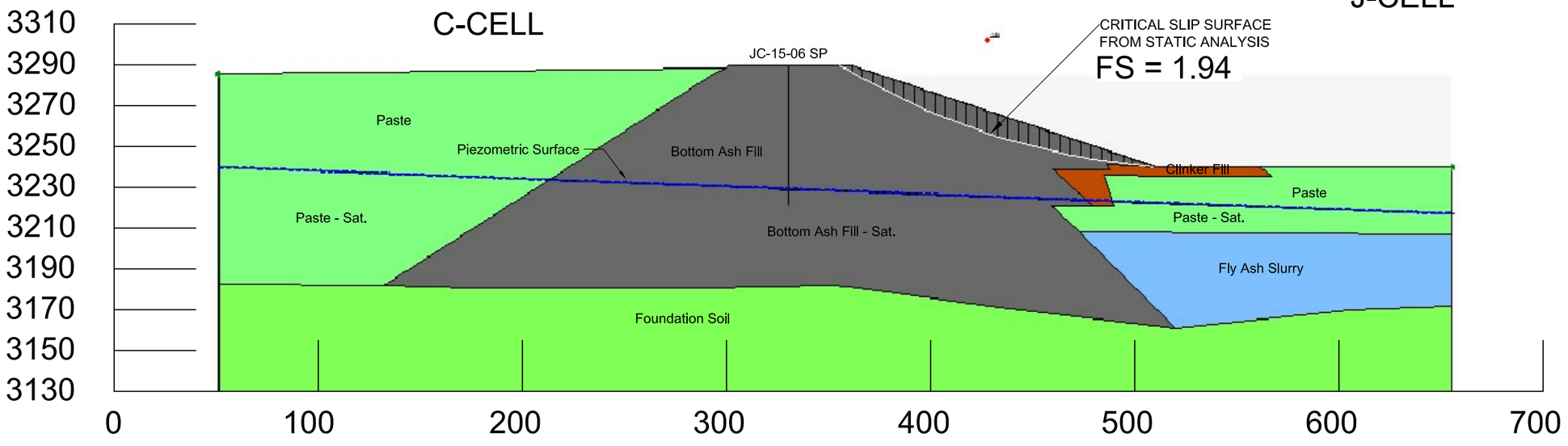



CROSS-SECTION L-L' J DIRECTION STATIC EXISTING CONDITIONS




CROSS-SECTION L-L' J DIRECTION SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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STABILITY MODEL
CROSS-SECTION L-L'
J-CELL DIRECTION
EXISTING CONDITIONS

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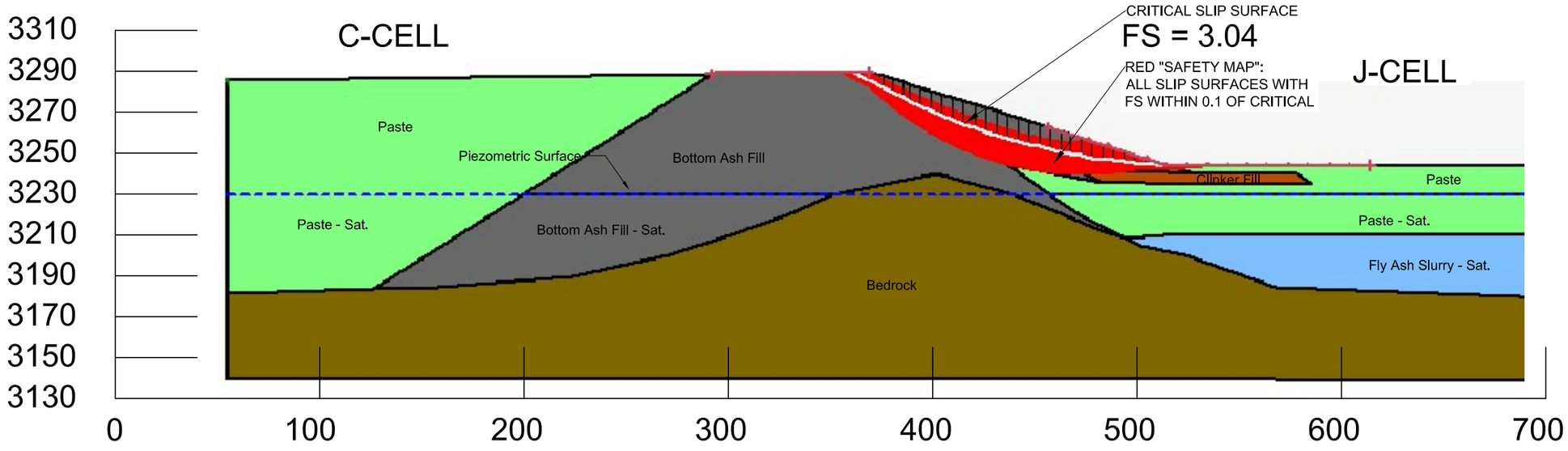
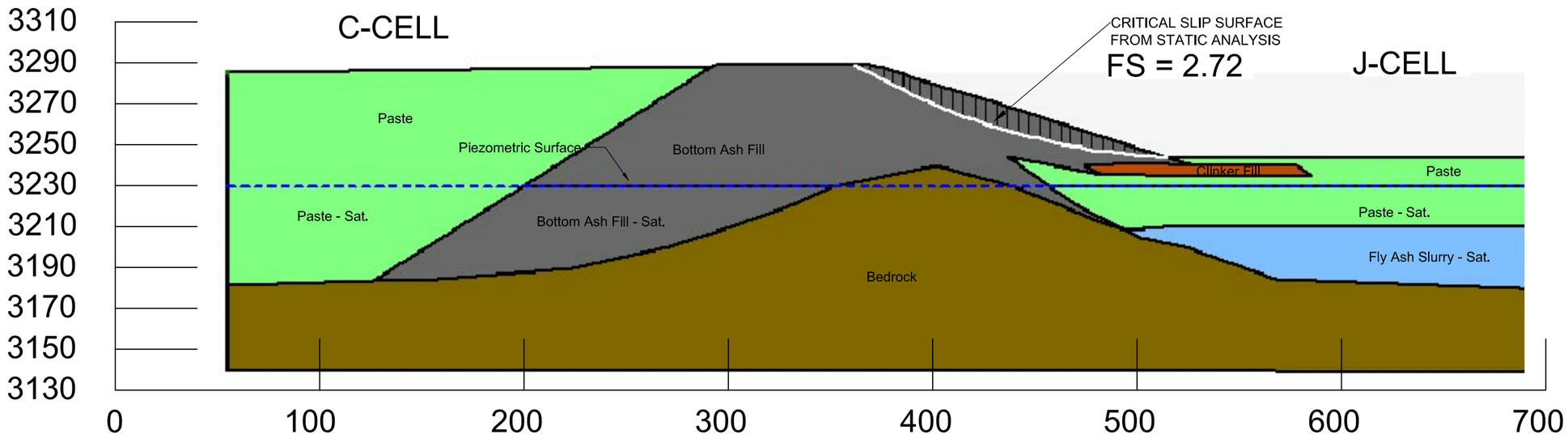



CROSS-SECTION M-M' J DIRECTION STATIC EXISTING CONDITIONS




CROSS-SECTION M-M' J DIRECTION SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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STABILITY MODEL
CROSS-SECTION M-M'
J-CELL DIRECTION
EXISTING CONDITIONS

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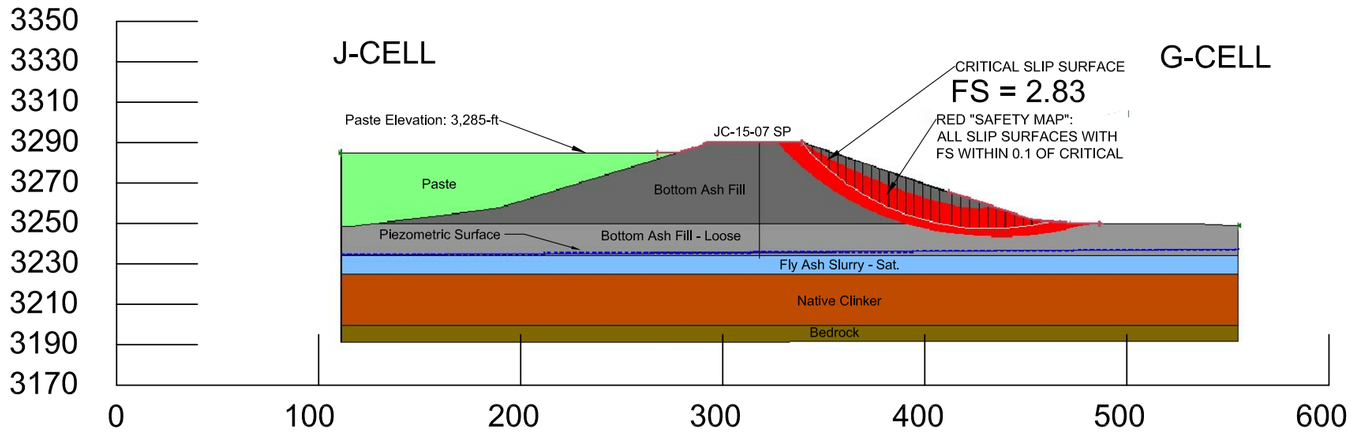
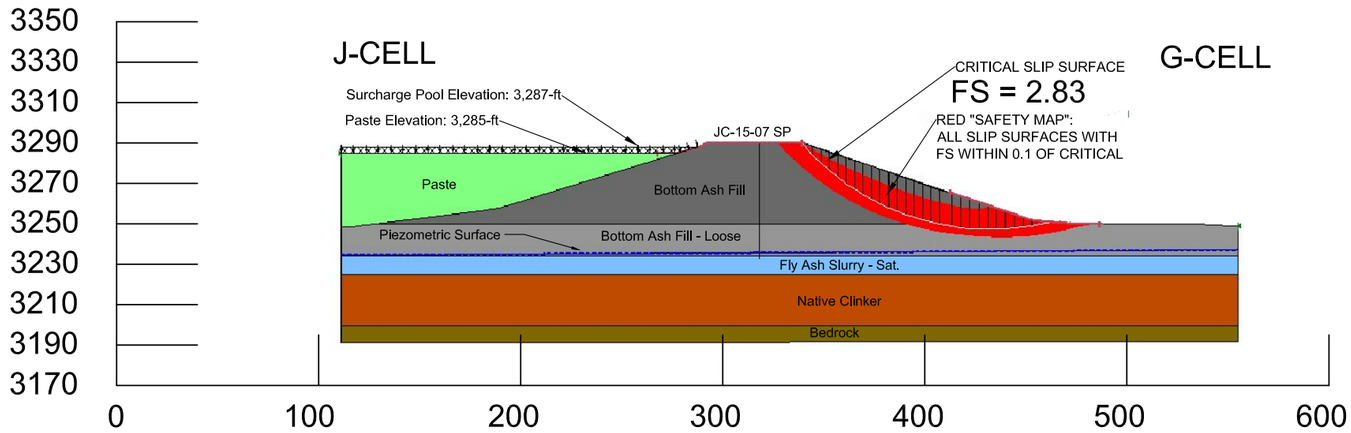
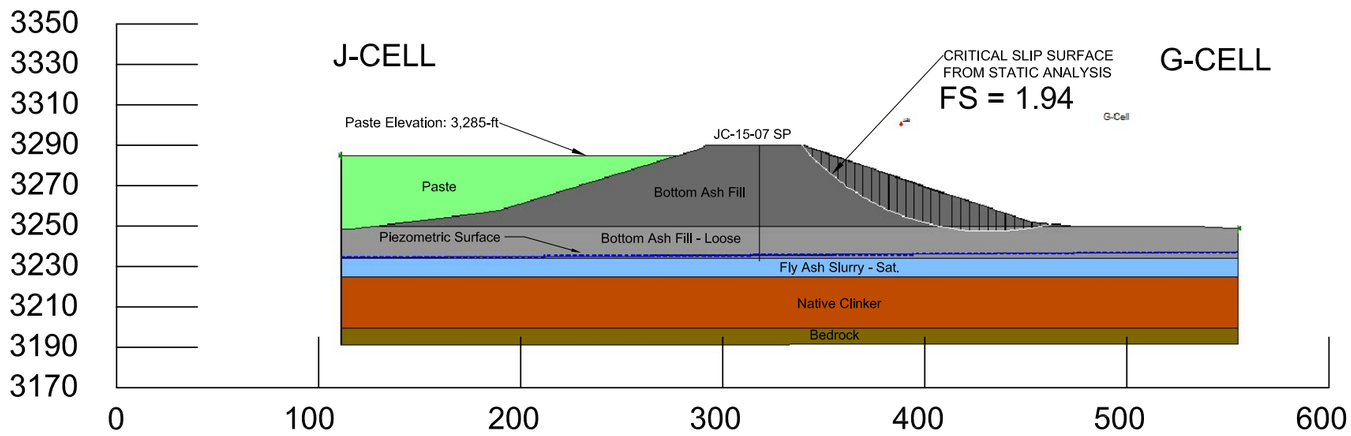



CROSS-SECTION N-N' G DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION N-N' G DIRECTION STATIC MAXIMUM SURCHARGE POOL




CROSS-SECTION N-N' G DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 75'
HORIZONTAL: 1" = 75'

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COLSTRIP, MONTANA

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CROSS-SECTION N-N'
G-CELL DIRECTION

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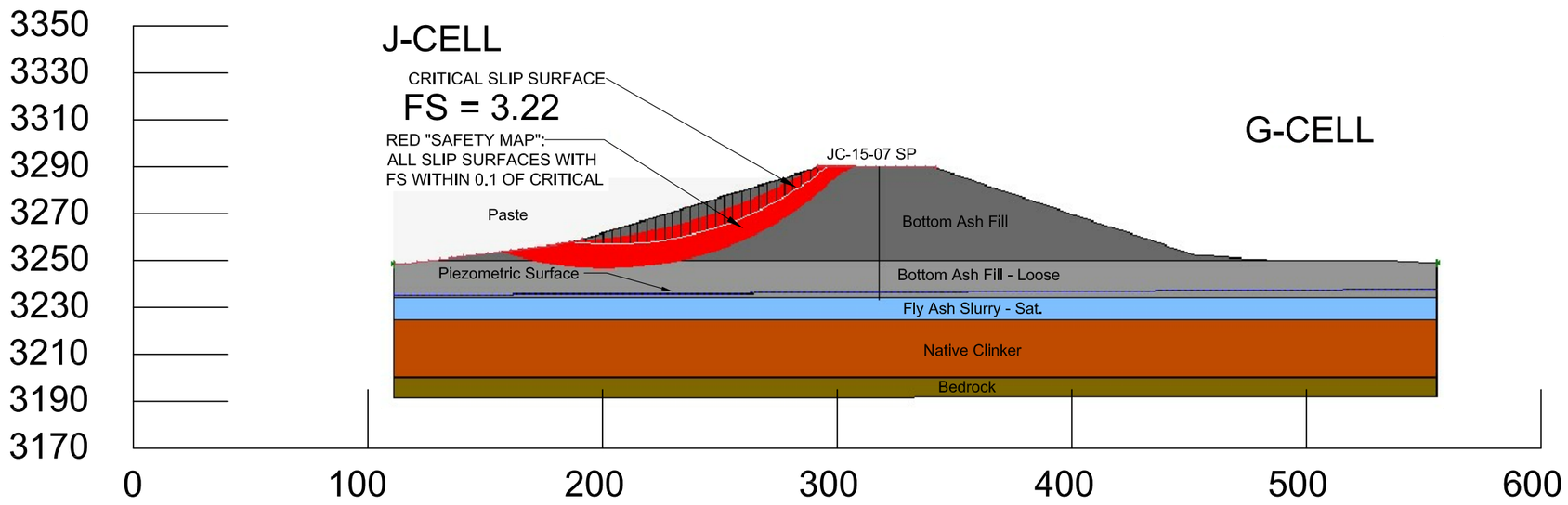
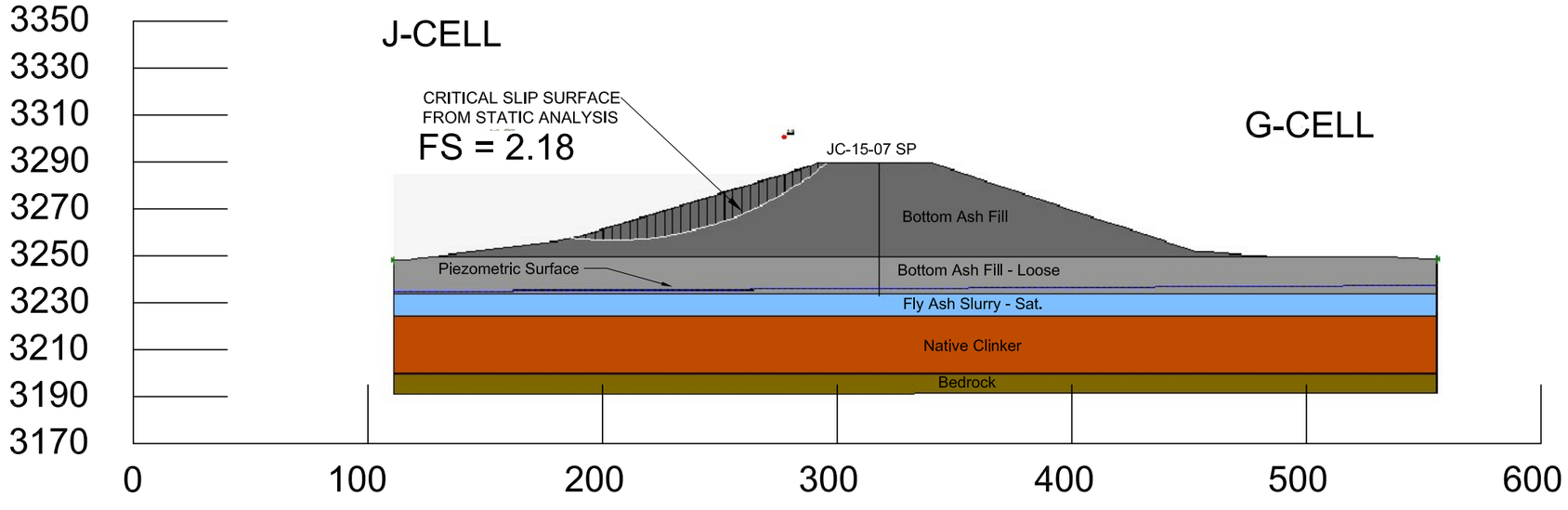



CROSS-SECTION N-N' J DIRECTION STATIC EXISTING CONDITIONS




CROSS-SECTION N-N' J DIRECTION SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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STABILITY MODEL CROSS-SECTION N-N' J-CELL DIRECTION EXISTING CONDITIONS

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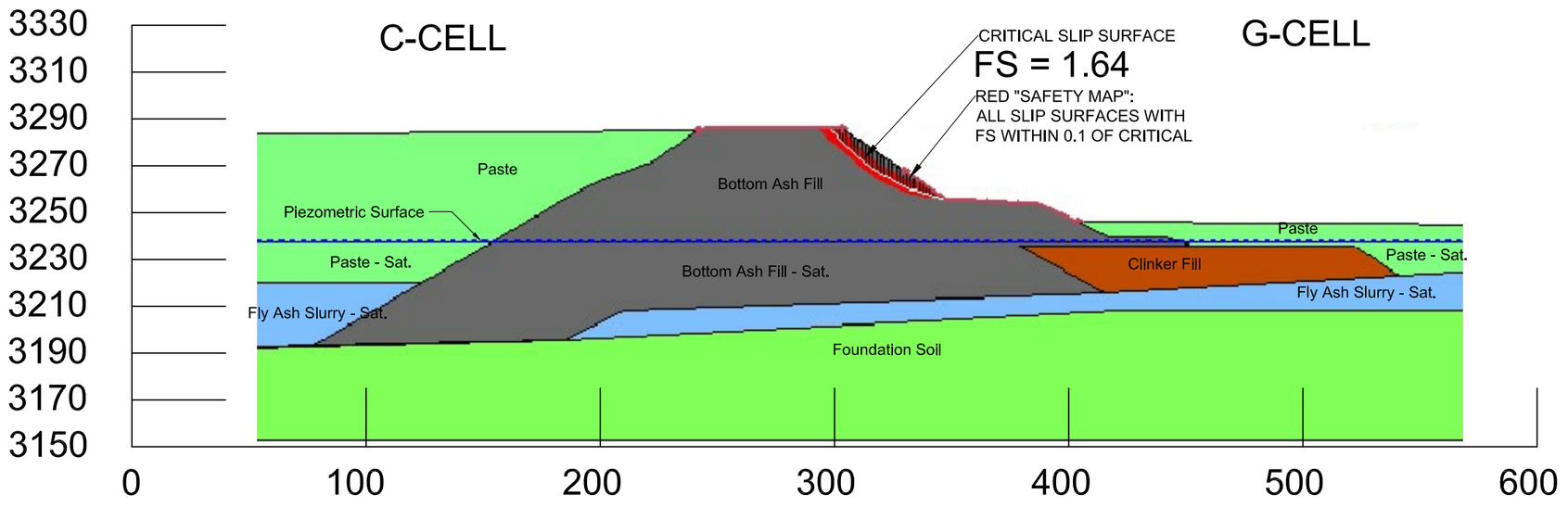
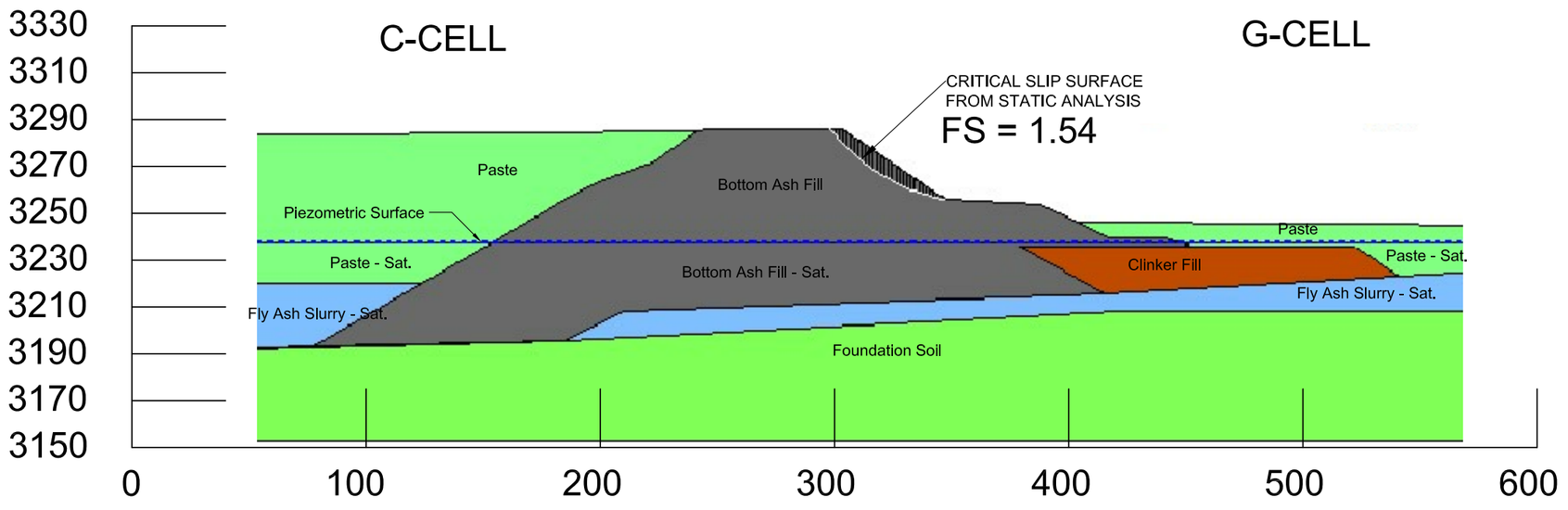



CROSS-SECTION O-O' G DIRECTION STATIC EXISTING CONDITIONS




CROSS-SECTION O-O' G DIRECTION SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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STABILITY MODEL
CROSS-SECTION O-O'
G-CELL DIRECTION
EXISTING CONDITIONS

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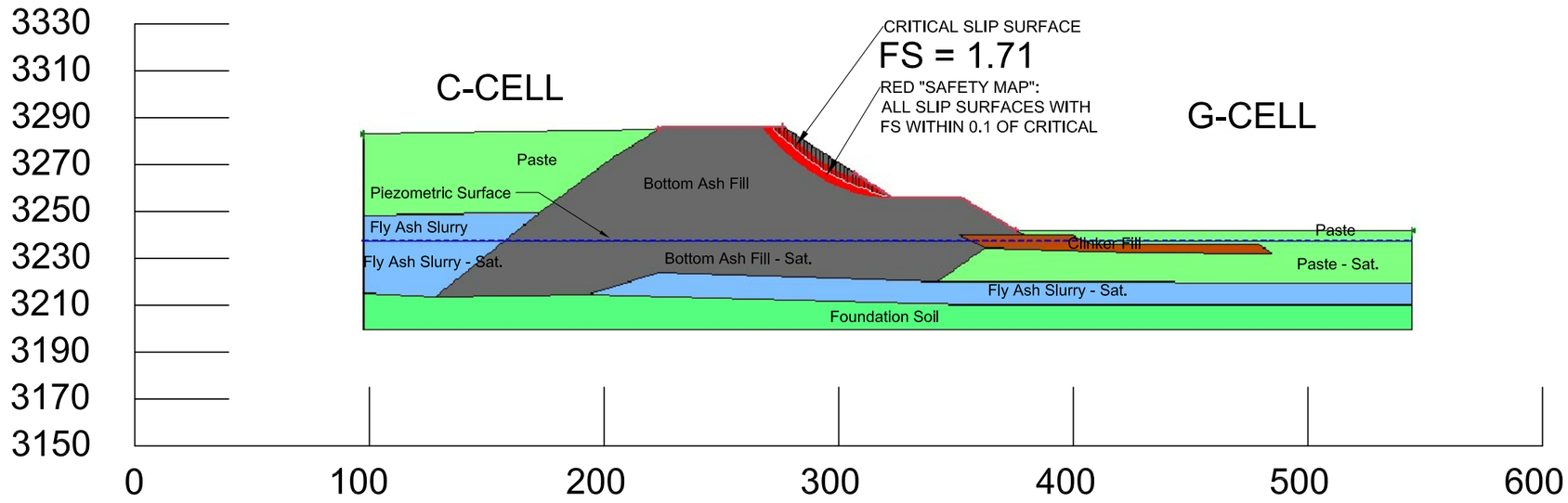
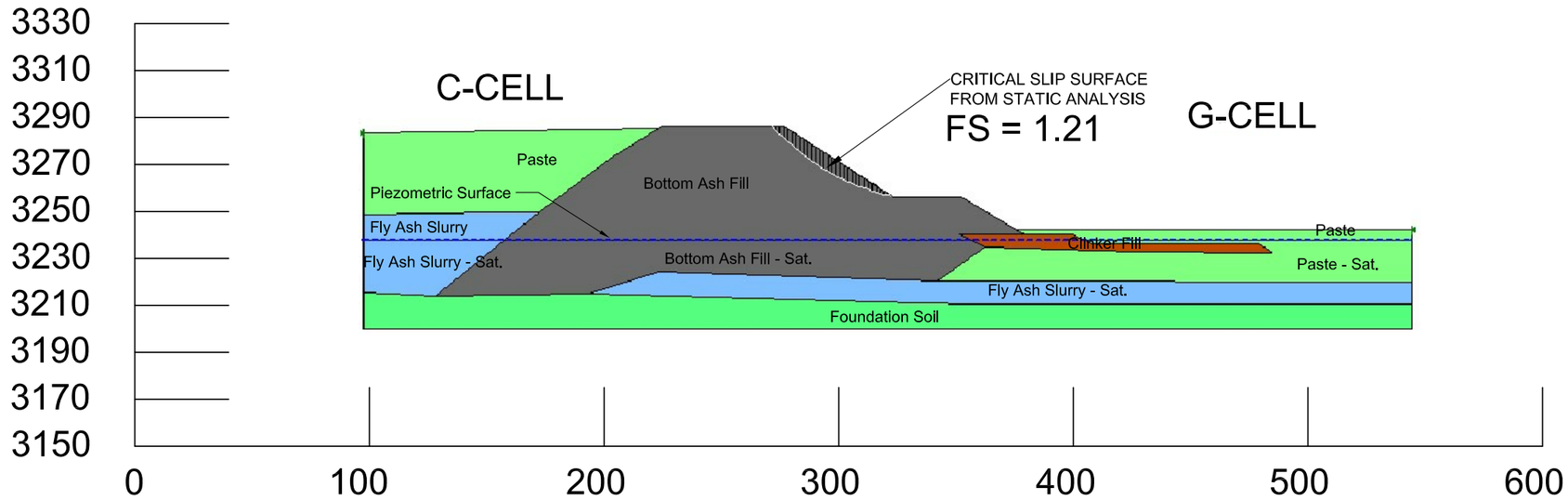



CROSS-SECTION P-P' G DIRECTION STATIC EXISTING CONDITIONS




CROSS-SECTION P-P' G DIRECTION SEISMIC EXISTING CONDITIONS

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

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COLSTRIP, MONTANA

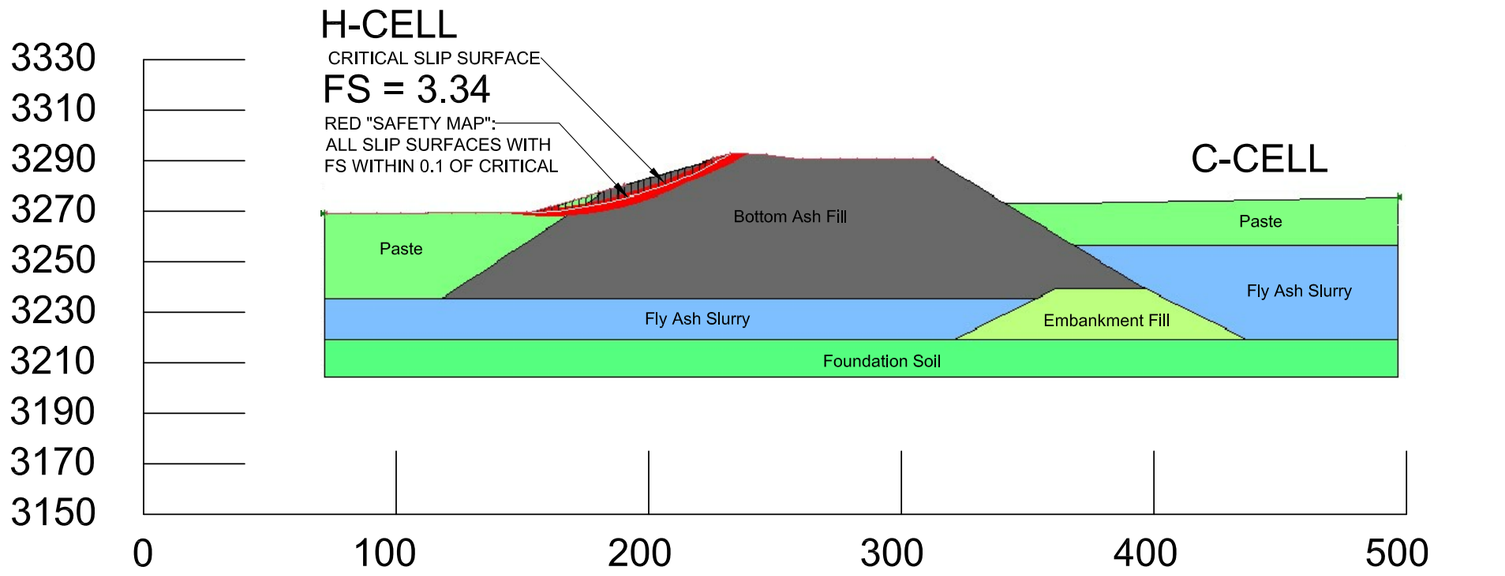
SHEET TITLE:
STABILITY MODEL CROSS-SECTION P-P' G-CELL DIRECTION EXISTING CONDITIONS

| | |
|---|---|
| DRAFTED BY: | HC |
| REVIEWED BY: | CHL |
| PLAN VERSION | DATE |
| | 10/14/2016 |

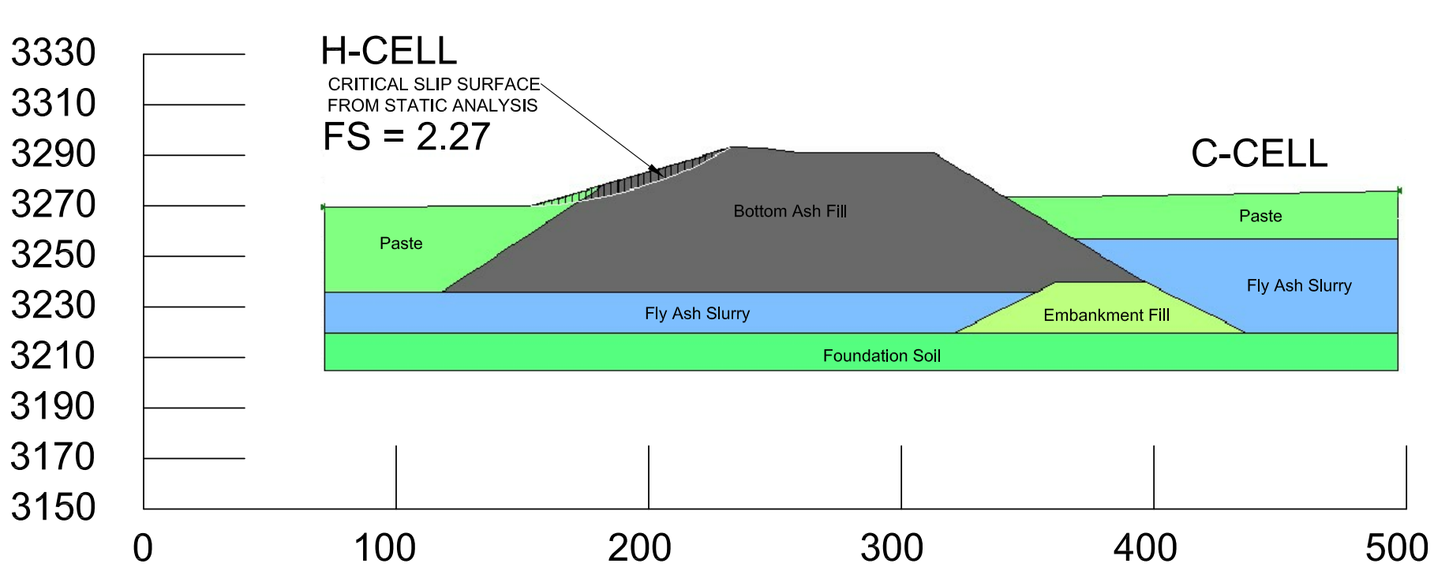
PROJECT NUMBER
16419

SHEET
A-23

C:\Users\clane\appdata\local\temp\AcPublish_53521\16419_EHP Stability Figures.dwg




CROSS-SECTION Q-Q' H DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION Q-Q' H DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 60'
HORIZONTAL: 1" = 60'

JORGENSEN
JACKSON, WYOMING
307.733.5150
www.jorgensenassociates.com

PROJECT TITLE:
UNITS 3 & 4 SAFETY FACTOR ASSESSMENT
COLSTRIP STEAM ELECTRIC STATION
COLSTRIP, MONTANA

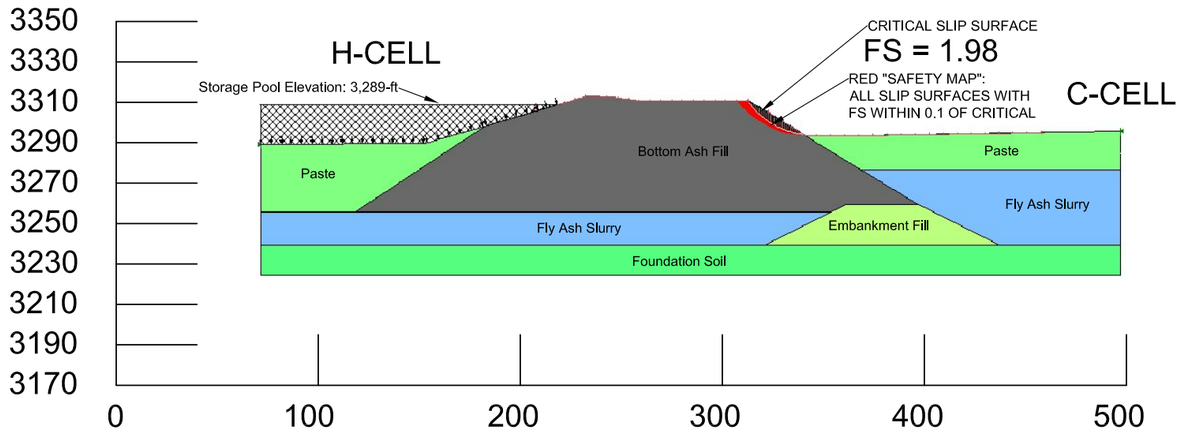
SHEET TITLE:
STABILITY MODEL
CROSS-SECTION Q-Q'
H-CELL DIRECTION

| | |
|---|---|
| DRAFTED BY: | HC |
| REVIEWED BY: | CHL |
| PLAN VERSION | DATE |
| | 10/14/2016 |

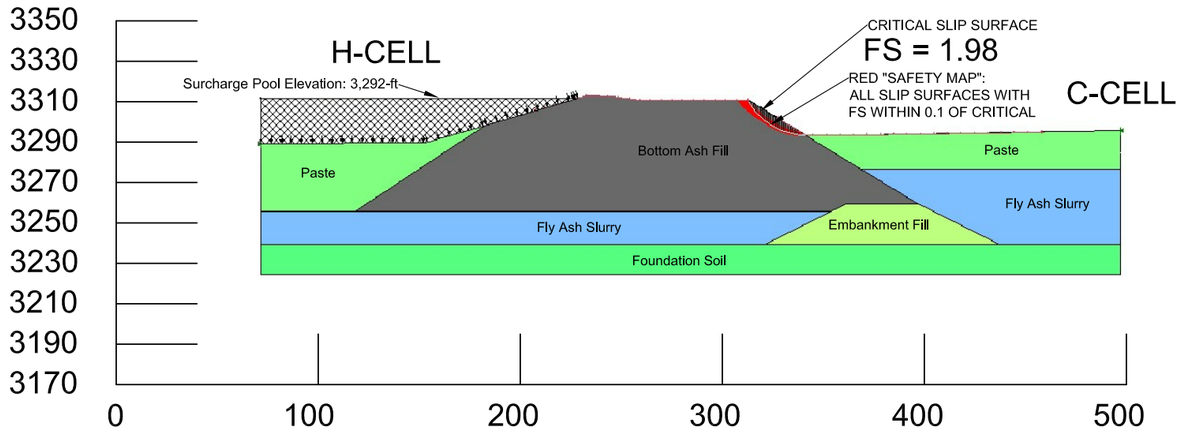
PROJECT NUMBER
16419

SHEET
A-24

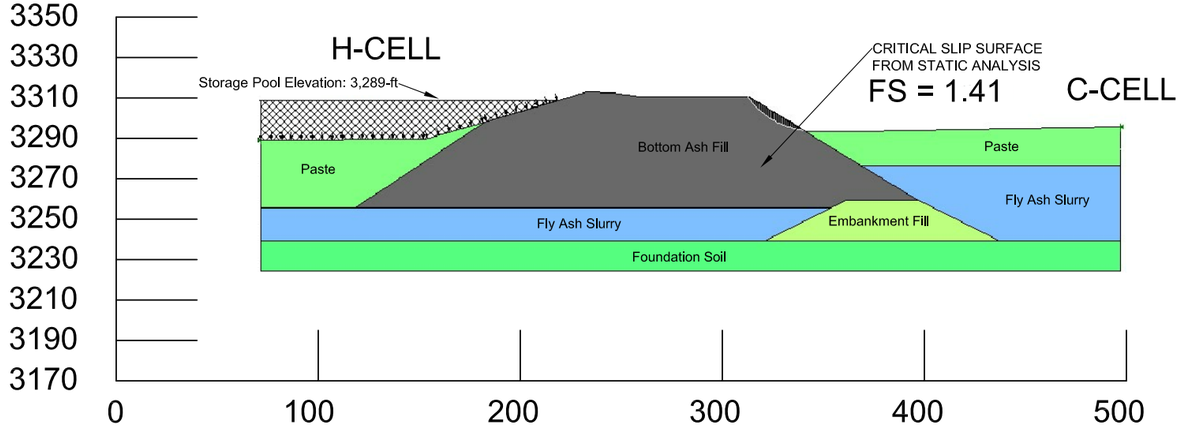
C:\Users\clane\appdata\local\temp\AcPublish_53521\16419_EHP Stability Figures.dwg




CROSS-SECTION Q-Q' C DIRECTION STATIC MAXIMUM STORAGE POOL




CROSS-SECTION Q-Q' C DIRECTION STATIC MAXIMUM SURCHARGE POOL




CROSS-SECTION Q-Q' C DIRECTION SEISMIC

SCALE:
VERTICAL: 1" = 75'
HORIZONTAL: 1" = 75'

C:\Users\clane\appdata\local\temp\AcPublish_5352\16419_EHP Stability Figures.dwg

JORGENSEN
JACKSON, WYOMING
307.733.5150
www.jorgensenassociates.com

PROJECT TITLE:
UNITS 3 & 4 SAFETY FACTOR ASSESSMENT
COLSTRIP STEAM ELECTRIC STATION
COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
CROSS-SECTION Q-Q'
C-CELL DIRECTION

| | |
|---|---|
| DRAFTED BY: | HC |
| REVIEWED BY: | CHL |
| PLAN VERSION | DATE |
| | 10/14/2016 |

PROJECT NUMBER
16419

SHEET
A-25

# APPENDIX B

# Slope Stability Analyses Reports

# Static Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 667
Date: 10/13/2016
Time: 7:24:48 PM
Tool Version: 8.15.1.11236
File Name: Main Dam A-A.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:24:50 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry**
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Sat.**
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (597.3194, 3,290) ft
Left-Zone Right Coordinate: (643.8055, 3,281.1598) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (708.2886, 3,259.6712) ft
Right-Zone Right Coordinate: (871.1911, 3,237.07) ft
Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (145, 3,143.9946) ft
Right Coordinate: (1,050, 3,234.8025) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 145 | 3,143.9946 |
| Coordinate 2 | 495.4094 | 3,150.0986 |
| Coordinate 3 | 527 | 3,156 |
| Coordinate 4 | 557 | 3,187 |
| Coordinate 5 | 597 | 3,191 |
| Coordinate 6 | 811 | 3,224 |
| Coordinate 7 | 1,050 | 3,224 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 775.8576 | 3,220 |
| Point 2 | 770.7737 | 3,221.7421 |
| Point 3 | 719 | 3,239 |
| Point 4 | 650 | 3,262 |
| Point 5 | 513.3194 | 3,262 |
| Point 6 | 160.0726 | 3,144.2511 |
| Point 7 | 495.4094 | 3,150.0986 |
| Point 8 | 528.0798 | 3,259 |
| Point 9 | 566.7 | 3,259 |
| Point 10 | 599.2322 | 3,150.5593 |
| Point 11 | 613.489 | 3,150.5593 |
| Point 12 | 675.9425 | 3,153.3028 |
| Point 13 | 760.3625 | 3,157.0113 |
| Point 14 | 860.1865 | 3,159.219 |
| Point 15 | 953.25 | 3,160.5024 |
| Point 16 | 538.5202 | 3,259 |
| Point 17 | 145 | 3,143.9946 |
| Point 18 | 145 | 3,139.9751 |
| Point 19 | 483.5203 | 3,145.8865 |
| Point 20 | 492.5 | 3,139.9 |
| Point 21 | 502.7902 | 3,139.9 |
| Point 22 | 597.5 | 3,139.9 |
| Point 23 | 145 | 3,100 |
| Point 24 | 1,050 | 3,100 |

| | | |
|---|---|---|
| Point 25 | 1,050 | 3,160 |
| Point 26 | 772.349 | 3,238.3235 |
| Point 27 | 1,050 | 3,234.8025 |
| Point 28 | 1,050 | 3,220 |
| Point 29 | 617.3194 | 3,290 |
| Point 30 | 597.3194 | 3,290 |
| Point 31 | 701 | 3,245 |
| Point 32 | 683 | 3,251 |
| Point 33 | 665 | 3,257 |
| Point 34 | 552 | 3,275 |
| Point 35 | 1,050 | 3,224 |
| Point 36 | 811 | 3,224 |
| Point 37 | 597 | 3,191 |
| Point 38 | 785.0606 | 3,220 |
| Point 39 | 778.7562 | 3,219.0278 |
| Point 40 | 557 | 3,187 |
| Point 41 | 587.3883 | 3,190.0388 |
| Point 42 | 527 | 3,156 |
| Point 43 | 506.4696 | 3,152.1647 |
| Point 44 | 623.2768 | 3,288 |
| Point 45 | 1,050 | 3,288 |
| Point 46 | 632.2817 | 3,285 |
| Point 47 | 1,050 | 3,285 |
| Point 48 | 701.3003 | 3,262 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,31,32,33,4,5,6,7,8,16,9,41,37,39 | 28,757 |
| Region 2 | Drain | 16,8,7,43 | 1,126.2 |
| Region 3 | Bedrock | 15,14,13,12,11,22,21,20,19,18,23,24,25 | 44,932 |
| Region 4 | Paste | 26,27,35,36,38,1,2,3 | 4,045.1 |
| Region 5 | Fly Ash Slurry | 1,39,38 | 4.4736 |
| Region 6 | Clinker Fill | 5,4,48,46,44,29,30,34 | 2,915.7 |
| Region 7 | Core | 16,9,41,40,42,43 | 4,495.4 |
| Region 8 | Bottom Ash Fill | 3,26,48,4,33,32,31 | 1,197.5 |
| Region 9 | Paste - Sat. | 28,38,36,35 | 1,007.9 |
| Region 10 | Fly Ash Slurry - Sat. | 15,25,28,38,39 | 11,053 |
| Region 11 | Embankment Fill - Sat. | 10,11,12,13,14,15,39,37,41 | 14,795 |
| Region 12 | Core - Sat. | 10,11,22,21,43,42,40,41 | 3,166 |

| | | | |
|---|---|---|---|
| Region 13 | Drain - Sat. | 6,17,18,19,20,21,43,7 | 1,552 |
| Region 14 | | 48,26,27,47,46 | 16,718 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.95
Volume: 470.90758 ft³
Weight: 60,997.311 lbs
Resisting Moment: 37,176,767 lbs-ft
Activating Moment: 12,581,597 lbs-ft
Resisting Force: 47,348.458 lbs
Activating Force: 16,050.675 lbs
F of S Rank (Analysis): 1,946 of 3,213 slip surfaces
F of S Rank (Query): 1,946 of 3,213 slip surfaces
Exit: (708.2886, 3,259.6712) ft
Entry: (597.3194, 3,290) ft
Radius: 754.59501 ft
Center: (851.1659, 4,000.6163) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 599.3194 | 3,289.2919 | -5,969.1532 | 83.709505 | 70.240615 | 0 |
| Slice 2 | 603.3194 | 3,287.8883 | -5,846.0076 | 250.24949 | 209.98426 | 0 |
| Slice 3 | 607.3194 | 3,286.5099 | -5,724.3958 | 414.57451 | 347.86932 | 0 |
| Slice 4 | 611.3194 | 3,285.1565 | -5,604.309 | 576.57674 | 483.80533 | 0 |
| Slice 5 | 615.3194 | 3,283.8279 | -5,485.7383 | 736.14919 | 617.70251 | 0 |
| Slice 6 | 618.80875 | 3,282.6878 | -5,383.4529 | 813.78923 | 682.85024 | 0 |
| Slice 7 | 621.78745 | 3,281.7306 | -5,297.1118 | 809.74554 | 679.45718 | 0 |
| Slice 8 | 625.52803 | 3,280.5499 | -5,189.9929 | 802.61536 | 673.47425 | 0 |
| Slice 9 | 630.03048 | 3,279.1545 | -5,062.6205 | 791.27409 | 663.9578 | 0 |
| Slice 10 | 634.17637 | 3,277.8956 | -4,946.924 | 777.47321 | 652.37748 | 0 |
| Slice 11 | 637.96572 | 3,276.7687 | -4,842.6224 | 761.83346 | 639.25418 | 0 |
| Slice 12 | 641.75507 | 3,275.6633 | -4,739.6348 | 743.47961 | 623.85347 | 0 |
| Slice 13 | 645.54441 | 3,274.5795 | -4,637.9553 | 722.44705 | 606.20505 | 0 |
| Slice 14 | 649.33376 | 3,273.5169 | -4,537.5779 | 698.7712 | 586.33866 | 0 |
| Slice 15 | 653.12311 | 3,272.4757 | -4,438.4969 | 672.48586 | 564.28264 | 0 |
| Slice 16 | 656.91245 | 3,271.4556 | -4,340.7069 | 643.62162 | 540.06267 | 0 |
| Slice 17 | 660.7018 | 3,270.4566 | -4,244.2023 | 612.20445 | 513.70053 | 0 |
| Slice 18 | 664.49115 | 3,269.4786 | -4,148.978 | 578.25442 | 485.21307 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 19 | 668.28049 | 3,268.5216 | -4,055.0288 | 541.78471 | 454.61135 | 0 |
| Slice 20 | 672.06984 | 3,267.5854 | -3,962.3497 | 502.80087 | 421.90003 | 0 |
| Slice 21 | 675.85919 | 3,266.6699 | -3,870.9358 | 461.30034 | 387.07694 | 0 |
| Slice 22 | 679.64853 | 3,265.7751 | -3,780.7824 | 417.2723 | 350.13303 | 0 |
| Slice 23 | 683.43788 | 3,264.9009 | -3,691.8849 | 370.69787 | 311.05245 | 0 |
| Slice 24 | 687.22723 | 3,264.0473 | -3,604.2389 | 321.55059 | 269.81298 | 0 |
| Slice 25 | 691.01657 | 3,263.2141 | -3,517.84 | 269.79722 | 226.38674 | 0 |
| Slice 26 | 694.80592 | 3,262.4013 | -3,432.6839 | 215.39883 | 180.74108 | 0 |
| Slice 27 | 699.00045 | 3,261.5265 | -3,339.9399 | 134.03016 | 112.46465 | 0 |
| Slice 28 | 703.04737 | 3,260.7033 | -3,251.7264 | 60.751047 | 50.976181 | 0 |
| Slice 29 | 706.54152 | 3,260.0124 | -3,176.7742 | 20.541377 | 17.236262 | 0 |

# Seismic Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 668
Date: 10/13/2016
Time: 7:25:42 PM
Tool Version: 8.15.1.11236
File Name: Main Dam A-A.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:25:42 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - Inboard [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Seismic**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf

Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits
Left Coordinate: (145, 3,143.9946) ft
Right Coordinate: (1,050, 3,234.8025) ft

## Piezometric Lines
### Piezometric Line 1
#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 145 | 3,143.9946 |
| Coordinate 2 | 495.4094 | 3,150.0986 |
| Coordinate 3 | 527 | 3,156 |
| Coordinate 4 | 557 | 3,187 |

| | | |
|---|---|---|
| Coordinate 5 | 597 | 3,191 |
| Coordinate 6 | 811 | 3,224 |
| Coordinate 7 | 1,050 | 3,224 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 775.8576 | 3,220 |
| Point 2 | 770.7737 | 3,221.7421 |
| Point 3 | 719 | 3,239 |
| Point 4 | 650 | 3,262 |
| Point 5 | 513.3194 | 3,262 |
| Point 6 | 160.0726 | 3,144.2511 |
| Point 7 | 495.4094 | 3,150.0986 |
| Point 8 | 528.0798 | 3,259 |
| Point 9 | 566.7 | 3,259 |
| Point 10 | 599.2322 | 3,150.5593 |
| Point 11 | 613.489 | 3,150.5593 |
| Point 12 | 675.9425 | 3,153.3028 |
| Point 13 | 760.3625 | 3,157.0113 |
| Point 14 | 860.1865 | 3,159.219 |
| Point 15 | 953.25 | 3,160.5024 |
| Point 16 | 538.5202 | 3,259 |
| Point 17 | 145 | 3,143.9946 |
| Point 18 | 145 | 3,139.9751 |
| Point 19 | 483.5203 | 3,145.8865 |
| Point 20 | 492.5 | 3,139.9 |
| Point 21 | 502.7902 | 3,139.9 |
| Point 22 | 597.5 | 3,139.9 |
| Point 23 | 145 | 3,100 |
| Point 24 | 1,050 | 3,100 |
| Point 25 | 1,050 | 3,160 |
| Point 26 | 772.349 | 3,238.3235 |
| Point 27 | 1,050 | 3,234.8025 |

| | | |
|---|---|---|
| Point 28 | 1,050 | 3,220 |
| Point 29 | 617.3194 | 3,290 |
| Point 30 | 597.3194 | 3,290 |
| Point 31 | 701 | 3,245 |
| Point 32 | 683 | 3,251 |
| Point 33 | 665 | 3,257 |
| Point 34 | 552 | 3,275 |
| Point 35 | 1,050 | 3,224 |
| Point 36 | 811 | 3,224 |
| Point 37 | 597 | 3,191 |
| Point 38 | 785.0606 | 3,220 |
| Point 39 | 778.7562 | 3,219.0278 |
| Point 40 | 557 | 3,187 |
| Point 41 | 587.3883 | 3,190.0388 |
| Point 42 | 527 | 3,156 |
| Point 43 | 506.4696 | 3,152.1647 |
| Point 44 | 623.2768 | 3,288 |
| Point 45 | 1,050 | 3,288 |
| Point 46 | 632.2817 | 3,285 |
| Point 47 | 1,050 | 3,285 |
| Point 48 | 701.3003 | 3,262 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill - Seismic | 1,2,3,31,32,33,4,5,6,7,8,16,9,41,37,39 | 28,757 |
| Region 2 | Drain - Seismic | 16,8,7,43 | 1,126.2 |
| Region 3 | Bedrock | 15,14,13,12,11,22,21,20,19,18,23,24,25 | 44,932 |
| Region 4 | Paste - Seismic | 26,27,35,36,38,1,2,3 | 4,045.1 |
| Region 5 | Fly Ash Slurry - Seismic | 1,39,38 | 4.4736 |
| Region 6 | Clinker Fill - Seismic | 5,4,48,46,44,29,30,34 | 2,915.7 |
| Region 7 | Core - Seismic | 16,9,41,40,42,43 | 4,495.4 |
| Region 8 | Bottom Ash Fill - Seismic | 3,26,48,4,33,32,31 | 1,197.5 |
| Region 9 | Paste - Sat. - Seismic | 28,38,36,35 | 1,007.9 |
| Region 10 | Fly Ash Slurry - Sat. - Seismic | 15,25,28,38,39 | 11,053 |
| Region 11 | Embankment Fill - Sat. - | 10,11,12,13,14,15,39,37,41 | 14,795 |

| | Seismic | | |
|---|---|---|---|
| Region 12 | Core - Sat. - Seismic | 10,11,22,21,43,42,40,41 | 3,166 |
| Region 13 | Drain - Sat. - Seismic | 6,17,18,19,20,21,43,7 | 1,552 |
| Region 14 | | 48,26,27,47,46 | 16,718 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.52
Volume: 2,413.3441 ft³
Weight: 262,349.1 lbs
Resisting Moment: 20,850,107 lbs-ft
Activating Moment: 13,744,309 lbs-ft
Resisting Force: 125,211.64 lbs
Activating Force: 82,636.555 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (767.47872, 3,239.9465) ft
Entry: (616.48838, 3,290) ft
Radius: 153.26507 ft
Center: (733.20831, 3,389.331) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 616.90389 | 3,289.5158 | -5,817.528 | 42.37367 | 26.478008 | 0 |
| Slice 2 | 620.2981 | 3,285.7837 | -5,558.1468 | 280.21327 | 175.09668 | 0 |
| Slice 3 | 625.52802 | 3,280.312 | -5,175.4923 | 607.66846 | 379.7134 | 0 |
| Slice 4 | 630.03048 | 3,276.0382 | -4,872.6824 | 854.95701 | 534.23643 | 0 |
| Slice 5 | 634.88524 | 3,271.8098 | -4,569.3255 | 1,094.2475 | 683.76174 | 0 |
| Slice 6 | 640.09231 | 3,267.6394 | -4,266.1958 | 1,328.1228 | 829.9032 | 0 |
| Slice 7 | 645.29939 | 3,263.8236 | -3,984.6814 | 1,541.9017 | 963.48711 | 0 |
| Slice 8 | 648.95146 | 3,261.3099 | -3,797.1452 | 1,716.9283 | 852.2906 | 40 |
| Slice 9 | 652.5 | 3,259.0708 | -3,627.3197 | 1,807.905 | 897.45181 | 40 |
| Slice 10 | 657.5 | 3,256.1012 | -3,399.325 | 1,914.5816 | 950.40656 | 40 |
| Slice 11 | 662.5 | 3,253.3803 | -3,186.4903 | 2,008.0412 | 996.80032 | 40 |
| Slice 12 | 667.25 | 3,251.0072 | -2,997.2005 | 2,085.2457 | 1,035.125 | 40 |
| Slice 13 | 671.75 | 3,248.9492 | -2,829.4734 | 2,146.7067 | 1,065.6344 | 40 |
| Slice 14 | 676.25 | 3,247.0634 | -2,672.2346 | 2,196.4984 | 1,090.3513 | 40 |
| Slice 15 | 680.75 | 3,245.3429 | -2,525.0714 | 2,233.4564 | 1,108.6974 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 16 | 685.25 | 3,243.7818 | -2,387.6261 | 2,256.0358 | 1,119.9059 | 40 |
| Slice 17 | 689.75 | 3,242.375 | -2,259.5886 | 2,262.3505 | 1,123.0405 | 40 |
| Slice 18 | 694.25 | 3,241.1182 | -2,140.6908 | 2,250.2414 | 1,117.0295 | 40 |
| Slice 19 | 698.75 | 3,240.0076 | -2,030.7014 | 2,217.3734 | 1,100.7137 | 40 |
| Slice 20 | 701.15015 | 3,239.4562 | -1,974.5385 | 2,192.8461 | 1,088.5383 | 40 |
| Slice 21 | 703.51276 | 3,238.9871 | -1,923.7394 | 2,186.1453 | 1,085.2119 | 40 |
| Slice 22 | 707.93769 | 3,238.1802 | -1,832.9689 | 2,163.9453 | 1,074.1918 | 40 |
| Slice 23 | 712.36261 | 3,237.5066 | -1,750.3187 | 2,117.174 | 1,050.9743 | 40 |
| Slice 24 | 716.78754 | 3,236.9643 | -1,675.6808 | 2,043.9652 | 1,014.6331 | 40 |
| Slice 25 | 721.1203 | 3,236.5581 | -1,610.1989 | 1,954.0184 | 969.98313 | 40 |
| Slice 26 | 725.3609 | 3,236.2816 | -1,553.49 | 1,848.1389 | 917.42411 | 40 |
| Slice 27 | 729.82429 | 3,236.1212 | -1,501.7583 | 1,729.2912 | 919.48046 | 0 |
| Slice 28 | 734.51044 | 3,236.0893 | -1,455.7726 | 1,588.2755 | 844.50105 | 0 |
| Slice 29 | 739.1966 | 3,236.2009 | -1,418.526 | 1,420.2349 | 755.15232 | 0 |
| Slice 30 | 743.88276 | 3,236.4561 | -1,390.0378 | 1,226.9924 | 652.40341 | 0 |
| Slice 31 | 748.56892 | 3,236.8558 | -1,370.3519 | 1,011.1232 | 537.62376 | 0 |
| Slice 32 | 753.25507 | 3,237.401 | -1,359.5378 | 775.80547 | 412.50309 | 0 |
| Slice 33 | 757.94123 | 3,238.0933 | -1,357.6917 | 524.61951 | 278.94514 | 0 |
| Slice 34 | 763.88152 | 3,239.2115 | -1,370.0131 | 200.09458 | 125.03297 | 0 |

# Static Safety Factor: Maximum Storage Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 665
Date: 10/13/2016
Time: 7:20:21 PM
Tool Version: 8.15.1.11236
File Name: Main Dam A-A.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:20:28 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry**
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Sat.**
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (145.1912, 3,143.9979) ft
Left-Zone Right Coordinate: (276, 3,182.8936) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (550, 3,274.3278) ft
Right-Zone Right Coordinate: (647.1244, 3,285) ft
Right-Zone Increment: 20
Radius Increments: 12

## Slip Surface Limits
Left Coordinate: (145, 3,143.9946) ft
Right Coordinate: (1,050, 3,285) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 145 | 3,143.9946 |
| Coordinate 2 | 495.4094 | 3,150.0986 |
| Coordinate 3 | 527 | 3,156 |
| Coordinate 4 | 557 | 3,187 |
| Coordinate 5 | 597 | 3,191 |
| Coordinate 6 | 811 | 3,224 |
| Coordinate 7 | 1,050 | 3,224 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 775.8576 | 3,220 |
| Point 2 | 770.7737 | 3,221.7421 |
| Point 3 | 719 | 3,239 |
| Point 4 | 650 | 3,262 |
| Point 5 | 513.3194 | 3,262 |
| Point 6 | 160.0726 | 3,144.2511 |
| Point 7 | 495.4094 | 3,150.0986 |
| Point 8 | 528.0798 | 3,259 |
| Point 9 | 566.7 | 3,259 |
| Point 10 | 599.2322 | 3,150.5593 |
| Point 11 | 613.489 | 3,150.5593 |
| Point 12 | 675.9425 | 3,153.3028 |
| Point 13 | 760.3625 | 3,157.0113 |
| Point 14 | 860.1865 | 3,159.219 |
| Point 15 | 953.25 | 3,160.5024 |
| Point 16 | 538.5202 | 3,259 |
| Point 17 | 145 | 3,143.9946 |
| Point 18 | 145 | 3,139.9751 |
| Point 19 | 483.5203 | 3,145.8865 |
| Point 20 | 492.5 | 3,139.9 |

| | | |
|---|---|---|
| Point 21 | 502.7902 | 3,139.9 |
| Point 22 | 597.5 | 3,139.9 |
| Point 23 | 145 | 3,100 |
| Point 24 | 1,050 | 3,100 |
| Point 25 | 1,050 | 3,160 |
| Point 26 | 772.349 | 3,238.3235 |
| Point 27 | 1,050 | 3,234.8025 |
| Point 28 | 1,050 | 3,220 |
| Point 29 | 617.3194 | 3,290 |
| Point 30 | 597.3194 | 3,290 |
| Point 31 | 701 | 3,245 |
| Point 32 | 683 | 3,251 |
| Point 33 | 665 | 3,257 |
| Point 34 | 552 | 3,275 |
| Point 35 | 1,050 | 3,224 |
| Point 36 | 811 | 3,224 |
| Point 37 | 597 | 3,191 |
| Point 38 | 785.0606 | 3,220 |
| Point 39 | 778.7562 | 3,219.0278 |
| Point 40 | 557 | 3,187 |
| Point 41 | 587.3883 | 3,190.0388 |
| Point 42 | 527 | 3,156 |
| Point 43 | 506.4696 | 3,152.1647 |
| Point 44 | 623.2768 | 3,288 |
| Point 45 | 1,050 | 3,288 |
| Point 46 | 632.2817 | 3,285 |
| Point 47 | 1,050 | 3,285 |
| Point 48 | 701.3003 | 3,262 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,31,32,33,4,5,6,7,8,16,9,41,37,39 | 28,757 |
| Region 2 | Drain | 16,8,7,43 | 1,126.2 |
| Region 3 | Bedrock | 15,14,13,12,11,22,21,20,19,18,23,24,25 | 44,932 |
| Region 4 | Paste | 26,27,35,36,38,1,2,3 | 4,045.1 |

| | | | |
|---|---|---|---|
| Region 5 | Fly Ash Slurry | 1,39,38 | 4.4736 |
| Region 6 | Clinker Fill | 5,4,48,46,44,29,30,34 | 2,915.7 |
| Region 7 | Core | 16,9,41,40,42,43 | 4,495.4 |
| Region 8 | Bottom Ash Fill | 3,26,48,4,33,32,31 | 1,197.5 |
| Region 9 | Paste - Sat. | 28,38,36,35 | 1,007.9 |
| Region 10 | Fly Ash Slurry - Sat. | 15,25,28,38,39 | 11,053 |
| Region 11 | Embankment Fill - Sat. | 10,11,12,13,14,15,39,37,41 | 14,795 |
| Region 12 | Core - Sat. | 10,11,22,21,43,42,40,41 | 3,166 |
| Region 13 | Drain - Sat. | 6,17,18,19,20,21,43,7 | 1,552 |
| Region 14 | Paste | 48,26,27,47,46 | 16,718 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.27
Volume: 1,357.7637 ft³
Weight: 169,900.46 lbs
Resisting Moment: 3.5650371e+008 lbs-ft
Activating Moment: 1.5688848e+008 lbs-ft
Resisting Force: 115,656.73 lbs
Activating Force: 50,961.618 lbs
F of S Rank (Analysis): 1,627 of 4,641 slip surfaces
F of S Rank (Query): 1,627 of 4,641 slip surfaces
Exit: (204.88373, 3,159.1881) ft
Entry: (549.99999, 3,274.3278) ft
Radius: 2,922.3092 ft
Center: (-545.60952, 5,983.4847) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 210.69424 | 3,160.745 | -973.51863 | 38.43125 | 24.957545 | 50 |
| Slice 2 | 222.31527 | 3,163.8843 | -1,156.7255 | 123.00415 | 79.879827 | 50 |
| Slice 3 | 233.93629 | 3,167.0751 | -1,343.1419 | 201.42558 | 130.8073 | 50 |
| Slice 4 | 245.55732 | 3,170.3175 | -1,532.7786 | 273.7347 | 177.76539 | 50 |
| Slice 5 | 257.17835 | 3,173.6117 | -1,725.6469 | 339.96405 | 220.77524 | 50 |
| Slice 6 | 268.79937 | 3,176.9579 | -1,921.7582 | 400.13837 | 259.85289 | 50 |
| Slice 7 | 280.4204 | 3,180.3563 | -2,121.124 | 454.27374 | 295.00882 | 50 |
| Slice 8 | 292.04143 | 3,183.807 | -2,323.7562 | 502.37725 | 326.2476 | 50 |
| Slice 9 | 303.66245 | 3,187.3103 | -2,529.6668 | 544.44692 | 353.56797 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 10 | 315.28348 | 3,190.8663 | -2,738.8684 | 580.47219 | 376.96305 | 50 |
| Slice 11 | 326.90451 | 3,194.4753 | -2,951.3733 | 610.43469 | 396.42092 | 50 |
| Slice 12 | 338.52554 | 3,198.1375 | -3,167.1944 | 634.30937 | 411.92532 | 50 |
| Slice 13 | 350.14656 | 3,201.853 | -3,386.345 | 652.06604 | 423.45664 | 50 |
| Slice 14 | 361.76759 | 3,205.6221 | -3,608.8382 | 663.67099 | 430.99298 | 50 |
| Slice 15 | 373.38862 | 3,209.445 | -3,834.6878 | 669.08895 | 434.51145 | 50 |
| Slice 16 | 385.00964 | 3,213.322 | -4,063.9076 | 668.28503 | 433.98938 | 50 |
| Slice 17 | 396.63067 | 3,217.2532 | -4,296.5119 | 661.22675 | 429.40567 | 50 |
| Slice 18 | 408.2517 | 3,221.2388 | -4,532.515 | 647.88596 | 420.74206 | 50 |
| Slice 19 | 419.87272 | 3,225.2792 | -4,771.9316 | 628.24058 | 407.98421 | 50 |
| Slice 20 | 431.49375 | 3,229.3746 | -5,014.7769 | 602.27618 | 391.12273 | 50 |
| Slice 21 | 443.11478 | 3,233.5252 | -5,261.0662 | 569.98708 | 370.15394 | 50 |
| Slice 22 | 454.73581 | 3,237.7312 | -5,510.815 | 531.37717 | 345.08037 | 50 |
| Slice 23 | 466.35683 | 3,241.993 | -5,764.0392 | 486.46026 | 315.91098 | 50 |
| Slice 24 | 477.97786 | 3,246.3107 | -6,020.7552 | 435.25985 | 282.66105 | 50 |
| Slice 25 | 489.59889 | 3,250.6846 | -6,280.9794 | 377.80852 | 245.35172 | 50 |
| Slice 26 | 499.8869 | 3,254.6012 | -6,250.6341 | 322.08713 | 209.16583 | 50 |
| Slice 27 | 508.8419 | 3,258.0489 | -6,357.6514 | 269.36613 | 174.92841 | 50 |
| Slice 28 | 516.16411 | 3,260.8906 | -6,446.5188 | 229.02976 | 148.73367 | 50 |
| Slice 29 | 523.00441 | 3,263.5698 | -6,531.016 | 191.4874 | 160.67701 | 0 |
| Slice 30 | 532.75 | 3,267.4225 | -3,183.1306 | 125.68864 | 105.46529 | 0 |
| Slice 31 | 544.24999 | 3,272.0166 | -2,963.1613 | 42.88429 | 35.984192 | 0 |

# Static Safety Factor: Maximum Surcharge Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 665
Date: 10/13/2016
Time: 7:20:21 PM
Tool Version: 8.15.1.11236
File Name: Main Dam A-A.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:20:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry**
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Sat.**
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (145.1912, 3,143.9979) ft
Left-Zone Right Coordinate: (276, 3,182.8936) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (550, 3,274.3278) ft
Right-Zone Right Coordinate: (647.1244, 3,285) ft
Right-Zone Increment: 20
Radius Increments: 12

## Slip Surface Limits
Left Coordinate: (145, 3,143.9946) ft
Right Coordinate: (1,050, 3,285) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 145 | 3,143.9946 |
| Coordinate 2 | 495.4094 | 3,150.0986 |
| Coordinate 3 | 527 | 3,156 |
| Coordinate 4 | 557 | 3,187 |
| Coordinate 5 | 597 | 3,191 |
| Coordinate 6 | 811 | 3,224 |
| Coordinate 7 | 1,050 | 3,224 |

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 623.2768 | 3,288 |
| | 1,050 | 3,288 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 775.8576 | 3,220 |
| Point 2 | 770.7737 | 3,221.7421 |
| Point 3 | 719 | 3,239 |
| Point 4 | 650 | 3,262 |
| Point 5 | 513.3194 | 3,262 |
| Point 6 | 160.0726 | 3,144.2511 |
| Point 7 | 495.4094 | 3,150.0986 |
| Point 8 | 528.0798 | 3,259 |
| Point 9 | 566.7 | 3,259 |
| Point 10 | 599.2322 | 3,150.5593 |
| Point 11 | 613.489 | 3,150.5593 |
| Point 12 | 675.9425 | 3,153.3028 |

| | | |
|---|---|---|
| Point 13 | 760.3625 | 3,157.0113 |
| Point 14 | 860.1865 | 3,159.219 |
| Point 15 | 953.25 | 3,160.5024 |
| Point 16 | 538.5202 | 3,259 |
| Point 17 | 145 | 3,143.9946 |
| Point 18 | 145 | 3,139.9751 |
| Point 19 | 483.5203 | 3,145.8865 |
| Point 20 | 492.5 | 3,139.9 |
| Point 21 | 502.7902 | 3,139.9 |
| Point 22 | 597.5 | 3,139.9 |
| Point 23 | 145 | 3,100 |
| Point 24 | 1,050 | 3,100 |
| Point 25 | 1,050 | 3,160 |
| Point 26 | 772.349 | 3,238.3235 |
| Point 27 | 1,050 | 3,234.8025 |
| Point 28 | 1,050 | 3,220 |
| Point 29 | 617.3194 | 3,290 |
| Point 30 | 597.3194 | 3,290 |
| Point 31 | 701 | 3,245 |
| Point 32 | 683 | 3,251 |
| Point 33 | 665 | 3,257 |
| Point 34 | 552 | 3,275 |
| Point 35 | 1,050 | 3,224 |
| Point 36 | 811 | 3,224 |
| Point 37 | 597 | 3,191 |
| Point 38 | 785.0606 | 3,220 |
| Point 39 | 778.7562 | 3,219.0278 |
| Point 40 | 557 | 3,187 |
| Point 41 | 587.3883 | 3,190.0388 |
| Point 42 | 527 | 3,156 |
| Point 43 | 506.4696 | 3,152.1647 |
| Point 44 | 623.2768 | 3,288 |
| Point 45 | 1,050 | 3,288 |
| Point 46 | 632.2817 | 3,285 |
| Point 47 | 1,050 | 3,285 |

| | | |
|---|---|---|
| Point 48 | 701.3003 | 3,262 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,31,32,33,4,5,6,7,8,16,9,41,37,39 | 28,757 |
| Region 2 | Drain | 16,8,7,43 | 1,126.2 |
| Region 3 | Bedrock | 15,14,13,12,11,22,21,20,19,18,23,24,25 | 44,932 |
| Region 4 | Paste | 26,27,35,36,38,1,2,3 | 4,045.1 |
| Region 5 | Fly Ash Slurry | 1,39,38 | 4.4736 |
| Region 6 | Clinker Fill | 5,4,48,46,44,29,30,34 | 2,915.7 |
| Region 7 | Core | 16,9,41,40,42,43 | 4,495.4 |
| Region 8 | Bottom Ash Fill | 3,26,48,4,33,32,31 | 1,197.5 |
| Region 9 | Paste - Sat. | 28,38,36,35 | 1,007.9 |
| Region 10 | Fly Ash Slurry - Sat. | 15,25,28,38,39 | 11,053 |
| Region 11 | Embankment Fill - Sat. | 10,11,12,13,14,15,39,37,41 | 14,795 |
| Region 12 | Core - Sat. | 10,11,22,21,43,42,40,41 | 3,166 |
| Region 13 | Drain - Sat. | 6,17,18,19,20,21,43,7 | 1,552 |
| Region 14 | Paste | 48,26,27,47,46 | 16,718 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.27
Volume: 1,357.7637 ft³
Weight: 169,900.46 lbs
Resisting Moment: 3.5650371e+008 lbs-ft
Activating Moment: 1.5688848e+008 lbs-ft
Resisting Force: 115,656.73 lbs
Activating Force: 50,961.618 lbs
F of S Rank (Analysis): 1,631 of 4,641 slip surfaces
F of S Rank (Query): 1,631 of 4,641 slip surfaces
Exit: (204.88373, 3,159.1881) ft
Entry: (549.99999, 3,274.3278) ft
Radius: 2,922.3092 ft
Center: (-545.60952, 5,983.4847) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 210.69424 | 3,160.745 | -973.51863 | 38.43125 | 24.957545 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 2 | 222.31527 | 3,163.8843 | -1,156.7255 | 123.00415 | 79.879827 | 50 |
| Slice 3 | 233.93629 | 3,167.0751 | -1,343.1419 | 201.42558 | 130.8073 | 50 |
| Slice 4 | 245.55732 | 3,170.3175 | -1,532.7786 | 273.7347 | 177.76539 | 50 |
| Slice 5 | 257.17835 | 3,173.6117 | -1,725.6469 | 339.96405 | 220.77524 | 50 |
| Slice 6 | 268.79937 | 3,176.9579 | -1,921.7582 | 400.13837 | 259.85289 | 50 |
| Slice 7 | 280.4204 | 3,180.3563 | -2,121.124 | 454.27374 | 295.00882 | 50 |
| Slice 8 | 292.04143 | 3,183.807 | -2,323.7562 | 502.37725 | 326.2476 | 50 |
| Slice 9 | 303.66245 | 3,187.3103 | -2,529.6668 | 544.44692 | 353.56797 | 50 |
| Slice 10 | 315.28348 | 3,190.8663 | -2,738.8684 | 580.47219 | 376.96305 | 50 |
| Slice 11 | 326.90451 | 3,194.4753 | -2,951.3733 | 610.43469 | 396.42092 | 50 |
| Slice 12 | 338.52554 | 3,198.1375 | -3,167.1944 | 634.30937 | 411.92532 | 50 |
| Slice 13 | 350.14656 | 3,201.853 | -3,386.345 | 652.06604 | 423.45664 | 50 |
| Slice 14 | 361.76759 | 3,205.6221 | -3,608.8382 | 663.67099 | 430.99298 | 50 |
| Slice 15 | 373.38862 | 3,209.445 | -3,834.6878 | 669.08895 | 434.51145 | 50 |
| Slice 16 | 385.00964 | 3,213.322 | -4,063.9076 | 668.28503 | 433.98938 | 50 |
| Slice 17 | 396.63067 | 3,217.2532 | -4,296.5119 | 661.22675 | 429.40567 | 50 |
| Slice 18 | 408.2517 | 3,221.2388 | -4,532.515 | 647.88596 | 420.74206 | 50 |
| Slice 19 | 419.87272 | 3,225.2792 | -4,771.9316 | 628.24058 | 407.98421 | 50 |
| Slice 20 | 431.49375 | 3,229.3746 | -5,014.7769 | 602.27618 | 391.12273 | 50 |
| Slice 21 | 443.11478 | 3,233.5252 | -5,261.0662 | 569.98708 | 370.15394 | 50 |
| Slice 22 | 454.73581 | 3,237.7312 | -5,510.815 | 531.37717 | 345.08037 | 50 |
| Slice 23 | 466.35683 | 3,241.993 | -5,764.0392 | 486.46026 | 315.91098 | 50 |
| Slice 24 | 477.97786 | 3,246.3107 | -6,020.7552 | 435.25985 | 282.66105 | 50 |
| Slice 25 | 489.59889 | 3,250.6846 | -6,280.9794 | 377.80852 | 245.35172 | 50 |
| Slice 26 | 499.8869 | 3,254.6012 | -6,250.6341 | 322.08713 | 209.16583 | 50 |
| Slice 27 | 508.8419 | 3,258.0489 | -6,357.6514 | 269.36613 | 174.92841 | 50 |
| Slice 28 | 516.16411 | 3,260.8906 | -6,446.5188 | 229.02976 | 148.73367 | 50 |
| Slice 29 | 523.00441 | 3,263.5698 | -6,531.016 | 191.4874 | 160.67701 | 0 |
| Slice 30 | 532.75 | 3,267.4225 | -3,183.1306 | 125.68864 | 105.46529 | 0 |
| Slice 31 | 544.24999 | 3,272.0166 | -2,963.1613 | 42.88429 | 35.984192 | 0 |

# Seismic Safety Factor - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 665
Date: 10/13/2016
Time: 7:20:21 PM
Tool Version: 8.15.1.11236
File Name: Main Dam A-A.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:20:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic FS - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - Outboard [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 0 psf
- Phi': 22.8 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Drain - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 0 psf
- Phi': 28 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Embankment Fill - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 125 pcf
- Cohesion': 40 psf
- Phi': 26.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 40 psf
- Phi': 26.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Fly Ash Slurry - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion': 560 psf
- Phi': 22.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 103.4 pcf
- Cohesion': 560 psf

Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 135 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits
Left Coordinate: (145, 3,143.9946) ft
Right Coordinate: (1,050, 3,285) ft

## Piezometric Lines
### Piezometric Line 1
#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 145 | 3,143.9946 |
| Coordinate 2 | 495.4094 | 3,150.0986 |
| Coordinate 3 | 527 | 3,156 |
| Coordinate 4 | 557 | 3,187 |

| | | |
|---|---|---|
| Coordinate 5 | 597 | 3,191 |
| Coordinate 6 | 811 | 3,224 |
| Coordinate 7 | 1,050 | 3,224 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 775.8576 | 3,220 |
| Point 2 | 770.7737 | 3,221.7421 |
| Point 3 | 719 | 3,239 |
| Point 4 | 650 | 3,262 |
| Point 5 | 513.3194 | 3,262 |
| Point 6 | 160.0726 | 3,144.2511 |
| Point 7 | 495.4094 | 3,150.0986 |
| Point 8 | 528.0798 | 3,259 |
| Point 9 | 566.7 | 3,259 |
| Point 10 | 599.2322 | 3,150.5593 |
| Point 11 | 613.489 | 3,150.5593 |
| Point 12 | 675.9425 | 3,153.3028 |
| Point 13 | 760.3625 | 3,157.0113 |
| Point 14 | 860.1865 | 3,159.219 |
| Point 15 | 953.25 | 3,160.5024 |
| Point 16 | 538.5202 | 3,259 |
| Point 17 | 145 | 3,143.9946 |
| Point 18 | 145 | 3,139.9751 |
| Point 19 | 483.5203 | 3,145.8865 |
| Point 20 | 492.5 | 3,139.9 |
| Point 21 | 502.7902 | 3,139.9 |
| Point 22 | 597.5 | 3,139.9 |
| Point 23 | 145 | 3,100 |
| Point 24 | 1,050 | 3,100 |
| Point 25 | 1,050 | 3,160 |
| Point 26 | 772.349 | 3,238.3235 |
| Point 27 | 1,050 | 3,234.8025 |

| | | |
|---|---|---|
| Point 28 | 1,050 | 3,220 |
| Point 29 | 617.3194 | 3,290 |
| Point 30 | 597.3194 | 3,290 |
| Point 31 | 701 | 3,245 |
| Point 32 | 683 | 3,251 |
| Point 33 | 665 | 3,257 |
| Point 34 | 552 | 3,275 |
| Point 35 | 1,050 | 3,224 |
| Point 36 | 811 | 3,224 |
| Point 37 | 597 | 3,191 |
| Point 38 | 785.0606 | 3,220 |
| Point 39 | 778.7562 | 3,219.0278 |
| Point 40 | 557 | 3,187 |
| Point 41 | 587.3883 | 3,190.0388 |
| Point 42 | 527 | 3,156 |
| Point 43 | 506.4696 | 3,152.1647 |
| Point 44 | 623.2768 | 3,288 |
| Point 45 | 1,050 | 3,288 |
| Point 46 | 632.2817 | 3,285 |
| Point 47 | 1,050 | 3,285 |
| Point 48 | 701.3003 | 3,262 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill - Seismic | 1,2,3,31,32,33,4,5,6,7,8,16,9,41,37,39 | 28,757 |
| Region 2 | Drain - Seismic | 16,8,7,43 | 1,126.2 |
| Region 3 | Bedrock | 15,14,13,12,11,22,21,20,19,18,23,24,25 | 44,932 |
| Region 4 | Paste - Seismic | 26,27,35,36,38,1,2,3 | 4,045.1 |
| Region 5 | Fly Ash Slurry - Seismic | 1,39,38 | 4.4736 |
| Region 6 | Clinker Fill - Seismic | 5,4,48,46,44,29,30,34 | 2,915.7 |
| Region 7 | Core - Seismic | 16,9,41,40,42,43 | 4,495.4 |
| Region 8 | Bottom Ash Fill - Seismic | 3,26,48,4,33,32,31 | 1,197.5 |
| Region 9 | Paste - Sat. - Seismic | 28,38,36,35 | 1,007.9 |
| Region 10 | Fly Ash Slurry - Sat. - Seismic | 15,25,28,38,39 | 11,053 |
| Region 11 | Embankment Fill - Sat. - | 10,11,12,13,14,15,39,37,41 | 14,795 |

| | Seismic | | |
|---|---|---|---|
| Region 12 | Core - Sat. - Seismic | 10,11,22,21,43,42,40,41 | 3,166 |
| Region 13 | Drain - Sat. - Seismic | 6,17,18,19,20,21,43,7 | 1,552 |
| Region 14 | Paste - Seismic | 48,26,27,47,46 | 16,718 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.44
Volume: 10,642.748 ft³
Weight: 1,334,720.9 lbs
Resisting Moment: 5.4469149e+008 lbs-ft
Activating Moment: 3.7734782e+008 lbs-ft
Resisting Force: 613,135.98 lbs
Activating Force: 424,662.38 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (160.60314, 3,144.4279) ft
Entry: (602.72824, 3,290) ft
Radius: 839.27168 ft
Center: (129.48618, 3,983.1226) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 167.88154 | 3,144.7613 | -22.962176 | 262.33078 | 130.22213 | 40 |
| Slice 2 | 182.43833 | 3,145.5548 | -56.642534 | 778.94723 | 386.67276 | 40 |
| Slice 3 | 196.99512 | 3,146.6023 | -106.17049 | 1,269.9759 | 630.42151 | 40 |
| Slice 4 | 211.55192 | 3,147.9048 | -171.60569 | 1,730.6989 | 859.1264 | 40 |
| Slice 5 | 226.10871 | 3,149.4636 | -253.02272 | 2,156.5444 | 1,070.5179 | 40 |
| Slice 6 | 240.66551 | 3,151.2799 | -350.51149 | 2,543.387 | 1,262.5483 | 40 |
| Slice 7 | 255.2223 | 3,153.3556 | -464.17752 | 2,887.8008 | 1,433.5168 | 40 |
| Slice 8 | 269.77909 | 3,155.6926 | -594.14262 | 3,187.2458 | 1,582.1626 | 40 |
| Slice 9 | 284.33589 | 3,158.2931 | -740.54542 | 3,440.1831 | 1,707.7217 | 40 |
| Slice 10 | 298.89268 | 3,161.1596 | -903.54192 | 3,646.1066 | 1,809.943 | 40 |
| Slice 11 | 313.44948 | 3,164.2949 | -1,083.3065 | 3,805.5032 | 1,889.0682 | 40 |
| Slice 12 | 328.00627 | 3,167.7021 | -1,280.0325 | 3,919.7441 | 1,945.7779 | 40 |
| Slice 13 | 342.56306 | 3,171.3846 | -1,493.9338 | 3,990.9274 | 1,981.1136 | 40 |
| Slice 14 | 357.11986 | 3,175.3462 | -1,725.2453 | 4,021.6831 | 1,996.3808 | 40 |
| Slice 15 | 371.67665 | 3,179.591 | -1,974.2246 | 4,014.9626 | 1,993.0448 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 16 | 386.23345 | 3,184.1236 | -2,241.1533 | 3,973.8283 | 1,972.6255 | 40 |
| Slice 17 | 400.79024 | 3,188.9489 | -2,526.339 | 3,901.2596 | 1,936.6021 | 40 |
| Slice 18 | 415.34703 | 3,194.0721 | -2,830.1166 | 3,799.9806 | 1,886.3267 | 40 |
| Slice 19 | 429.90383 | 3,199.4993 | -3,152.8511 | 3,672.324 | 1,822.9574 | 40 |
| Slice 20 | 444.46062 | 3,205.2367 | -3,494.9394 | 3,520.1242 | 1,747.4048 | 40 |
| Slice 21 | 459.01742 | 3,211.2913 | -3,856.8132 | 3,344.642 | 1,660.2947 | 40 |
| Slice 22 | 473.57421 | 3,217.6706 | -4,238.9423 | 3,146.5119 | 1,561.9421 | 40 |
| Slice 23 | 488.131 | 3,224.3828 | -4,641.8379 | 2,925.7042 | 1,452.3322 | 40 |
| Slice 24 | 504.3644 | 3,232.2943 | -4,855.191 | 2,649.5937 | 1,315.2697 | 40 |
| Slice 25 | 518.11626 | 3,239.2716 | -5,120.9927 | 2,405.9086 | 1,194.3034 | 40 |
| Slice 26 | 524.95656 | 3,242.8694 | -5,260.8793 | 2,298.3194 | 1,222.0381 | 0 |
| Slice 27 | 527.5399 | 3,244.2519 | -2,646.3717 | 2,278.7662 | 1,211.6415 | 0 |
| Slice 28 | 531.72931 | 3,246.5358 | -2,584.6521 | 2,194.4495 | 1,166.8095 | 0 |
| Slice 29 | 536.94951 | 3,249.401 | -2,508.3343 | 2,109.9925 | 886.95919 | 0 |
| Slice 30 | 545.2601 | 3,254.1172 | -2,391.5065 | 1,913.463 | 804.3458 | 0 |
| Slice 31 | 552.88894 | 3,258.4806 | -2,285.2895 | 1,750.086 | 735.66843 | 0 |
| Slice 32 | 555.38894 | 3,259.9488 | -2,251.6381 | 1,648.7648 | 818.45395 | 40 |
| Slice 33 | 557.92843 | 3,261.4488 | -4,593.8737 | 1,587.7792 | 788.18045 | 40 |
| Slice 34 | 565.21405 | 3,265.8619 | -4,821.5132 | 1,348.0246 | 842.33927 | 0 |
| Slice 35 | 577.92843 | 3,273.7426 | -5,229.8471 | 981.3774 | 613.23266 | 0 |
| Slice 36 | 590.64281 | 3,281.9424 | -5,657.8967 | 584.24375 | 365.07601 | 0 |
| Slice 37 | 597.1597 | 3,286.2306 | -5,802.8659 | 372.36976 | 232.68245 | 0 |
| Slice 38 | 600.02382 | 3,288.1689 | -5,894.0852 | 183.45398 | 114.63477 | 0 |

# Static Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 629
Date: 10/13/2016
Time: 7:42:22 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam B-B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:42:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (243.24421, 3,256.4977) ft
Left-Zone Right Coordinate: (336.5, 3,274.5) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (383.22729, 3,290) ft
Right-Zone Right Coordinate: (437.99994, 3,282.6667) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (0, 3,253.5) ft
Right Coordinate: (604.44329, 3,240.8608) ft

## Piezometric Lines
### Piezometric Line 1
#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Coordinate 1 | 0 | 3,226.5 |
| Coordinate 2 | 387 | 3,236.5 |
| Coordinate 3 | 459.5 | 3,236.5 |
| Coordinate 4 | 464.5 | 3,219.5 |
| Coordinate 5 | 604.44329 | 3,219.5 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440.48236 | 3,231.5775 |
| Point 2 | 429.70942 | 3,231.5865 |
| Point 3 | 438.68911 | 3,225.6 |
| Point 4 | 486.76298 | 3,225.6 |
| Point 5 | 476.81597 | 3,258.7567 |
| Point 6 | 448.63612 | 3,258.7567 |
| Point 7 | 604.44329 | 3,233.8752 |
| Point 8 | 604.44329 | 3,229.868 |
| Point 9 | 506.03283 | 3,231.5865 |
| Point 10 | 497.05314 | 3,225.6 |
| Point 11 | 487.25628 | 3,258.7567 |
| Point 12 | 494.14371 | 3,235.7986 |
| Point 13 | 314.35797 | 3,246.0826 |
| Point 14 | 264.7675 | 3,229.497 |
| Point 15 | 234.96255 | 3,219.5287 |
| Point 16 | 385 | 3,221.07 |
| Point 17 | 604.44329 | 3,240.8608 |
| Point 18 | 594.13162 | 3,238 |
| Point 19 | 572.90818 | 3,238 |
| Point 20 | 500 | 3,262 |
| Point 21 | 385 | 3,261.27 |
| Point 22 | 355.97036 | 3,260 |
| Point 23 | 75.018 | 3,234.0128 |
| Point 24 | 0 | 3,230.378 |
| Point 25 | 0 | 3,229.497 |
| Point 26 | 184.3811 | 3,217.3171 |
| Point 27 | 123.86712 | 3,229.497 |

| | | |
|---|---|---|
| Point 28 | 0 | 3,209.2553 |
| Point 29 | 0 | 3,200 |
| Point 30 | 604.44329 | 3,200 |
| Point 31 | 416 | 3,290 |
| Point 32 | 383 | 3,290 |
| Point 33 | 242 | 3,243 |
| Point 34 | 293 | 3,260 |
| Point 35 | 476 | 3,270 |
| Point 36 | 446 | 3,280 |
| Point 37 | 463 | 3,200 |
| Point 38 | 463 | 3,225.6 |
| Point 39 | 461 | 3,200 |
| Point 40 | 461 | 3,225.6 |
| Point 41 | 461 | 3,228 |
| Point 42 | 463 | 3,228 |
| Point 43 | 0 | 3,253.5 |
| Point 44 | 284 | 3,257 |
| Point 45 | 441.95911 | 3,236.5 |
| Point 46 | 459.5 | 3,236.5 |
| Point 47 | 462 | 3,228 |
| Point 48 | 387 | 3,236.5 |
| Point 49 | 276.73636 | 3,233.5 |
| Point 50 | 0 | 3,288 |
| Point 51 | 377 | 3,288 |
| Point 52 | 206.83958 | 3,229.497 |
| Point 53 | 604.44329 | 3,225.5635 |
| Point 54 | 362 | 3,283 |
| Point 55 | 0 | 3,283 |
| Point 56 | 368 | 3,285 |
| Point 57 | 0 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Core - Sat. | 1,2,3,40,41,47,46,45 | 255.45 |
| Region 2 | Drain | 7,8,9,10,4,5,11,12 | 817.94 |

| | | | |
|---|---|---|---|
| Region 3 | Embankment Fill | 13,49,48,45,6,5,11,12,7,17,18,19,20,21,22 | 4,790.4 |
| Region 4 | Paste | 13,33,23,24,25,27,49 | 2,102.2 |
| Region 5 | Fly Ash Slurry - Sat. | 25,28,52,27 | 2,093.4 |
| Region 6 | Bottom Ash Fill | 33,13,22,34,44 | 974.63 |
| Region 7 | Clinker Fill | 34,22,21,20,35,36,31,32,51,56,54 | 3,477.5 |
| Region 8 | Bedrock | 28,29,39,40,3,16,15,26 | 8,251.2 |
| Region 9 | Bedrock | 30,53,10,4,38,37 | 3,619 |
| Region 10 | Cutoff Wall | 42,47,41,40,39,37,38 | 56 |
| Region 11 | Paste | 44,33,23,24,43 | 4,745.9 |
| Region 12 | Core | 42,38,4,5,6,45,46,47 | 1,036.1 |
| Region 13 | Embankment Fill - Sat. | 14,16,3,2,1,45,48,49 | 1,815.8 |
| Region 14 | Paste - Sat. | 14,49,27,52 | 282.01 |
| Region 15 | Native Clinker | 16,14,52,28,26,15 | 2,329.1 |
| Region 16 | Native Clinker | 8,9,10,53 | 533.41 |
| Region 17 | | 43,44,34,54,56,57,55 | 9,625 |

## Current Slip Surface

Slip Surface: 374
F of S: 2.59
Volume: 2,243.4888 ft³
Weight: 258,465.87 lbs
Resisting Moment: 19,039,191 lbs-ft
Activating Moment: 7,350,812.6 lbs-ft
Resisting Force: 172,108.49 lbs
Activating Force: 66,490.345 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (261.26136, 3,256.7198) ft
Entry: (392.5544, 3,290) ft
Radius: 100.20537 ft
Center: (308.76067, 3,344.952) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 263.51708 | 3,255.5779 | -1,388.6357 | 142.5026 | 99.781394 | 0 |
| Slice 2 | 268.02852 | 3,253.432 | -1,247.555 | 417.64294 | 292.43673 | 0 |
| Slice 3 | 272.5702 | 3,251.5424 | -1,122.4041 | 666.42917 | 559.20047 | 0 |
| Slice 4 | 277.14212 | 3,249.8964 | -1,012.3922 | 850.32941 | 713.51109 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 5 | 281.71404 | 3,248.495 | -917.63835 | 1,002.9458 | 841.57148 | 0 |
| Slice 6 | 286.25 | 3,247.3352 | -838.00373 | 1,210.9643 | 1,016.1197 | 0 |
| Slice 7 | 290.75 | 3,246.4051 | -772.75511 | 1,471.4966 | 1,234.7323 | 0 |
| Slice 8 | 295.30469 | 3,245.6815 | -720.29274 | 1,732.3704 | 1,453.6314 | 0 |
| Slice 9 | 299.74179 | 3,245.1763 | -681.64286 | 1,942.9309 | 1,360.4549 | 0 |
| Slice 10 | 304.0066 | 3,244.8823 | -656.43392 | 2,145.8568 | 1,502.5451 | 0 |
| Slice 11 | 308.27142 | 3,244.7705 | -642.59528 | 2,310.2823 | 1,617.6771 | 0 |
| Slice 12 | 312.3809 | 3,244.8316 | -639.78209 | 2,435.4208 | 1,581.5808 | 0 |
| Slice 13 | 316.43859 | 3,245.063 | -647.67445 | 2,560.7188 | 1,662.9502 | 0 |
| Slice 14 | 320.59983 | 3,245.4706 | -666.38272 | 2,661.9938 | 1,728.719 | 0 |
| Slice 15 | 324.76107 | 3,246.0548 | -696.10932 | 2,730.9757 | 1,773.5164 | 0 |
| Slice 16 | 328.92231 | 3,246.8189 | -737.05141 | 2,771.0267 | 1,799.5258 | 0 |
| Slice 17 | 333.08355 | 3,247.7671 | -789.47403 | 2,785.448 | 1,808.8911 | 0 |
| Slice 18 | 337.24478 | 3,248.9048 | -853.71788 | 2,777.299 | 1,803.599 | 0 |
| Slice 19 | 341.40602 | 3,250.239 | -930.20987 | 2,749.2575 | 1,785.3887 | 0 |
| Slice 20 | 345.56726 | 3,251.7781 | -1,019.4774 | 2,703.5128 | 1,755.6817 | 0 |
| Slice 21 | 349.7285 | 3,253.5324 | -1,122.1673 | 2,641.683 | 1,715.529 | 0 |
| Slice 22 | 353.88974 | 3,255.5146 | -1,239.0716 | 2,564.7443 | 1,665.5644 | 0 |
| Slice 23 | 358.98518 | 3,258.3121 | -1,405.3103 | 2,417.1835 | 1,569.7373 | 0 |
| Slice 24 | 362.17397 | 3,260.1694 | -1,515.9884 | 2,310.031 | 1,500.1517 | 0 |
| Slice 25 | 365.17397 | 3,262.2057 | -1,638.1336 | 2,109.4202 | 1,770.0137 | 50 |
| Slice 26 | 370.25 | 3,265.8821 | -1,859.2094 | 1,868.3367 | 1,567.7206 | 50 |
| Slice 27 | 374.75 | 3,269.6023 | -2,083.9454 | 1,625.5403 | 1,363.9903 | 50 |
| Slice 28 | 380 | 3,274.6111 | -2,387.8271 | 1,295.9101 | 1,087.3977 | 50 |
| Slice 29 | 385 | 3,279.9969 | -2,715.6179 | 880.13284 | 738.51915 | 50 |
| Slice 30 | 389.7772 | 3,286.1722 | -3,099.5435 | 316.92196 | 265.9291 | 50 |

# Seismic Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 629
Date: 10/13/2016
Time: 7:42:22 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam B-B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:42:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - Inboard [(last)]

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,253.5) ft
Right Coordinate: (604.44329, 3,240.8608) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,226 |
| Coordinate 2 | 387 | 3,236.5 |
| Coordinate 3 | 459.5 | 3,236.5 |
| Coordinate 4 | 464.5 | 3,219.5 |
| Coordinate 5 | 604.44329 | 3,219.5 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440.48236 | 3,231.5775 |
| Point 2 | 429.70942 | 3,231.5865 |
| Point 3 | 438.68911 | 3,225.6 |
| Point 4 | 486.76298 | 3,225.6 |
| Point 5 | 476.81597 | 3,258.7567 |
| Point 6 | 448.63612 | 3,258.7567 |
| Point 7 | 604.44329 | 3,233.8752 |
| Point 8 | 604.44329 | 3,229.868 |
| Point 9 | 506.03283 | 3,231.5865 |
| Point 10 | 497.05314 | 3,225.6 |
| Point 11 | 487.25628 | 3,258.7567 |
| Point 12 | 494.14371 | 3,235.7986 |
| Point 13 | 314.35797 | 3,246.0826 |
| Point 14 | 264.7675 | 3,229.497 |
| Point 15 | 234.96255 | 3,219.5287 |
| Point 16 | 385 | 3,221.07 |
| Point 17 | 604.44329 | 3,240.8608 |
| Point 18 | 594.13162 | 3,238 |
| Point 19 | 572.90818 | 3,238 |
| Point 20 | 500 | 3,262 |
| Point 21 | 385 | 3,261.27 |
| Point 22 | 355.97036 | 3,260 |
| Point 23 | 75.018 | 3,234.0128 |
| Point 24 | 0 | 3,230.378 |
| Point 25 | 0 | 3,229.497 |
| Point 26 | 184.3811 | 3,217.3171 |
| Point 27 | 123.86712 | 3,229.497 |
| Point 28 | 0 | 3,209.2553 |
| Point 29 | 0 | 3,200 |
| Point 30 | 604.44329 | 3,200 |
| Point 31 | 416 | 3,290 |
| Point 32 | 383 | 3,290 |
| Point 33 | 242 | 3,243 |

| | | |
|---|---|---|
| Point 34 | 293 | 3,260 |
| Point 35 | 476 | 3,270 |
| Point 36 | 446 | 3,280 |
| Point 37 | 463 | 3,200 |
| Point 38 | 463 | 3,225.6 |
| Point 39 | 461 | 3,200 |
| Point 40 | 461 | 3,225.6 |
| Point 41 | 461 | 3,228 |
| Point 42 | 463 | 3,228 |
| Point 43 | 0 | 3,253.5 |
| Point 44 | 284 | 3,257 |
| Point 45 | 441.95911 | 3,236.5 |
| Point 46 | 459.5 | 3,236.5 |
| Point 47 | 462 | 3,228 |
| Point 48 | 387 | 3,236.5 |
| Point 49 | 276.73636 | 3,233.5 |
| Point 50 | 0 | 3,288 |
| Point 51 | 377 | 3,288 |
| Point 52 | 206.83958 | 3,229.497 |
| Point 53 | 604.44329 | 3,225.5635 |
| Point 54 | 362 | 3,283 |
| Point 55 | 0 | 3,283 |
| Point 56 | 368 | 3,285 |
| Point 57 | 0 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Core - Sat. - Seismic | 1,2,3,40,41,47,46,45 | 255.45 |
| Region 2 | Drain - Seismic | 7,8,9,10,4,5,11,12 | 817.94 |
| Region 3 | Embankment Fill - Seismic | 13,49,48,45,6,5,11,12,7,17,18,19,20,21,22 | 4,790.4 |
| Region 4 | Paste - Seismic | 13,33,23,24,25,27,49 | 2,102.2 |
| Region 5 | Fly Ash Slurry - Sat. - Seismic | 25,28,52,27 | 2,093.4 |
| Region 6 | Bottom Ash Fill - Seismic | 33,13,22,34,44 | 974.63 |
| Region 7 | Clinker Fill - Seismic | 34,22,21,20,35,36,31,32,51,56,54 | 3,477.5 |

| | | | |
|---|---|---|---|
| Region 8 | Bedrock | 28,29,39,40,3,16,15,26 | 8,251.2 |
| Region 9 | Bedrock | 30,53,10,4,38,37 | 3,619 |
| Region 10 | Cutoff Wall | 42,47,41,40,39,37,38 | 56 |
| Region 11 | Paste - Seismic | 44,33,23,24,43 | 4,745.9 |
| Region 12 | Core - Seismic | 42,38,4,5,6,45,46,47 | 1,036.1 |
| Region 13 | Embankment Fill - Sat. - Seismic | 14,16,3,2,1,45,48,49 | 1,815.8 |
| Region 14 | Paste - Sat. - Seismic | 14,49,27,52 | 282.01 |
| Region 15 | Native Clinker - Seismic | 16,14,52,28,26,15 | 2,329.1 |
| Region 16 | Native Clinker - Seismic | 8,9,10,53 | 533.41 |
| Region 17 | | 43,44,34,54,56,57,55 | 9,625 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.80
Volume: 2,243.4888 ft³
Weight: 258,465.87 lbs
Resisting Moment: 14,324,672 lbs-ft
Activating Moment: 7,976,091.9 lbs-ft
Resisting Force: 129,888.65 lbs
Activating Force: 71,948.997 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (261.26136, 3,256.7198) ft
Entry: (392.5544, 3,290) ft
Radius: 100.20537 ft
Center: (308.76067, 3,344.952) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 263.51708 | 3,255.5779 | -1,398.4887 | 145.57319 | 77.402641 | 0 |
| Slice 2 | 268.02852 | 3,253.432 | -1,257.0541 | 428.80126 | 227.99767 | 0 |
| Slice 3 | 272.5702 | 3,251.5424 | -1,131.5459 | 688.3672 | 430.13957 | 0 |
| Slice 4 | 277.14212 | 3,249.8964 | -1,021.1732 | 882.61669 | 551.52012 | 0 |
| Slice 5 | 281.71404 | 3,248.495 | -926.05753 | 1,044.4608 | 652.65156 | 0 |
| Slice 6 | 286.25 | 3,247.3352 | -846.06295 | 1,261.9627 | 788.56179 | 0 |
| Slice 7 | 290.75 | 3,246.4051 | -780.45624 | 1,531.4607 | 956.96284 | 0 |
| Slice 8 | 295.30469 | 3,245.6815 | -727.63051 | 1,798.5055 | 1,123.831 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 9 | 299.74179 | 3,245.1763 | -688.62585 | 2,005.1857 | 1,066.1761 | 0 |
| Slice 10 | 304.0066 | 3,244.8823 | -663.07507 | 2,205.0268 | 1,172.4336 | 0 |
| Slice 11 | 308.27142 | 3,244.7705 | -648.89377 | 2,362.4649 | 1,256.1449 | 0 |
| Slice 12 | 312.3809 | 3,244.8316 | -645.74969 | 2,474.7536 | 1,228.4784 | 0 |
| Slice 13 | 316.43859 | 3,245.063 | -653.31463 | 2,588.012 | 1,284.7003 | 0 |
| Slice 14 | 320.59983 | 3,245.4706 | -671.6864 | 2,675.1931 | 1,327.9774 | 0 |
| Slice 15 | 324.76107 | 3,246.0548 | -701.07574 | 2,729.1139 | 1,354.7439 | 0 |
| Slice 16 | 328.92231 | 3,246.8189 | -741.6798 | 2,753.986 | 1,367.0905 | 0 |
| Slice 17 | 333.08355 | 3,247.7671 | -793.7636 | 2,753.8665 | 1,367.0312 | 0 |
| Slice 18 | 337.24478 | 3,248.9048 | -857.6678 | 2,732.4389 | 1,356.3945 | 0 |
| Slice 19 | 341.40602 | 3,250.239 | -933.81934 | 2,692.8669 | 1,336.7507 | 0 |
| Slice 20 | 345.56726 | 3,251.7781 | -1,022.7455 | 2,637.6895 | 1,309.3604 | 0 |
| Slice 21 | 349.7285 | 3,253.5324 | -1,125.0932 | 2,568.7547 | 1,275.1409 | 0 |
| Slice 22 | 353.88974 | 3,255.5146 | -1,241.6543 | 2,487.1706 | 1,234.6422 | 0 |
| Slice 23 | 358.98518 | 3,258.3121 | -1,407.4711 | 2,338.2 | 1,160.6925 | 0 |
| Slice 24 | 362.17397 | 3,260.1694 | -1,517.8848 | 2,232.0446 | 1,107.9966 | 0 |
| Slice 25 | 365.17397 | 3,262.2057 | -1,639.7799 | 2,041.7347 | 1,275.8175 | 40 |
| Slice 26 | 370.25 | 3,265.8821 | -1,860.4317 | 1,806.7533 | 1,128.9848 | 40 |
| Slice 27 | 374.75 | 3,269.6023 | -2,084.7897 | 1,571.9132 | 982.24039 | 40 |
| Slice 28 | 380 | 3,274.6111 | -2,388.2277 | 1,254.1245 | 783.66396 | 40 |
| Slice 29 | 385 | 3,279.9969 | -2,715.5933 | 852.69376 | 532.8222 | 40 |
| Slice 30 | 389.7772 | 3,286.1722 | -3,099.5435 | 305.7521 | 191.05512 | 40 |

# Static Safety Factor: Maximum Storage Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 628
Date: 10/13/2016
Time: 7:40:58 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam B-B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:41:00 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (350.99994, 3,285) ft
Left-Zone Right Coordinate: (416, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (488, 3,266) ft
Right-Zone Right Coordinate: (604, 3,240.7378) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (0, 3,285) ft
Right Coordinate: (604.44329, 3,240.8608) ft

## Piezometric Lines

### Piezometric Line 1

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Coordinate 1 | 0 | 3,226 |
| Coordinate 2 | 387 | 3,236.5 |
| Coordinate 3 | 459.5 | 3,236.5 |
| Coordinate 4 | 464.5 | 3,219.5 |
| Coordinate 5 | 604.44329 | 3,219.5 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440.48236 | 3,231.5775 |
| Point 2 | 429.70942 | 3,231.5865 |
| Point 3 | 438.68911 | 3,225.6 |
| Point 4 | 486.76298 | 3,225.6 |
| Point 5 | 476.81597 | 3,258.7567 |
| Point 6 | 448.63612 | 3,258.7567 |
| Point 7 | 604.44329 | 3,233.8752 |
| Point 8 | 604.44329 | 3,229.868 |
| Point 9 | 506.03283 | 3,231.5865 |
| Point 10 | 497.05314 | 3,225.6 |
| Point 11 | 487.25628 | 3,258.7567 |
| Point 12 | 494.14371 | 3,235.7986 |
| Point 13 | 314.35797 | 3,246.0826 |
| Point 14 | 264.7675 | 3,229.497 |
| Point 15 | 234.96255 | 3,219.5287 |
| Point 16 | 385 | 3,221.07 |
| Point 17 | 604.44329 | 3,240.8608 |
| Point 18 | 594.13162 | 3,238 |
| Point 19 | 572.90818 | 3,238 |
| Point 20 | 500 | 3,262 |
| Point 21 | 385 | 3,261.27 |
| Point 22 | 355.97036 | 3,260 |
| Point 23 | 75.018 | 3,234.0128 |
| Point 24 | 0 | 3,230.378 |
| Point 25 | 0 | 3,229.497 |
| Point 26 | 184.3811 | 3,217.3171 |
| Point 27 | 123.86712 | 3,229.497 |

| | | |
|---|---|---|
| Point 28 | 0 | 3,209.2553 |
| Point 29 | 0 | 3,200 |
| Point 30 | 604.44329 | 3,200 |
| Point 31 | 416 | 3,290 |
| Point 32 | 383 | 3,290 |
| Point 33 | 242 | 3,243 |
| Point 34 | 293 | 3,260 |
| Point 35 | 476 | 3,270 |
| Point 36 | 446 | 3,280 |
| Point 37 | 463 | 3,200 |
| Point 38 | 463 | 3,225.6 |
| Point 39 | 461 | 3,200 |
| Point 40 | 461 | 3,225.6 |
| Point 41 | 461 | 3,228 |
| Point 42 | 463 | 3,228 |
| Point 43 | 0 | 3,253.5 |
| Point 44 | 284 | 3,257 |
| Point 45 | 441.95911 | 3,236.5 |
| Point 46 | 459.5 | 3,236.5 |
| Point 47 | 462 | 3,228 |
| Point 48 | 387 | 3,236.5 |
| Point 49 | 276.73636 | 3,233.5 |
| Point 50 | 0 | 3,288 |
| Point 51 | 377 | 3,288 |
| Point 52 | 206.83958 | 3,229.497 |
| Point 53 | 604.44329 | 3,225.5635 |
| Point 54 | 362 | 3,283 |
| Point 55 | 0 | 3,283 |
| Point 56 | 368 | 3,285 |
| Point 57 | 0 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Core - Sat. | 1,2,3,40,41,47,46,45 | 255.45 |
| Region 2 | Drain | 7,8,9,10,4,5,11,12 | 817.94 |

| | | | |
|---|---|---|---|
| Region 3 | Embankment Fill | 13,49,48,45,6,5,11,12,7,17,18,19,20,21,22 | 4,790.4 |
| Region 4 | Paste | 13,33,23,24,25,27,49 | 2,102.2 |
| Region 5 | Fly Ash Slurry - Sat. | 25,28,52,27 | 2,093.4 |
| Region 6 | Bottom Ash Fill | 33,13,22,34,44 | 974.63 |
| Region 7 | Clinker Fill | 34,22,21,20,35,36,31,32,51,56,54 | 3,477.5 |
| Region 8 | Bedrock | 28,29,39,40,3,16,15,26 | 8,251.2 |
| Region 9 | Bedrock | 30,53,10,4,38,37 | 3,619 |
| Region 10 | Cutoff Wall | 42,47,41,40,39,37,38 | 56 |
| Region 11 | Paste | 44,33,23,24,43 | 4,745.9 |
| Region 12 | Core | 42,38,4,5,6,45,46,47 | 1,036.1 |
| Region 13 | Embankment Fill - Sat. | 14,16,3,2,1,45,48,49 | 1,815.8 |
| Region 14 | Paste - Sat. | 14,49,27,52 | 282.01 |
| Region 15 | Native Clinker | 16,14,52,28,26,15 | 2,329.1 |
| Region 16 | Native Clinker | 8,9,10,53 | 533.41 |
| Region 17 | Paste | 43,44,34,54,56,57,55 | 9,625 |

## Current Slip Surface

Slip Surface: 1,488
F of S: 2.19
Volume: 1,806.5437 ft³
Weight: 229,521.31 lbs
Resisting Moment: 33,071,990 lbs-ft
Activating Moment: 15,111,652 lbs-ft
Resisting Force: 142,191.13 lbs
Activating Force: 64,919.185 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (574.15513, 3,238) ft
Entry: (416, 3,290) ft
Radius: 217.3679 ft
Center: (557.79491, 3,454.7514) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 418.5 | 3,287.9127 | -3,208.1543 | 108.2903 | 90.866347 | 50 |
| Slice 2 | 423.5 | 3,283.8608 | -2,955.3155 | 342.3865 | 287.29638 | 50 |
| Slice 3 | 428.5 | 3,280.046 | -2,717.2708 | 553.72944 | 464.63417 | 50 |
| Slice 4 | 433.5 | 3,276.453 | -2,493.0689 | 745.51915 | 625.56485 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 5 | 438.5 | 3,273.0687 | -2,281.8871 | 920.39941 | 772.30681 | 50 |
| Slice 6 | 443.5 | 3,269.8816 | -2,083.0095 | 1,080.4873 | 906.6365 | 50 |
| Slice 7 | 448.95815 | 3,266.6246 | -1,879.7733 | 1,239.3773 | 1,039.961 | 50 |
| Slice 8 | 454.87446 | 3,263.3228 | -1,673.7404 | 1,396.6193 | 1,171.9027 | 50 |
| Slice 9 | 458.66631 | 3,261.3051 | -1,547.8391 | 1,519.2794 | 986.6316 | 0 |
| Slice 10 | 461.65038 | 3,259.8173 | -152.16748 | 1,575.5037 | 1,023.1441 | 0 |
| Slice 11 | 464.15038 | 3,258.5898 | -188.29835 | 1,633.8882 | 887.12894 | 0 |
| Slice 12 | 467.375 | 3,257.1076 | -2,346.7148 | 1,683.5126 | 914.07278 | 0 |
| Slice 13 | 473.125 | 3,254.5763 | -2,188.7587 | 1,766.0074 | 958.86378 | 0 |
| Slice 14 | 476.40799 | 3,253.1955 | -2,102.5964 | 1,809.4083 | 982.42853 | 0 |
| Slice 15 | 477.79061 | 3,252.6449 | -2,068.2417 | 1,839.2461 | 998.62917 | 0 |
| Slice 16 | 480.88801 | 3,251.456 | -1,994.0571 | 1,885.9953 | 1,320.5881 | 0 |
| Slice 17 | 485.13352 | 3,249.9001 | -1,896.9633 | 1,935.4621 | 1,355.2251 | 0 |
| Slice 18 | 488.85846 | 3,248.6113 | -1,816.5458 | 1,947.6862 | 1,363.7846 | 0 |
| Slice 19 | 492.84548 | 3,247.3288 | -1,736.5148 | 1,945.9734 | 1,263.7299 | 0 |
| Slice 20 | 497.61516 | 3,245.8948 | -1,647.038 | 1,959.983 | 1,272.8279 | 0 |
| Slice 21 | 502.60386 | 3,244.5241 | -1,561.5026 | 1,964.2835 | 1,275.6206 | 0 |
| Slice 22 | 507.81159 | 3,243.2252 | -1,480.4523 | 1,956.156 | 1,270.3426 | 0 |
| Slice 23 | 513.01932 | 3,242.0617 | -1,407.8526 | 1,927.9319 | 1,252.0136 | 0 |
| Slice 24 | 518.22704 | 3,241.0315 | -1,343.5654 | 1,878.0766 | 1,219.6372 | 0 |
| Slice 25 | 523.43477 | 3,240.1325 | -1,287.4708 | 1,805.3116 | 1,172.3831 | 0 |
| Slice 26 | 528.6425 | 3,239.3632 | -1,239.4663 | 1,708.7328 | 1,109.664 | 0 |
| Slice 27 | 533.85023 | 3,238.7222 | -1,199.4654 | 1,587.9117 | 1,031.2019 | 0 |
| Slice 28 | 539.05795 | 3,238.2083 | -1,167.3969 | 1,442.9704 | 937.07593 | 0 |
| Slice 29 | 544.26568 | 3,237.8206 | -1,143.2044 | 1,274.6185 | 827.74694 | 0 |
| Slice 30 | 549.47341 | 3,237.5584 | -1,126.8457 | 1,084.1474 | 704.05352 | 0 |
| Slice 31 | 554.68114 | 3,237.4214 | -1,118.2925 | 873.3764 | 567.17726 | 0 |
| Slice 32 | 559.88886 | 3,237.4091 | -1,117.5299 | 644.55358 | 418.57799 | 0 |
| Slice 33 | 565.09659 | 3,237.5217 | -1,124.5568 | 400.21479 | 259.90252 | 0 |
| Slice 34 | 570.30432 | 3,237.7594 | -1,139.3851 | 143.01209 | 92.873134 | 0 |
| Slice 35 | 573.53165 | 3,237.9547 | -1,151.576 | 5.9714293 | 3.8778915 | 0 |

# Static Safety Factor: Maximum Surcharge Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 628
Date: 10/13/2016
Time: 7:40:58 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam B-B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:41:01 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Core

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °

### Drain

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Cutoff Wall

Model: Bedrock (Impenetrable)

**Embankment Fill**
- Model: Mohr-Coulomb
- Unit Weight: 125 pcf
- Cohesion': 0 psf
- Phi': 33 °
- Phi-B: 0 °

**Clinker Fill**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 50 psf
- Phi': 40 °
- Phi-B: 0 °

**Bedrock**
- Model: Bedrock (Impenetrable)

**Paste**
- Model: Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion': 0 psf
- Phi': 35 °
- Phi-B: 0 °

**Fly Ash Slurry**
- Model: Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion': 700 psf
- Phi': 28 °
- Phi-B: 0 °

## Slip Surface Entry and Exit
- Left Projection: Range
- Left-Zone Left Coordinate: (350.99994, 3,285) ft
- Left-Zone Right Coordinate: (416, 3,290) ft
- Left-Zone Increment: 12
- Right Projection: Range
- Right-Zone Left Coordinate: (488, 3,266) ft
- Right-Zone Right Coordinate: (604, 3,240.7378) ft
- Right-Zone Increment: 12
- Radius Increments: 8

## Slip Surface Limits
- Left Coordinate: (0, 3,285) ft
- Right Coordinate: (604.44329, 3,240.8608) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 0 | 3,288 |
| | 377 | 3,288 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440.48236 | 3,231.5775 |
| Point 2 | 429.70942 | 3,231.5865 |
| Point 3 | 438.68911 | 3,225.6 |
| Point 4 | 486.76298 | 3,225.6 |
| Point 5 | 476.81597 | 3,258.7567 |
| Point 6 | 448.63612 | 3,258.7567 |
| Point 7 | 604.44329 | 3,233.8752 |
| Point 8 | 604.44329 | 3,229.868 |
| Point 9 | 506.03283 | 3,231.5865 |
| Point 10 | 497.05314 | 3,225.6 |
| Point 11 | 487.25628 | 3,258.7567 |
| Point 12 | 494.14371 | 3,235.7986 |
| Point 13 | 314.35797 | 3,246.0826 |
| Point 14 | 264.7675 | 3,229.497 |
| Point 15 | 234.96255 | 3,219.5287 |
| Point 16 | 385 | 3,221.07 |
| Point 17 | 604.44329 | 3,240.8608 |
| Point 18 | 594.13162 | 3,238 |
| Point 19 | 572.90818 | 3,238 |
| Point 20 | 500 | 3,262 |
| Point 21 | 385 | 3,261.27 |
| Point 22 | 355.97036 | 3,260 |
| Point 23 | 75.018 | 3,234.0128 |
| Point 24 | 0 | 3,230.378 |

| | | |
|---|---|---|
| Point 25 | 0 | 3,229.497 |
| Point 26 | 184.3811 | 3,217.3171 |
| Point 27 | 123.86712 | 3,229.497 |
| Point 28 | 0 | 3,209.2553 |
| Point 29 | 0 | 3,200 |
| Point 30 | 604.44329 | 3,200 |
| Point 31 | 416 | 3,290 |
| Point 32 | 383 | 3,290 |
| Point 33 | 242 | 3,243 |
| Point 34 | 293 | 3,260 |
| Point 35 | 476 | 3,270 |
| Point 36 | 446 | 3,280 |
| Point 37 | 463 | 3,200 |
| Point 38 | 463 | 3,225.6 |
| Point 39 | 461 | 3,200 |
| Point 40 | 461 | 3,225.6 |
| Point 41 | 461 | 3,228 |
| Point 42 | 463 | 3,228 |
| Point 43 | 0 | 3,253.5 |
| Point 44 | 284 | 3,257 |
| Point 45 | 441.95911 | 3,236.5 |
| Point 46 | 459.5 | 3,236.5 |
| Point 47 | 462 | 3,228 |
| Point 48 | 387 | 3,236.5 |
| Point 49 | 276.73636 | 3,233.5 |
| Point 50 | 0 | 3,288 |
| Point 51 | 377 | 3,288 |
| Point 52 | 206.83958 | 3,229.497 |
| Point 53 | 604.44329 | 3,225.5635 |
| Point 54 | 362 | 3,283 |
| Point 55 | 0 | 3,283 |
| Point 56 | 368 | 3,285 |
| Point 57 | 0 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Core | 1,2,3,40,41,47,46,45 | 255.45 |
| Region 2 | Drain | 7,8,9,10,4,5,11,12 | 817.94 |
| Region 3 | Embankment Fill | 13,49,48,45,6,5,11,12,7,17,18,19,20,21,22 | 4,790.4 |
| Region 4 | Paste | 13,33,23,24,25,27,49 | 2,102.2 |
| Region 5 | Fly Ash Slurry | 25,28,52,27 | 2,093.4 |
| Region 6 | Bottom Ash Fill | 33,13,22,34,44 | 974.63 |
| Region 7 | Clinker Fill | 34,22,21,20,35,36,31,32,51,56,54 | 3,477.5 |
| Region 8 | Bedrock | 28,29,39,40,3,16,15,26 | 8,251.2 |
| Region 9 | Bedrock | 30,53,10,4,38,37 | 3,619 |
| Region 10 | Cutoff Wall | 42,47,41,40,39,37,38 | 56 |
| Region 11 | Paste | 44,33,23,24,43 | 4,745.9 |
| Region 12 | Core | 42,38,4,5,6,45,46,47 | 1,036.1 |
| Region 13 | Embankment Fill - Sat. | 14,16,3,2,1,45,48,49 | 1,815.8 |
| Region 14 | Paste | 14,49,27,52 | 282.01 |
| Region 15 | Native Clinker | 16,14,52,28,26,15 | 2,329.1 |
| Region 16 | Native Clinker | 8,9,10,53 | 533.41 |
| Region 17 | Paste | 43,44,34,54,56,57,55 | 9,625 |

## Current Slip Surface

Slip Surface: 1,488
F of S: 2.19
Volume: 1,806.4376 ft³
Weight: 229,508.04 lbs
Resisting Moment: 33,070,119 lbs-ft
Activating Moment: 15,110,683 lbs-ft
Resisting Force: 142,183.79 lbs
Activating Force: 64,915.341 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (574.15513, 3,238) ft
Entry: (416, 3,290) ft
Radius: 217.3679 ft
Center: (557.79491, 3,454.7514) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 418.5 | 3,287.9127 | 0 | 108.2906 | 90.866606 | 50 |
| Slice 2 | 423.5 | 3,283.8608 | 0 | 342.38729 | 287.29704 | 50 |
| Slice 3 | 428.5 | 3,280.046 | 0 | 553.7307 | 464.63522 | 50 |
| Slice 4 | 433.5 | 3,276.453 | 0 | 745.52082 | 625.56624 | 50 |
| Slice 5 | 438.5 | 3,273.0687 | 0 | 920.40139 | 772.30847 | 50 |
| Slice 6 | 443.5 | 3,269.8816 | 0 | 1,080.4895 | 906.63831 | 50 |
| Slice 7 | 448.95815 | 3,266.6246 | 0 | 1,239.3795 | 1,039.9629 | 50 |
| Slice 8 | 454.87446 | 3,263.3228 | 0 | 1,396.6214 | 1,171.9045 | 50 |
| Slice 9 | 460.81668 | 3,260.2445 | 0 | 1,558.4998 | 1,012.1016 | 0 |
| Slice 10 | 466.85057 | 3,257.3516 | 0 | 1,675.022 | 909.46272 | 0 |
| Slice 11 | 472.95019 | 3,254.6534 | 0 | 1,763.3992 | 957.44762 | 0 |
| Slice 12 | 476.40799 | 3,253.1955 | 0 | 1,809.4124 | 982.43076 | 0 |
| Slice 13 | 477.79061 | 3,252.6449 | 0 | 1,839.25 | 998.63129 | 0 |
| Slice 14 | 480.88801 | 3,251.456 | 0 | 1,885.9975 | 1,320.5897 | 0 |
| Slice 15 | 485.13352 | 3,249.9001 | 0 | 1,935.4634 | 1,355.226 | 0 |
| Slice 16 | 488.85846 | 3,248.6113 | 0 | 1,947.6867 | 1,363.7849 | 0 |
| Slice 17 | 492.84548 | 3,247.3288 | 0 | 1,945.9734 | 1,263.7299 | 0 |
| Slice 18 | 497.61516 | 3,245.8948 | 0 | 1,959.982 | 1,272.8272 | 0 |
| Slice 19 | 502.60386 | 3,244.5241 | 0 | 1,964.2815 | 1,275.6193 | 0 |
| Slice 20 | 507.81159 | 3,243.2252 | 0 | 1,956.153 | 1,270.3406 | 0 |
| Slice 21 | 513.01932 | 3,242.0617 | 0 | 1,927.928 | 1,252.0111 | 0 |
| Slice 22 | 518.22704 | 3,241.0315 | 0 | 1,878.0721 | 1,219.6343 | 0 |
| Slice 23 | 523.43477 | 3,240.1325 | 0 | 1,805.3067 | 1,172.3799 | 0 |
| Slice 24 | 528.6425 | 3,239.3632 | 0 | 1,708.7278 | 1,109.6608 | 0 |
| Slice 25 | 533.85023 | 3,238.7222 | 0 | 1,587.9069 | 1,031.1988 | 0 |
| Slice 26 | 539.05795 | 3,238.2083 | 0 | 1,442.966 | 937.07307 | 0 |
| Slice 27 | 544.26568 | 3,237.8206 | 0 | 1,274.6147 | 827.74448 | 0 |
| Slice 28 | 549.47341 | 3,237.5584 | 0 | 1,084.1444 | 704.05157 | 0 |
| Slice 29 | 554.68114 | 3,237.4214 | 0 | 873.37424 | 567.17586 | 0 |
| Slice 30 | 559.88886 | 3,237.4091 | 0 | 644.55224 | 418.57712 | 0 |
| Slice 31 | 565.09659 | 3,237.5217 | 0 | 400.21415 | 259.90211 | 0 |
| Slice 32 | 570.30432 | 3,237.7594 | 0 | 143.01192 | 92.873027 | 0 |
| Slice 33 | 573.53165 | 3,237.9547 | 0 | 5.9714174 | 3.8778838 | 0 |

# Seismic Safety Factor - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 628
Date: 10/13/2016
Time: 7:40:58 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam B-B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 7:41:01 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - Outboard [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,253.5) ft
Right Coordinate: (604.44329, 3,240.8608) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,226 |
| Coordinate 2 | 387 | 3,236.5 |
| Coordinate 3 | 459.5 | 3,236.5 |
| Coordinate 4 | 464.5 | 3,219.5 |
| Coordinate 5 | 604.44329 | 3,219.5 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440.48236 | 3,231.5775 |
| Point 2 | 429.70942 | 3,231.5865 |
| Point 3 | 438.68911 | 3,225.6 |
| Point 4 | 486.76298 | 3,225.6 |
| Point 5 | 476.81597 | 3,258.7567 |
| Point 6 | 448.63612 | 3,258.7567 |
| Point 7 | 604.44329 | 3,233.8752 |
| Point 8 | 604.44329 | 3,229.868 |
| Point 9 | 506.03283 | 3,231.5865 |
| Point 10 | 497.05314 | 3,225.6 |
| Point 11 | 487.25628 | 3,258.7567 |
| Point 12 | 494.14371 | 3,235.7986 |
| Point 13 | 314.35797 | 3,246.0826 |
| Point 14 | 264.7675 | 3,229.497 |
| Point 15 | 234.96255 | 3,219.5287 |
| Point 16 | 385 | 3,221.07 |
| Point 17 | 604.44329 | 3,240.8608 |
| Point 18 | 594.13162 | 3,238 |
| Point 19 | 572.90818 | 3,238 |
| Point 20 | 500 | 3,262 |
| Point 21 | 385 | 3,261.27 |
| Point 22 | 355.97036 | 3,260 |
| Point 23 | 75.018 | 3,234.0128 |
| Point 24 | 0 | 3,230.378 |
| Point 25 | 0 | 3,229.497 |
| Point 26 | 184.3811 | 3,217.3171 |
| Point 27 | 123.86712 | 3,229.497 |
| Point 28 | 0 | 3,209.2553 |
| Point 29 | 0 | 3,200 |
| Point 30 | 604.44329 | 3,200 |
| Point 31 | 416 | 3,290 |
| Point 32 | 383 | 3,290 |
| Point 33 | 242 | 3,243 |

| | | |
|---|---|---|
| Point 34 | 293 | 3,260 |
| Point 35 | 476 | 3,270 |
| Point 36 | 446 | 3,280 |
| Point 37 | 463 | 3,200 |
| Point 38 | 463 | 3,225.6 |
| Point 39 | 461 | 3,200 |
| Point 40 | 461 | 3,225.6 |
| Point 41 | 461 | 3,228 |
| Point 42 | 463 | 3,228 |
| Point 43 | 0 | 3,253.5 |
| Point 44 | 284 | 3,257 |
| Point 45 | 441.95911 | 3,236.5 |
| Point 46 | 459.5 | 3,236.5 |
| Point 47 | 462 | 3,228 |
| Point 48 | 387 | 3,236.5 |
| Point 49 | 276.73636 | 3,233.5 |
| Point 50 | 0 | 3,288 |
| Point 51 | 377 | 3,288 |
| Point 52 | 206.83958 | 3,229.497 |
| Point 53 | 604.44329 | 3,225.5635 |
| Point 54 | 362 | 3,283 |
| Point 55 | 0 | 3,283 |
| Point 56 | 368 | 3,285 |
| Point 57 | 0 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Core - Sat. - Seismic | 1,2,3,40,41,47,46,45 | 255.45 |
| Region 2 | Drain - Seismic | 7,8,9,10,4,5,11,12 | 817.94 |
| Region 3 | Embankment Fill - Seismic | 13,49,48,45,6,5,11,12,7,17,18,19,20,21,22 | 4,790.4 |
| Region 4 | Paste - Seismic | 13,33,23,24,25,27,49 | 2,102.2 |
| Region 5 | Fly Ash Slurry - Sat. - Seismic | 25,28,52,27 | 2,093.4 |
| Region 6 | Bottom Ash Fill - Seismic | 33,13,22,34,44 | 974.63 |
| Region 7 | Clinker Fill - Seismic | 34,22,21,20,35,36,31,32,51,56,54 | 3,477.5 |

| | | | |
|---|---|---|---|
| Region 8 | Bedrock | 28,29,39,40,3,16,15,26 | 8,251.2 |
| Region 9 | Bedrock | 30,53,10,4,38,37 | 3,619 |
| Region 10 | Cutoff Wall | 42,47,41,40,39,37,38 | 56 |
| Region 11 | Paste - Seismic | 44,33,23,24,43 | 4,745.9 |
| Region 12 | Core - Seismic | 42,38,4,5,6,45,46,47 | 1,036.1 |
| Region 13 | Embankment Fill - Sat. - Seismic | 14,16,3,2,1,45,48,49 | 1,815.8 |
| Region 14 | Paste - Sat. - Seismic | 14,49,27,52 | 282.01 |
| Region 15 | Native Clinker - Seismic | 16,14,52,28,26,15 | 2,329.1 |
| Region 16 | Native Clinker - Seismic | 8,9,10,53 | 533.41 |
| Region 17 | | 43,44,34,54,56,57,55 | 9,625 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.51
Volume: 1,806.5437 ft³
Weight: 229,521.31 lbs
Resisting Moment: 24,940,777 lbs-ft
Activating Moment: 16,467,310 lbs-ft
Resisting Force: 107,365.26 lbs
Activating Force: 70,848.278 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (574.15513, 3,238) ft
Entry: (416, 3,290) ft
Radius: 217.3679 ft
Center: (557.79491, 3,454.7514) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 418.5 | 3,287.9127 | -3,208.1544 | 104.14739 | 65.078513 | 40 |
| Slice 2 | 423.5 | 3,283.8608 | -2,955.3155 | 333.8461 | 208.61019 | 40 |
| Slice 3 | 428.5 | 3,280.046 | -2,717.2708 | 540.88019 | 337.97946 | 40 |
| Slice 4 | 433.5 | 3,276.453 | -2,493.0689 | 728.61133 | 455.28689 | 40 |
| Slice 5 | 438.5 | 3,273.0687 | -2,281.8872 | 899.82175 | 562.27103 | 40 |
| Slice 6 | 443.5 | 3,269.8816 | -2,083.0095 | 1,056.7471 | 660.32886 | 40 |
| Slice 7 | 448.95815 | 3,266.6246 | -1,879.7733 | 1,212.9025 | 757.90562 | 40 |
| Slice 8 | 454.87446 | 3,263.3228 | -1,673.7403 | 1,368.1111 | 854.8907 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 9 | 458.66631 | 3,261.3051 | -1,547.8391 | 1,485.923 | 737.61858 | 0 |
| Slice 10 | 461.65038 | 3,259.8173 | -152.16748 | 1,541.6825 | 765.29785 | 0 |
| Slice 11 | 464.15038 | 3,258.5898 | -188.29835 | 1,597.8518 | 671.67505 | 0 |
| Slice 12 | 467.375 | 3,257.1076 | -2,346.7148 | 1,647.4089 | 692.50695 | 0 |
| Slice 13 | 473.125 | 3,254.5763 | -2,188.7587 | 1,730.5934 | 727.47448 | 0 |
| Slice 14 | 476.40799 | 3,253.1955 | -2,102.5964 | 1,774.8643 | 746.08426 | 0 |
| Slice 15 | 477.79061 | 3,252.6449 | -2,068.2417 | 1,804.984 | 758.74542 | 0 |
| Slice 16 | 480.88801 | 3,251.456 | -1,994.0571 | 1,857.1279 | 987.45242 | 0 |
| Slice 17 | 485.13352 | 3,249.9001 | -1,896.9633 | 1,909.3008 | 1,015.1932 | 0 |
| Slice 18 | 488.85846 | 3,248.6113 | -1,816.5458 | 1,924.577 | 1,023.3157 | 0 |
| Slice 19 | 492.84548 | 3,247.3288 | -1,736.5147 | 1,924.9735 | 955.56515 | 0 |
| Slice 20 | 497.61516 | 3,245.8948 | -1,647.038 | 1,943.3057 | 964.66533 | 0 |
| Slice 21 | 502.60386 | 3,244.5241 | -1,561.5026 | 1,952.3449 | 969.15243 | 0 |
| Slice 22 | 507.81159 | 3,243.2252 | -1,480.4523 | 1,949.1901 | 967.58637 | 0 |
| Slice 23 | 513.01932 | 3,242.0617 | -1,407.8526 | 1,925.748 | 955.9496 | 0 |
| Slice 24 | 518.22704 | 3,241.0315 | -1,343.5654 | 1,880.218 | 933.34832 | 0 |
| Slice 25 | 523.43477 | 3,240.1325 | -1,287.4708 | 1,811.0808 | 899.02833 | 0 |
| Slice 26 | 528.6425 | 3,239.3632 | -1,239.4663 | 1,717.2396 | 852.44513 | 0 |
| Slice 27 | 533.85023 | 3,238.7222 | -1,199.4654 | 1,598.1414 | 793.32426 | 0 |
| Slice 28 | 539.05795 | 3,238.2083 | -1,167.3969 | 1,453.8669 | 721.70578 | 0 |
| Slice 29 | 544.26568 | 3,237.8206 | -1,143.2044 | 1,285.1754 | 637.96662 | 0 |
| Slice 30 | 549.47341 | 3,237.5584 | -1,126.8457 | 1,093.4987 | 542.81746 | 0 |
| Slice 31 | 554.68114 | 3,237.4214 | -1,118.2925 | 880.87718 | 437.27123 | 0 |
| Slice 32 | 559.88886 | 3,237.4091 | -1,117.5299 | 649.84085 | 322.5838 | 0 |
| Slice 33 | 565.09659 | 3,237.5217 | -1,124.5568 | 403.2434 | 200.17176 | 0 |
| Slice 34 | 570.30432 | 3,237.7594 | -1,139.3851 | 144.05809 | 71.511059 | 0 |
| Slice 35 | 573.53165 | 3,237.9547 | -1,151.576 | 6.0746156 | 3.0154653 | 0 |

# Static Safety Factor: Maximum Storage Pool - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 625
Date: 10/13/2016
Time: 8:12:24 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam C-C.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:12:27 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Maximum Storage Pool - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat.**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (379, 3,277) ft
Left-Zone Right Coordinate: (433.95007, 3,283.3145) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (454, 3,290) ft
Right-Zone Right Coordinate: (506.99445, 3,279) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (0, 3,259) ft

Right Coordinate: (650, 3,236.62) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237 |
| Coordinate 2 | 501 | 3,237 |
| Coordinate 3 | 519 | 3,237 |
| Coordinate 4 | 525 | 3,207 |
| Coordinate 5 | 650 | 3,207 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 650 | 3,236.62 |
| Point 2 | 548.364 | 3,236.62 |
| Point 3 | 541.35 | 3,260 |
| Point 4 | 536.35 | 3,260 |
| Point 5 | 544.564 | 3,232.62 |
| Point 6 | 650 | 3,232.62 |
| Point 7 | 553.56399 | 3,232.62 |
| Point 8 | 546.064 | 3,227.62 |
| Point 9 | 496.836 | 3,227.62 |
| Point 10 | 491.58617 | 3,231.1199 |
| Point 11 | 489.33601 | 3,232.62 |
| Point 12 | 498.336 | 3,232.62 |
| Point 13 | 506.55 | 3,260 |
| Point 14 | 218.94121 | 3,227.7 |
| Point 15 | 21.36544 | 3,220 |
| Point 16 | 0 | 3,220 |
| Point 17 | 0 | 3,227.7 |
| Point 18 | 316.00198 | 3,244.0009 |
| Point 19 | 454 | 3,290 |
| Point 20 | 474 | 3,290 |
| Point 21 | 558.21712 | 3,262 |

| | | |
|---|---|---|
| Point 22 | 499.42722 | 3,262 |
| Point 23 | 410.23923 | 3,260 |
| Point 24 | 371.01933 | 3,246.946 |
| Point 25 | 317.01854 | 3,228.9729 |
| Point 26 | 266.00446 | 3,229.2 |
| Point 27 | 364 | 3,260.038 |
| Point 28 | 120.99092 | 3,233.9863 |
| Point 29 | 266.00162 | 3,223.0192 |
| Point 30 | 499 | 3,222.0436 |
| Point 31 | 650 | 3,220 |
| Point 32 | 522.98248 | 3,227.9848 |
| Point 33 | 394.00653 | 3,269.9956 |
| Point 34 | 533.99591 | 3,269.998 |
| Point 35 | 449.98058 | 3,236.0164 |
| Point 36 | 450 | 3,260.8916 |
| Point 37 | 521.03127 | 3,209.9955 |
| Point 38 | 523.0038 | 3,212.9872 |
| Point 39 | 535 | 3,213 |
| Point 40 | 523 | 3,234 |
| Point 41 | 523 | 3,210 |
| Point 42 | 450 | 3,222 |
| Point 43 | 450 | 3,217 |
| Point 44 | 521 | 3,234 |
| Point 45 | 521 | 3,227.9572 |
| Point 46 | 521 | 3,213.7432 |
| Point 47 | 650 | 3,200 |
| Point 48 | 0 | 3,200 |
| Point 49 | 501 | 3,216 |
| Point 50 | 537 | 3,208 |
| Point 51 | 0 | 3,286 |
| Point 52 | 442 | 3,285.9987 |
| Point 53 | 179.87998 | 3,237.0105 |
| Point 54 | 341.15764 | 3,237.0071 |
| Point 55 | 522 | 3,237 |
| Point 56 | 522 | 3,234 |

| | | |
|---|---|---|
| Point 57 | 499.65021 | 3,237.0007 |
| Point 58 | 341.15298 | 3,237.0056 |
| Point 59 | 384.9795 | 3,267 |
| Point 60 | 0 | 3,259 |
| Point 61 | 0 | 3,237 |
| Point 62 | 379 | 3,277 |
| Point 63 | 418.01181 | 3,278 |
| Point 64 | 340 | 3,266.0653 |
| Point 65 | 433.00687 | 3,283 |
| Point 66 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Drain | 1,2,3,4,5,7,6 | 541.04 |
| Region 2 | Core | 7,8,32,40,56,55,57,13,4,5 | 1,068.6 |
| Region 3 | Fly Ash Slurry - Sat. | 14,15,16,17 | 925.18 |
| Region 4 | Clinker Fill | 27,23,36,22,21,34,20,19,52,65,63,33,59 | 3,087.8 |
| Region 5 | Embankment Fill | 1,2,3,4,13,57,58,54,24,23,36,22,21 | 4,613.8 |
| Region 6 | Paste | 18,24,54,58,53 | 793.48 |
| Region 7 | Bottom Ash Fill | 18,24,23,27 | 673.03 |
| Region 8 | Native Clinker | 42,30,46,45,9,10,11,35,25 | 1,706.6 |
| Region 9 | Clinker Ash - Sat. | 30,43,29,15,14,26,25,42 | 2,102.9 |
| Region 10 | Native Clinker | 32,8,7,6,31,39,38 | 1,959.6 |
| Region 11 | Cutoff Wall | 44,56,40,32,38,41,37,46,45 | 47.796 |
| Region 12 | Bedrock | 31,47,48,16,15,29,43,30,46,37,41,38,39 | 12,795 |
| Region 13 | Core - Sat. | 44,45,9,10,11,12,57,55,56 | 234.89 |
| Region 14 | Embankment Fill - Sat. | 12,11,35,25,58,57 | 650.58 |
| Region 15 | Paste - Sat. | 25,26,14,17,28,53,58 | 2,107 |
| Region 16 | Paste - Sat. | 17,61,53,28 | 834.3 |
| Region 17 | Paste | 60,61,53,18,27,59,64 | 8,254.1 |
| Region 18 | Bottom Ash Fill | 33,63,62,64,59 | 425.91 |
| Region 19 | | 65,63,62,64,60,66 | 7,658.2 |

## Current Slip Surface

Slip Surface: 822
F of S: 3.21

Volume: 95.436344 ft³
Weight: 12,406.725 lbs
Resisting Moment: 597,217.7 lbs-ft
Activating Moment: 186,055.51 lbs-ft
Resisting Force: 11,281.933 lbs
Activating Force: 3,511.1977 lbs
F of S Rank (Analysis): 1 of 1,287 slip surfaces
F of S Rank (Query): 1 of 1,287 slip surfaces
Exit: (418.06235, 3,278.0169) ft
Entry: (454, 3,290) ft
Radius: 49.663437 ft
Center: (421.50904, 3,327.5605) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 418.68504 | 3,277.9814 | -2,557.2385 | 34.201582 | 28.698535 | 50 |
| Slice 2 | 419.93042 | 3,277.9261 | -2,553.7895 | 99.076989 | 83.135465 | 50 |
| Slice 3 | 421.1758 | 3,277.9021 | -2,552.2929 | 160.49236 | 134.66908 | 50 |
| Slice 4 | 422.42117 | 3,277.9094 | -2,552.746 | 217.71246 | 182.68245 | 50 |
| Slice 5 | 423.66655 | 3,277.9479 | -2,555.1495 | 270.04662 | 226.59602 | 50 |
| Slice 6 | 424.91192 | 3,278.0178 | -2,559.5081 | 316.89856 | 265.90947 | 50 |
| Slice 7 | 426.1573 | 3,278.1191 | -2,565.8299 | 357.80569 | 300.23463 | 50 |
| Slice 8 | 427.40268 | 3,278.252 | -2,574.1272 | 392.46484 | 329.31711 | 50 |
| Slice 9 | 428.64805 | 3,278.4169 | -2,584.416 | 420.74313 | 353.04541 | 50 |
| Slice 10 | 429.89343 | 3,278.614 | -2,596.7164 | 442.67423 | 371.44778 | 50 |
| Slice 11 | 431.13881 | 3,278.8438 | -2,611.0528 | 458.44153 | 384.67811 | 50 |
| Slice 12 | 432.38418 | 3,279.1066 | -2,627.4543 | 468.35109 | 392.99322 | 50 |
| Slice 13 | 433.56894 | 3,279.3871 | -2,644.9555 | 472.80422 | 396.72985 | 50 |
| Slice 14 | 434.69308 | 3,279.6826 | -2,663.3939 | 472.70715 | 396.6484 | 50 |
| Slice 15 | 435.81722 | 3,280.0065 | -2,683.6048 | 468.84445 | 393.4072 | 50 |
| Slice 16 | 436.94136 | 3,280.3594 | -2,705.6248 | 461.54712 | 387.28402 | 50 |
| Slice 17 | 438.06551 | 3,280.7419 | -2,729.4949 | 451.11945 | 378.53416 | 50 |
| Slice 18 | 439.18965 | 3,281.1548 | -2,755.2607 | 437.82485 | 367.37867 | 50 |
| Slice 19 | 440.31379 | 3,281.5989 | -2,782.9735 | 421.87499 | 353.99515 | 50 |
| Slice 20 | 441.43793 | 3,282.0752 | -2,812.6903 | 403.42187 | 338.51114 | 50 |
| Slice 21 | 442.6 | 3,282.6029 | -2,845.6214 | 381.74462 | 320.32177 | 50 |
| Slice 22 | 443.8 | 3,283.1858 | -2,881.993 | 356.72631 | 299.32892 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 23 | 445 | 3,283.8093 | -2,920.9027 | 328.88969 | 275.97122 | 50 |
| Slice 24 | 446.2 | 3,284.4753 | -2,962.4609 | 298.04665 | 250.09084 | 50 |
| Slice 25 | 447.4 | 3,285.1858 | -3,006.7926 | 263.88778 | 221.42814 | 50 |
| Slice 26 | 448.6 | 3,285.9429 | -3,054.04 | 225.9653 | 189.6074 | 50 |
| Slice 27 | 449.8 | 3,286.7494 | -3,104.3656 | 183.67248 | 154.11951 | 50 |
| Slice 28 | 451 | 3,287.6083 | -3,157.9562 | 136.22081 | 114.30283 | 50 |
| Slice 29 | 452.2 | 3,288.5229 | -3,215.0276 | 82.617492 | 69.324307 | 50 |
| Slice 30 | 453.4 | 3,289.4973 | -3,275.8312 | 21.646636 | 18.163685 | 50 |

# Seismic Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 625
Date: 10/13/2016
Time: 8:12:24 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam C-C.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:12:27 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: B1 Static Safety Factor: Maximum Storage Pool - Inboard [(last)]

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 120.4 pcf
Cohesion': 760 psf
Phi': 21.28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,259) ft
Right Coordinate: (650, 3,236.62) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237 |

| | | |
|---|---|---|
| Coordinate 2 | 501 | 3,237 |
| Coordinate 3 | 519 | 3,237 |
| Coordinate 4 | 525 | 3,207 |
| Coordinate 5 | 650 | 3,207 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 650 | 3,236.62 |
| Point 2 | 548.364 | 3,236.62 |
| Point 3 | 541.35 | 3,260 |
| Point 4 | 536.35 | 3,260 |
| Point 5 | 544.564 | 3,232.62 |
| Point 6 | 650 | 3,232.62 |
| Point 7 | 553.56399 | 3,232.62 |
| Point 8 | 546.064 | 3,227.62 |
| Point 9 | 496.836 | 3,227.62 |
| Point 10 | 491.58617 | 3,231.1199 |
| Point 11 | 489.33601 | 3,232.62 |
| Point 12 | 498.336 | 3,232.62 |
| Point 13 | 506.55 | 3,260 |
| Point 14 | 218.94121 | 3,227.7 |
| Point 15 | 21.36544 | 3,220 |
| Point 16 | 0 | 3,220 |
| Point 17 | 0 | 3,227.7 |
| Point 18 | 316.00198 | 3,244.0009 |
| Point 19 | 454 | 3,290 |
| Point 20 | 474 | 3,290 |
| Point 21 | 558.21712 | 3,262 |
| Point 22 | 499.42722 | 3,262 |
| Point 23 | 410.23923 | 3,260 |
| Point 24 | 371.01933 | 3,246.946 |
| Point 25 | 317.01854 | 3,228.9729 |
| Point 26 | 266.00446 | 3,229.2 |

| | | |
|---|---|---|
| Point 27 | 364 | 3,260.038 |
| Point 28 | 120.99092 | 3,233.9863 |
| Point 29 | 266.00162 | 3,223.0192 |
| Point 30 | 499 | 3,222.0436 |
| Point 31 | 650 | 3,220 |
| Point 32 | 522.98248 | 3,227.9848 |
| Point 33 | 394.00653 | 3,269.9956 |
| Point 34 | 533.99591 | 3,269.998 |
| Point 35 | 449.98058 | 3,236.0164 |
| Point 36 | 450 | 3,260.8916 |
| Point 37 | 521.03127 | 3,209.9955 |
| Point 38 | 523.0038 | 3,212.9872 |
| Point 39 | 535 | 3,213 |
| Point 40 | 523 | 3,234 |
| Point 41 | 523 | 3,210 |
| Point 42 | 450 | 3,222 |
| Point 43 | 450 | 3,217 |
| Point 44 | 521 | 3,234 |
| Point 45 | 521 | 3,227.9572 |
| Point 46 | 521 | 3,213.7432 |
| Point 47 | 650 | 3,200 |
| Point 48 | 0 | 3,200 |
| Point 49 | 501 | 3,216 |
| Point 50 | 537 | 3,208 |
| Point 51 | 0 | 3,286 |
| Point 52 | 442 | 3,285.9987 |
| Point 53 | 179.87998 | 3,237.0105 |
| Point 54 | 341.15764 | 3,237.0071 |
| Point 55 | 522 | 3,237 |
| Point 56 | 522 | 3,234 |
| Point 57 | 499.65021 | 3,237.0007 |
| Point 58 | 341.15298 | 3,237.0056 |
| Point 59 | 384.9795 | 3,267 |
| Point 60 | 0 | 3,259 |
| Point 61 | 0 | 3,237 |

| | | |
|---|---|---|
| Point 62 | 379 | 3,277 |
| Point 63 | 418.01181 | 3,278 |
| Point 64 | 340 | 3,266.0653 |
| Point 65 | 433.00687 | 3,283 |
| Point 66 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Drain - Seismic | 1,2,3,4,5,7,6 | 541.04 |
| Region 2 | Core - Seismic | 7,8,32,40,56,55,57,13,4,5 | 1,068.6 |
| Region 3 | Fly Ash Slurry - Sat. - Seismic | 14,15,16,17 | 925.18 |
| Region 4 | Clinker Fill - Seismic | 27,23,36,22,21,34,20,19,52,65,63,33,59 | 3,087.8 |
| Region 5 | Embankment Fill - Seismic | 1,2,3,4,13,57,58,54,24,23,36,22,21 | 4,613.8 |
| Region 6 | Paste - Seismic | 18,24,54,58,53 | 793.48 |
| Region 7 | Bottom Ash Fill - Seismic | 18,24,23,27 | 673.03 |
| Region 8 | Native Clinker - Seismic | 42,30,46,45,9,10,11,35,25 | 1,706.6 |
| Region 9 | Clinker Ash - Seismic | 30,43,29,15,14,26,25,42 | 2,102.9 |
| Region 10 | Native Clinker - Seismic | 32,8,7,6,31,39,38 | 1,959.6 |
| Region 11 | Cutoff Wall | 44,56,40,32,38,41,37,46,45 | 47.796 |
| Region 12 | Bedrock | 31,47,48,16,15,29,43,30,46,37,41,38,39 | 12,795 |
| Region 13 | Core - Sat. - Seismic | 44,45,9,10,11,12,57,55,56 | 234.89 |
| Region 14 | Embankment Fill - Sat. - Seismic | 12,11,35,25,58,57 | 650.58 |
| Region 15 | Paste - Sat. - Seismic | 25,26,14,17,28,53,58 | 2,107 |
| Region 16 | Paste - Sat. - Seismic | 17,61,53,28 | 834.3 |
| Region 17 | Paste - Seismic | 60,61,53,18,27,59,64 | 8,254.1 |
| Region 18 | Bottom Ash Fill - Seismic | 33,63,62,64,59 | 425.91 |
| Region 19 | | 65,63,62,64,60,66 | 7,658.2 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.20
Volume: 95.436344 ft³
Weight: 12,406.725 lbs
Resisting Moment: 446,760.29 lbs-ft
Activating Moment: 202,796.77 lbs-ft
Resisting Force: 8,440.6932 lbs

Activating Force: 3,836.2457 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (418.06235, 3,278.0169) ft
Entry: (454, 3,290) ft
Radius: 49.663437 ft
Center: (421.50904, 3,327.5605) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 418.68504 | 3,277.9814 | -2,557.2385 | 34.563665 | 21.597775 | 40 |
| Slice 2 | 419.93042 | 3,277.9261 | -2,553.7895 | 99.723764 | 62.314324 | 40 |
| Slice 3 | 421.1758 | 3,277.9021 | -2,552.2929 | 161.31609 | 100.80148 | 40 |
| Slice 4 | 422.42117 | 3,277.9094 | -2,552.746 | 218.59209 | 136.59149 | 40 |
| Slice 5 | 423.66655 | 3,277.9479 | -2,555.1495 | 270.85262 | 169.2475 | 40 |
| Slice 6 | 424.91192 | 3,278.0178 | -2,559.5081 | 317.49903 | 198.39541 | 40 |
| Slice 7 | 426.1573 | 3,278.1191 | -2,565.8299 | 358.07274 | 223.74868 | 40 |
| Slice 8 | 427.40268 | 3,278.252 | -2,574.1272 | 392.28309 | 245.12568 | 40 |
| Slice 9 | 428.64805 | 3,278.4169 | -2,584.416 | 420.01535 | 262.45472 | 40 |
| Slice 10 | 429.89343 | 3,278.614 | -2,596.7164 | 441.32838 | 275.77258 | 40 |
| Slice 11 | 431.13881 | 3,278.8438 | -2,611.0528 | 456.4339 | 285.21156 | 40 |
| Slice 12 | 432.38418 | 3,279.1066 | -2,627.4543 | 465.66946 | 290.98257 | 40 |
| Slice 13 | 433.56894 | 3,279.3871 | -2,644.9555 | 469.49746 | 293.37457 | 40 |
| Slice 14 | 434.69308 | 3,279.6826 | -2,663.3939 | 468.84608 | 292.96755 | 40 |
| Slice 15 | 435.81722 | 3,280.0065 | -2,683.6048 | 464.48551 | 290.24276 | 40 |
| Slice 16 | 436.94136 | 3,280.3594 | -2,705.6248 | 456.76311 | 285.41727 | 40 |
| Slice 17 | 438.06551 | 3,280.7419 | -2,729.4949 | 445.99377 | 278.68784 | 40 |
| Slice 18 | 439.18965 | 3,281.1548 | -2,755.2607 | 432.44887 | 270.22404 | 40 |
| Slice 19 | 440.31379 | 3,281.5989 | -2,782.9735 | 416.34373 | 260.16044 | 40 |
| Slice 20 | 441.43793 | 3,282.0752 | -2,812.6903 | 397.82919 | 248.59127 | 40 |
| Slice 21 | 442.6 | 3,282.6029 | -2,845.6214 | 376.184 | 235.06585 | 40 |
| Slice 22 | 443.8 | 3,283.1858 | -2,881.993 | 351.29177 | 219.51146 | 40 |
| Slice 23 | 445 | 3,283.8093 | -2,920.9028 | 323.66655 | 202.24931 | 40 |
| Slice 24 | 446.2 | 3,284.4753 | -2,962.4609 | 293.10992 | 183.15541 | 40 |
| Slice 25 | 447.4 | 3,285.1858 | -3,006.7926 | 259.3023 | 162.03006 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | 448.6 | 3,285.9429 | -3,054.04 | 221.78796 | 138.5885 | 40 |
| Slice 27 | 449.8 | 3,286.7494 | -3,104.3656 | 179.95596 | 112.44896 | 40 |
| Slice 28 | 451 | 3,287.6083 | -3,157.9561 | 133.01855 | 83.119212 | 40 |
| Slice 29 | 452.2 | 3,288.5229 | -3,215.0276 | 79.990317 | 49.983497 | 40 |
| Slice 30 | 453.4 | 3,289.4973 | -3,275.8312 | 19.672219 | 12.292567 | 40 |

# Static Safety Factor: Maximum Storage Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 625
Date: 10/13/2016
Time: 8:12:24 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam C-C.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:12:26 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat.**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (421.99994, 3,283) ft
Left-Zone Right Coordinate: (474, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (530.99042, 3,271) ft
Right-Zone Right Coordinate: (650, 3,236.62) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (0, 3,283) ft

Right Coordinate: (650, 3,236.62) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237 |
| Coordinate 2 | 501 | 3,237 |
| Coordinate 3 | 519 | 3,237 |
| Coordinate 4 | 525 | 3,207 |
| Coordinate 5 | 650 | 3,207 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 650 | 3,236.62 |
| Point 2 | 548.364 | 3,236.62 |
| Point 3 | 541.35 | 3,260 |
| Point 4 | 536.35 | 3,260 |
| Point 5 | 544.564 | 3,232.62 |
| Point 6 | 650 | 3,232.62 |
| Point 7 | 553.56399 | 3,232.62 |
| Point 8 | 546.064 | 3,227.62 |
| Point 9 | 496.836 | 3,227.62 |
| Point 10 | 491.58617 | 3,231.1199 |
| Point 11 | 489.33601 | 3,232.62 |
| Point 12 | 498.336 | 3,232.62 |
| Point 13 | 506.55 | 3,260 |
| Point 14 | 218.94121 | 3,227.7 |
| Point 15 | 21.36544 | 3,220 |
| Point 16 | 0 | 3,220 |
| Point 17 | 0 | 3,227.7 |
| Point 18 | 316.00198 | 3,244.0009 |
| Point 19 | 454 | 3,290 |
| Point 20 | 474 | 3,290 |
| Point 21 | 558.21712 | 3,262 |

| | | |
|---|---|---|
| Point 22 | 499.42722 | 3,262 |
| Point 23 | 410.23923 | 3,260 |
| Point 24 | 371.01933 | 3,246.946 |
| Point 25 | 317.01854 | 3,228.9729 |
| Point 26 | 266.00446 | 3,229.2 |
| Point 27 | 364 | 3,260.038 |
| Point 28 | 120.99092 | 3,233.9863 |
| Point 29 | 266.00162 | 3,223.0192 |
| Point 30 | 499 | 3,222.0436 |
| Point 31 | 650 | 3,220 |
| Point 32 | 522.98248 | 3,227.9848 |
| Point 33 | 394.00653 | 3,269.9956 |
| Point 34 | 533.99591 | 3,269.998 |
| Point 35 | 449.98058 | 3,236.0164 |
| Point 36 | 450 | 3,260.8916 |
| Point 37 | 521.03127 | 3,209.9955 |
| Point 38 | 523.0038 | 3,212.9872 |
| Point 39 | 535 | 3,213 |
| Point 40 | 523 | 3,234 |
| Point 41 | 523 | 3,210 |
| Point 42 | 450 | 3,222 |
| Point 43 | 450 | 3,217 |
| Point 44 | 521 | 3,234 |
| Point 45 | 521 | 3,227.9572 |
| Point 46 | 521 | 3,213.7432 |
| Point 47 | 650 | 3,200 |
| Point 48 | 0 | 3,200 |
| Point 49 | 501 | 3,216 |
| Point 50 | 537 | 3,208 |
| Point 51 | 0 | 3,286 |
| Point 52 | 442 | 3,285.9987 |
| Point 53 | 179.87998 | 3,237.0105 |
| Point 54 | 341.15764 | 3,237.0071 |
| Point 55 | 522 | 3,237 |
| Point 56 | 522 | 3,234 |

| | | |
|---|---|---|
| Point 57 | 499.65021 | 3,237.0007 |
| Point 58 | 341.15298 | 3,237.0056 |
| Point 59 | 384.9795 | 3,267 |
| Point 60 | 0 | 3,259 |
| Point 61 | 0 | 3,237 |
| Point 62 | 379 | 3,277 |
| Point 63 | 418.01181 | 3,278 |
| Point 64 | 340 | 3,266.0653 |
| Point 65 | 433.00687 | 3,283 |
| Point 66 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Drain | 1,2,3,4,5,7,6 | 541.04 |
| Region 2 | Core | 7,8,32,40,56,55,57,13,4,5 | 1,068.6 |
| Region 3 | Fly Ash Slurry - Sat. | 14,15,16,17 | 925.18 |
| Region 4 | Clinker Fill | 27,23,36,22,21,34,20,19,52,65,63,33,59 | 3,087.8 |
| Region 5 | Embankment Fill | 1,2,3,4,13,57,58,54,24,23,36,22,21 | 4,613.8 |
| Region 6 | Paste | 18,24,54,58,53 | 793.48 |
| Region 7 | Bottom Ash Fill | 18,24,23,27 | 673.03 |
| Region 8 | Native Clinker | 42,30,46,45,9,10,11,35,25 | 1,706.6 |
| Region 9 | Clinker Ash - Sat. | 30,43,29,15,14,26,25,42 | 2,102.9 |
| Region 10 | Native Clinker | 32,8,7,6,31,39,38 | 1,959.6 |
| Region 11 | Cutoff Wall | 44,56,40,32,38,41,37,46,45 | 47.796 |
| Region 12 | Bedrock | 31,47,48,16,15,29,43,30,46,37,41,38,39 | 12,795 |
| Region 13 | Core - Sat. | 44,45,9,10,11,12,57,55,56 | 234.89 |
| Region 14 | Embankment Fill - Sat. | 12,11,35,25,58,57 | 650.58 |
| Region 15 | Paste - Sat. | 25,26,14,17,28,53,58 | 2,107 |
| Region 16 | Paste - Sat. | 17,61,53,28 | 834.3 |
| Region 17 | Paste | 60,61,53,18,27,59,64 | 8,254.1 |
| Region 18 | Paste | 33,63,62,64,59 | 425.91 |
| Region 19 | Paste | 65,63,62,64,60,66 | 7,658.2 |

## Current Slip Surface

Slip Surface: 1,380
F of S: 2.34

Volume: 1,865.2107 ft³
Weight: 237,115.13 lbs
Resisting Moment: 33,533,656 lbs-ft
Activating Moment: 14,303,695 lbs-ft
Resisting Force: 147,751.59 lbs
Activating Force: 63,032.424 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (630.09645, 3,242.1238) ft
Entry: (469.57197, 3,290) ft
Radius: 212.91363 ft
Center: (605.78044, 3,453.6443) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 471.78599 | 3,288.2068 | -3,195.3032 | 166.1247 | 139.39517 | 50 |
| Slice 2 | 476.7 | 3,284.3549 | -2,954.9431 | 462.18272 | 387.81735 | 50 |
| Slice 3 | 482.1 | 3,280.3689 | -2,706.2223 | 682.1958 | 572.43025 | 50 |
| Slice 4 | 487.5 | 3,276.6375 | -2,473.382 | 879.55348 | 738.033 | 50 |
| Slice 5 | 492.9 | 3,273.1448 | -2,255.4357 | 1,057.2263 | 887.11819 | 50 |
| Slice 6 | 498.3 | 3,269.8771 | -2,051.5327 | 1,217.5343 | 1,021.6326 | 50 |
| Slice 7 | 504.00478 | 3,266.6624 | -1,850.9367 | 1,369.3115 | 1,148.9888 | 50 |
| Slice 8 | 510.01433 | 3,263.5135 | -1,654.44 | 1,512.4741 | 1,269.1164 | 50 |
| Slice 9 | 515.14458 | 3,261 | -1,497.6 | 1,644.9407 | 1,068.237 | 0 |
| Slice 10 | 518.13503 | 3,259.6093 | -1,410.8199 | 1,705.3422 | 925.92527 | 0 |
| Slice 11 | 522 | 3,257.9343 | -86.242402 | 1,755.2366 | 953.01573 | 0 |
| Slice 12 | 527.24898 | 3,255.7576 | -3,042.4725 | 1,817.1032 | 986.60655 | 0 |
| Slice 13 | 531.74693 | 3,254.031 | -2,934.7315 | 1,859.2674 | 1,009.4998 | 0 |
| Slice 14 | 535.17296 | 3,252.7831 | -2,856.8644 | 1,886.5863 | 1,024.3328 | 0 |
| Slice 15 | 537.62372 | 3,251.9389 | -2,804.1893 | 1,921.4836 | 1,043.2805 | 0 |
| Slice 16 | 540.12372 | 3,251.111 | -2,752.5268 | 1,955.7318 | 1,369.4181 | 0 |
| Slice 17 | 542.88541 | 3,250.2387 | -2,698.0956 | 1,949.4963 | 1,365.052 | 0 |
| Slice 18 | 546.7202 | 3,249.1 | -2,627.0414 | 1,936.6134 | 1,257.6515 | 0 |
| Slice 19 | 551.31897 | 3,247.8277 | -2,547.6455 | 1,936.5185 | 1,257.5898 | 0 |
| Slice 20 | 555.91774 | 3,246.6653 | -2,475.113 | 1,922.6155 | 1,248.5611 | 0 |
| Slice 21 | 560.98171 | 3,245.5163 | -2,403.4151 | 1,911.5703 | 1,241.3882 | 0 |
| Slice 22 | 566.51089 | 3,244.4024 | -2,333.907 | 1,899.3672 | 1,233.4635 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 23 | 572.04007 | 3,243.4398 | -2,273.841 | 1,863.7261 | 1,210.3179 | 0 |
| Slice 24 | 577.56925 | 3,242.6264 | -2,223.088 | 1,803.1552 | 1,170.9827 | 0 |
| Slice 25 | 583.09842 | 3,241.9606 | -2,181.5403 | 1,716.5352 | 1,114.731 | 0 |
| Slice 26 | 588.6276 | 3,241.4409 | -2,149.1114 | 1,603.2418 | 1,041.1574 | 0 |
| Slice 27 | 594.15678 | 3,241.0663 | -2,125.7342 | 1,463.2404 | 950.23939 | 0 |
| Slice 28 | 599.68596 | 3,240.8359 | -2,111.361 | 1,297.1381 | 842.37135 | 0 |
| Slice 29 | 605.21514 | 3,240.7494 | -2,105.9626 | 1,106.1861 | 718.36564 | 0 |
| Slice 30 | 610.74432 | 3,240.8065 | -2,109.5278 | 892.22569 | 579.41814 | 0 |
| Slice 31 | 616.2735 | 3,241.0074 | -2,122.0641 | 657.58079 | 427.03796 | 0 |
| Slice 32 | 621.80268 | 3,241.3525 | -2,143.5969 | 404.90089 | 262.94571 | 0 |
| Slice 33 | 627.33186 | 3,241.8425 | -2,174.1701 | 136.96715 | 88.94751 | 0 |

# Static Safety Factor: Maximum Surcharge Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 625
Date: 10/13/2016
Time: 8:12:24 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam C-C.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:12:27 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Core

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °

### Drain

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Clinker Ash

Model: Mohr-Coulomb

Unit Weight: 120.4 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °

**Cutoff Wall**
Model: Bedrock (Impenetrable)

**Embankment Fill**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °

**Clinker Fill**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

**Bedrock**
Model: Bedrock (Impenetrable)

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

**Fly Ash Slurry**
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (421.99994, 3,283) ft
Left-Zone Right Coordinate: (474, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (530.99042, 3,271) ft
Right-Zone Right Coordinate: (650, 3,236.62) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (650, 3,236.62) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 0 | 3,286 |
| | 442 | 3,285.9987 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 650 | 3,236.62 |
| Point 2 | 548.364 | 3,236.62 |
| Point 3 | 541.35 | 3,260 |
| Point 4 | 536.35 | 3,260 |
| Point 5 | 544.564 | 3,232.62 |
| Point 6 | 650 | 3,232.62 |
| Point 7 | 553.56399 | 3,232.62 |
| Point 8 | 546.064 | 3,227.62 |
| Point 9 | 496.836 | 3,227.62 |
| Point 10 | 491.58617 | 3,231.1199 |
| Point 11 | 489.33601 | 3,232.62 |
| Point 12 | 498.336 | 3,232.62 |
| Point 13 | 506.55 | 3,260 |
| Point 14 | 218.94121 | 3,227.7 |
| Point 15 | 21.36544 | 3,220 |
| Point 16 | 0 | 3,220 |
| Point 17 | 0 | 3,227.7 |
| Point 18 | 316.00198 | 3,244.0009 |
| Point 19 | 454 | 3,290 |
| Point 20 | 474 | 3,290 |
| Point 21 | 558.21712 | 3,262 |

| | | |
|---|---|---|
| Point 22 | 499.42722 | 3,262 |
| Point 23 | 410.23923 | 3,260 |
| Point 24 | 371.01933 | 3,246.946 |
| Point 25 | 317.01854 | 3,228.9729 |
| Point 26 | 266.00446 | 3,229.2 |
| Point 27 | 364 | 3,260.038 |
| Point 28 | 120.99092 | 3,233.9863 |
| Point 29 | 266.00162 | 3,223.0192 |
| Point 30 | 499 | 3,222.0436 |
| Point 31 | 650 | 3,220 |
| Point 32 | 522.98248 | 3,227.9848 |
| Point 33 | 394.00653 | 3,269.9956 |
| Point 34 | 533.99591 | 3,269.998 |
| Point 35 | 449.98058 | 3,236.0164 |
| Point 36 | 450 | 3,260.8916 |
| Point 37 | 521.03127 | 3,209.9955 |
| Point 38 | 523.0038 | 3,212.9872 |
| Point 39 | 535 | 3,213 |
| Point 40 | 523 | 3,234 |
| Point 41 | 523 | 3,210 |
| Point 42 | 450 | 3,222 |
| Point 43 | 450 | 3,217 |
| Point 44 | 521 | 3,234 |
| Point 45 | 521 | 3,227.9572 |
| Point 46 | 521 | 3,213.7432 |
| Point 47 | 650 | 3,200 |
| Point 48 | 0 | 3,200 |
| Point 49 | 501 | 3,216 |
| Point 50 | 537 | 3,208 |
| Point 51 | 0 | 3,286 |
| Point 52 | 442 | 3,285.9987 |
| Point 53 | 179.87998 | 3,237.0105 |
| Point 54 | 341.15764 | 3,237.0071 |
| Point 55 | 522 | 3,237 |
| Point 56 | 522 | 3,234 |

| | | |
|---|---|---|
| Point 57 | 499.65021 | 3,237.0007 |
| Point 58 | 341.15298 | 3,237.0056 |
| Point 59 | 384.9795 | 3,267 |
| Point 60 | 0 | 3,259 |
| Point 61 | 0 | 3,237 |
| Point 62 | 379 | 3,277 |
| Point 63 | 418.01181 | 3,278 |
| Point 64 | 340 | 3,266.0653 |
| Point 65 | 433.00687 | 3,283 |
| Point 66 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Drain | 1,2,3,4,5,7,6 | 541.04 |
| Region 2 | Core | 7,8,32,40,56,55,57,13,4,5 | 1,068.6 |
| Region 3 | Fly Ash Slurry | 14,15,16,17 | 925.18 |
| Region 4 | Clinker Fill | 27,23,36,22,21,34,20,19,52,65,63,33,59 | 3,087.8 |
| Region 5 | Embankment Fill | 1,2,3,4,13,57,58,54,24,23,36,22,21 | 4,613.8 |
| Region 6 | Paste | 18,24,54,58,53 | 793.48 |
| Region 7 | Bottom Ash Fill | 18,24,23,27 | 673.03 |
| Region 8 | Native Clinker | 42,30,46,45,9,10,11,35,25 | 1,706.6 |
| Region 9 | Clinker Ash | 30,43,29,15,14,26,25,42 | 2,102.9 |
| Region 10 | Native Clinker | 32,8,7,6,31,39,38 | 1,959.6 |
| Region 11 | Cutoff Wall | 44,56,40,32,38,41,37,46,45 | 47.796 |
| Region 12 | Bedrock | 31,47,48,16,15,29,43,30,46,37,41,38,39 | 12,795 |
| Region 13 | Core | 44,45,9,10,11,12,57,55,56 | 234.89 |
| Region 14 | Embankment Fill | 12,11,35,25,58,57 | 650.58 |
| Region 15 | Paste | 25,26,14,17,28,53,58 | 2,107 |
| Region 16 | Paste - Sat. | 17,61,53,28 | 834.3 |
| Region 17 | Paste | 60,61,53,18,27,59,64 | 8,254.1 |
| Region 18 | Bottom Ash Fill | 33,63,62,64,59 | 425.91 |
| Region 19 | Paste | 65,63,62,64,60,66 | 7,658.2 |

## Current Slip Surface

Slip Surface: 1,380
F of S: 2.34

Volume: 1,865.1522 ft³
Weight: 237,107.81 lbs
Resisting Moment: 33,532,786 lbs-ft
Activating Moment: 14,303,147 lbs-ft
Resisting Force: 147,748.03 lbs
Activating Force: 63,030.138 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (630.09645, 3,242.1238) ft
Entry: (469.57197, 3,290) ft
Radius: 212.91363 ft
Center: (605.78044, 3,453.6443) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 471.78599 | 3,288.2068 | 0 | 166.12522 | 139.39561 | 50 |
| Slice 2 | 476.78708 | 3,284.2907 | 0 | 465.68818 | 390.75878 | 50 |
| Slice 3 | 482.36124 | 3,280.1848 | 0 | 692.01903 | 580.67292 | 50 |
| Slice 4 | 487.9354 | 3,276.3492 | 0 | 894.37119 | 750.46654 | 50 |
| Slice 5 | 493.50955 | 3,272.7667 | 0 | 1,075.9653 | 902.8421 | 50 |
| Slice 6 | 499.08371 | 3,269.4226 | 0 | 1,239.2881 | 1,039.8862 | 50 |
| Slice 7 | 504.65787 | 3,266.304 | 0 | 1,386.1528 | 1,163.1203 | 50 |
| Slice 8 | 510.23203 | 3,263.3998 | 0 | 1,517.7591 | 1,273.5511 | 50 |
| Slice 9 | 515.14458 | 3,261 | 0 | 1,644.9351 | 1,068.2333 | 0 |
| Slice 10 | 520.0577 | 3,258.7737 | 0 | 1,730.0728 | 939.35289 | 0 |
| Slice 11 | 525.63299 | 3,256.4147 | 0 | 1,798.9061 | 976.72633 | 0 |
| Slice 12 | 531.20827 | 3,254.2393 | 0 | 1,853.9001 | 1,006.5856 | 0 |
| Slice 13 | 535.17296 | 3,252.7831 | 0 | 1,886.5815 | 1,024.3302 | 0 |
| Slice 14 | 537.62372 | 3,251.9389 | 0 | 1,921.4791 | 1,043.2781 | 0 |
| Slice 15 | 540.12372 | 3,251.111 | 0 | 1,955.7301 | 1,369.4169 | 0 |
| Slice 16 | 542.88541 | 3,250.2387 | 0 | 1,949.4952 | 1,365.0512 | 0 |
| Slice 17 | 546.7202 | 3,249.1 | 0 | 1,936.6125 | 1,257.6508 | 0 |
| Slice 18 | 551.31897 | 3,247.8277 | 0 | 1,936.5187 | 1,257.5899 | 0 |
| Slice 19 | 555.91774 | 3,246.6653 | 0 | 1,922.6168 | 1,248.5619 | 0 |
| Slice 20 | 560.98171 | 3,245.5163 | 0 | 1,911.5729 | 1,241.3899 | 0 |
| Slice 21 | 566.51089 | 3,244.4024 | 0 | 1,899.3711 | 1,233.466 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 22 | 572.04007 | 3,243.4398 | 0 | 1,863.7311 | 1,210.3211 | 0 |
| Slice 23 | 577.56925 | 3,242.6264 | 0 | 1,803.1611 | 1,170.9865 | 0 |
| Slice 24 | 583.09842 | 3,241.9606 | 0 | 1,716.5415 | 1,114.7351 | 0 |
| Slice 25 | 588.6276 | 3,241.4409 | 0 | 1,603.2481 | 1,041.1615 | 0 |
| Slice 26 | 594.15678 | 3,241.0663 | 0 | 1,463.2463 | 950.24326 | 0 |
| Slice 27 | 599.68596 | 3,240.8359 | 0 | 1,297.1433 | 842.37471 | 0 |
| Slice 28 | 605.21514 | 3,240.7494 | 0 | 1,106.1902 | 718.36831 | 0 |
| Slice 29 | 610.74432 | 3,240.8065 | 0 | 892.22857 | 579.42001 | 0 |
| Slice 30 | 616.2735 | 3,241.0074 | 0 | 657.58247 | 427.03905 | 0 |
| Slice 31 | 621.80268 | 3,241.3525 | 0 | 404.90157 | 262.94616 | 0 |
| Slice 32 | 627.33186 | 3,241.8425 | 0 | 136.96726 | 88.947579 | 0 |

# Seismic Safety Factor - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 625
Date: 10/13/2016
Time: 8:12:24 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam C-C.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:12:27 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - Outboard [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 120.4 pcf
Cohesion': 760 psf
Phi': 21.28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (650, 3,236.62) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237 |

| | | |
|---|---|---|
| Coordinate 2 | 501 | 3,237 |
| Coordinate 3 | 519 | 3,237 |
| Coordinate 4 | 525 | 3,207 |
| Coordinate 5 | 650 | 3,207 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 650 | 3,236.62 |
| Point 2 | 548.364 | 3,236.62 |
| Point 3 | 541.35 | 3,260 |
| Point 4 | 536.35 | 3,260 |
| Point 5 | 544.564 | 3,232.62 |
| Point 6 | 650 | 3,232.62 |
| Point 7 | 553.56399 | 3,232.62 |
| Point 8 | 546.064 | 3,227.62 |
| Point 9 | 496.836 | 3,227.62 |
| Point 10 | 491.58617 | 3,231.1199 |
| Point 11 | 489.33601 | 3,232.62 |
| Point 12 | 498.336 | 3,232.62 |
| Point 13 | 506.55 | 3,260 |
| Point 14 | 218.94121 | 3,227.7 |
| Point 15 | 21.36544 | 3,220 |
| Point 16 | 0 | 3,220 |
| Point 17 | 0 | 3,227.7 |
| Point 18 | 316.00198 | 3,244.0009 |
| Point 19 | 454 | 3,290 |
| Point 20 | 474 | 3,290 |
| Point 21 | 558.21712 | 3,262 |
| Point 22 | 499.42722 | 3,262 |
| Point 23 | 410.23923 | 3,260 |
| Point 24 | 371.01933 | 3,246.946 |
| Point 25 | 317.01854 | 3,228.9729 |
| Point 26 | 266.00446 | 3,229.2 |

| | | |
|---|---|---|
| Point 27 | 364 | 3,260.038 |
| Point 28 | 120.99092 | 3,233.9863 |
| Point 29 | 266.00162 | 3,223.0192 |
| Point 30 | 499 | 3,222.0436 |
| Point 31 | 650 | 3,220 |
| Point 32 | 522.98248 | 3,227.9848 |
| Point 33 | 394.00653 | 3,269.9956 |
| Point 34 | 533.99591 | 3,269.998 |
| Point 35 | 449.98058 | 3,236.0164 |
| Point 36 | 450 | 3,260.8916 |
| Point 37 | 521.03127 | 3,209.9955 |
| Point 38 | 523.0038 | 3,212.9872 |
| Point 39 | 535 | 3,213 |
| Point 40 | 523 | 3,234 |
| Point 41 | 523 | 3,210 |
| Point 42 | 450 | 3,222 |
| Point 43 | 450 | 3,217 |
| Point 44 | 521 | 3,234 |
| Point 45 | 521 | 3,227.9572 |
| Point 46 | 521 | 3,213.7432 |
| Point 47 | 650 | 3,200 |
| Point 48 | 0 | 3,200 |
| Point 49 | 501 | 3,216 |
| Point 50 | 537 | 3,208 |
| Point 51 | 0 | 3,286 |
| Point 52 | 442 | 3,285.9987 |
| Point 53 | 179.87998 | 3,237.0105 |
| Point 54 | 341.15764 | 3,237.0071 |
| Point 55 | 522 | 3,237 |
| Point 56 | 522 | 3,234 |
| Point 57 | 499.65021 | 3,237.0007 |
| Point 58 | 341.15298 | 3,237.0056 |
| Point 59 | 384.9795 | 3,267 |
| Point 60 | 0 | 3,259 |
| Point 61 | 0 | 3,237 |

| | | |
|---|---|---|
| Point 62 | 379 | 3,277 |
| Point 63 | 418.01181 | 3,278 |
| Point 64 | 340 | 3,266.0653 |
| Point 65 | 433.00687 | 3,283 |
| Point 66 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Drain - Seismic | 1,2,3,4,5,7,6 | 541.04 |
| Region 2 | Core - Seismic | 7,8,32,40,56,55,57,13,4,5 | 1,068.6 |
| Region 3 | Fly Ash Slurry - Sat. - Seismic | 14,15,16,17 | 925.18 |
| Region 4 | Clinker Fill - Seismic | 27,23,36,22,21,34,20,19,52,65,63,33,59 | 3,087.8 |
| Region 5 | Embankment Fill - Seismic | 1,2,3,4,13,57,58,54,24,23,36,22,21 | 4,613.8 |
| Region 6 | Paste - Seismic | 18,24,54,58,53 | 793.48 |
| Region 7 | Bottom Ash Fill - Seismic | 18,24,23,27 | 673.03 |
| Region 8 | Native Clinker - Seismic | 42,30,46,45,9,10,11,35,25 | 1,706.6 |
| Region 9 | Clinker Ash - Seismic | 30,43,29,15,14,26,25,42 | 2,102.9 |
| Region 10 | Native Clinker - Seismic | 32,8,7,6,31,39,38 | 1,959.6 |
| Region 11 | Cutoff Wall | 44,56,40,32,38,41,37,46,45 | 47.796 |
| Region 12 | Bedrock | 31,47,48,16,15,29,43,30,46,37,41,38,39 | 12,795 |
| Region 13 | Core - Sat. - Seismic | 44,45,9,10,11,12,57,55,56 | 234.89 |
| Region 14 | Embankment Fill - Sat. - Seismic | 12,11,35,25,58,57 | 650.58 |
| Region 15 | Paste - Sat. - Seismic | 25,26,14,17,28,53,58 | 2,107 |
| Region 16 | Paste - Sat. - Seismic | 17,61,53,28 | 834.3 |
| Region 17 | Paste - Seismic | 60,61,53,18,27,59,64 | 8,254.1 |

| | | | |
|---|---|---|---|
| Region 18 | Bottom Ash Fill - Seismic | 33,63,62,64,59 | 425.91 |
| Region 19 | Paste - Seismic | 65,63,62,64,60,66 | 7,658.2 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.61
Volume: 1,865.2107 ft³
Weight: 237,115.13 lbs
Resisting Moment: 25,307,867 lbs-ft
Activating Moment: 15,681,337 lbs-ft
Resisting Force: 111,671.83 lbs
Activating Force: 69,145.357 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (630.09645, 3,242.1238) ft
Entry: (469.57197, 3,290) ft
Radius: 212.91363 ft
Center: (605.78044, 3,453.6443) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 471.78599 | 3,288.2068 | -3,195.3032 | 160.91136 | 100.54858 | 40 |
| Slice 2 | 476.7 | 3,284.3549 | -2,954.9431 | 451.05814 | 281.85241 | 40 |
| Slice 3 | 482.1 | 3,280.3689 | -2,706.2222 | 666.11447 | 416.23452 | 40 |
| Slice 4 | 487.5 | 3,276.6375 | -2,473.382 | 858.86105 | 536.67595 | 40 |
| Slice 5 | 492.9 | 3,273.1448 | -2,255.4357 | 1,032.4939 | 645.17377 | 40 |
| Slice 6 | 498.3 | 3,269.8771 | -2,051.5327 | 1,189.5135 | 743.29053 | 40 |
| Slice 7 | 504.00478 | 3,266.6624 | -1,850.9367 | 1,338.8058 | 836.57874 | 40 |
| Slice 8 | 510.01433 | 3,263.5135 | -1,654.44 | 1,480.5567 | 925.15451 | 40 |
| Slice 9 | 515.14458 | 3,261 | -1,497.6 | 1,607.8763 | 798.15675 | 0 |
| Slice 10 | 518.13503 | 3,259.6093 | -1,410.8199 | 1,665.9114 | 700.28467 | 0 |
| Slice 11 | 522 | 3,257.9343 | -86.242402 | 1,716.1617 | 721.40795 | 0 |
| Slice 12 | 527.24898 | 3,255.7576 | -3,042.4725 | 1,779.3534 | 747.9713 | 0 |
| Slice 13 | 531.74693 | 3,254.031 | -2,934.7315 | 1,823.5713 | 766.55877 | 0 |
| Slice 14 | 535.17296 | 3,252.7831 | -2,856.8644 | 1,852.9427 | 778.90538 | 0 |
| Slice 15 | 537.62372 | 3,251.9389 | -2,804.1893 | 1,889.3032 | 794.18994 | 0 |
| Slice 16 | 540.12372 | 3,251.111 | -2,752.5268 | 1,930.5414 | 1,026.4871 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 17 | 542.88541 | 3,250.2387 | -2,698.0956 | 1,927.1726 | 1,024.6958 | 0 |
| Slice 18 | 546.7202 | 3,249.1 | -2,627.0414 | 1,916.7004 | 951.45833 | 0 |
| Slice 19 | 551.31897 | 3,247.8277 | -2,547.6455 | 1,921.5495 | 953.86547 | 0 |
| Slice 20 | 555.91774 | 3,246.6653 | -2,475.1129 | 1,912.773 | 949.50878 | 0 |
| Slice 21 | 560.98171 | 3,245.5163 | -2,403.4151 | 1,907.2441 | 946.76418 | 0 |
| Slice 22 | 566.51089 | 3,244.4024 | -2,333.907 | 1,900.7542 | 943.54256 | 0 |
| Slice 23 | 572.04007 | 3,243.4398 | -2,273.841 | 1,870.2808 | 928.41546 | 0 |
| Slice 24 | 577.56925 | 3,242.6264 | -2,223.088 | 1,813.9979 | 900.47639 | 0 |
| Slice 25 | 583.09842 | 3,241.9606 | -2,181.5403 | 1,730.5123 | 859.03376 | 0 |
| Slice 26 | 588.6276 | 3,241.4409 | -2,149.1114 | 1,619.0191 | 803.68806 | 0 |
| Slice 27 | 594.15678 | 3,241.0663 | -2,125.7342 | 1,479.4196 | 734.39024 | 0 |
| Slice 28 | 599.68596 | 3,240.8359 | -2,111.361 | 1,312.3874 | 651.47478 | 0 |
| Slice 29 | 605.21514 | 3,240.7494 | -2,105.9626 | 1,119.3719 | 555.66102 | 0 |
| Slice 30 | 610.74432 | 3,240.8065 | -2,109.5278 | 902.53205 | 448.0208 | 0 |
| Slice 31 | 616.2735 | 3,241.0074 | -2,122.0641 | 664.60074 | 329.91067 | 0 |
| Slice 32 | 621.80268 | 3,241.3525 | -2,143.5969 | 408.69014 | 202.87555 | 0 |
| Slice 33 | 627.33186 | 3,241.8425 | -2,174.1701 | 138.05053 | 68.528877 | 0 |

# Static Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/13/2016
Time: 8:34:19 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam D-D.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:34:22 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat.**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (266, 3,260) ft
Left-Zone Right Coordinate: (329.88847, 3,269.9378) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (384.31002, 3,288.0783) ft
Right-Zone Right Coordinate: (418.24329, 3,287.2912) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (74, 3,257) ft

Right Coordinate: (675, 3,239) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 74 | 3,237 |
| Coordinate 2 | 456 | 3,237 |
| Coordinate 3 | 463 | 3,206 |
| Coordinate 4 | 675 | 3,206 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 303.07508 | 3,261 |
| Point 2 | 410.07508 | 3,290 |
| Point 3 | 390.07508 | 3,290 |
| Point 4 | 249.99957 | 3,243.0009 |
| Point 5 | 460.33972 | 3,230 |
| Point 6 | 457.8619 | 3,230 |
| Point 7 | 431.84708 | 3,224.2465 |
| Point 8 | 423.03161 | 3,224.3328 |
| Point 9 | 430.80994 | 3,219.11 |
| Point 10 | 481.97383 | 3,219.11 |
| Point 11 | 470.34694 | 3,257.4466 |
| Point 12 | 442.16709 | 3,257.4466 |
| Point 13 | 675 | 3,226.0714 |
| Point 14 | 675 | 3,222.0622 |
| Point 15 | 501.24367 | 3,225.0965 |
| Point 16 | 492.26398 | 3,219.11 |
| Point 17 | 480.78725 | 3,257.4466 |
| Point 18 | 489.22798 | 3,229.3108 |
| Point 19 | 300.00135 | 3,245.9509 |
| Point 20 | 242 | 3,227 |
| Point 21 | 224.4454 | 3,223 |
| Point 22 | 370 | 3,218.7 |

| | | |
|---|---|---|
| Point 23 | 452.95523 | 3,215.309 |
| Point 24 | 442.90022 | 3,217.82 |
| Point 25 | 442.89993 | 3,219.11 |
| Point 26 | 370 | 3,223.69 |
| Point 27 | 461 | 3,213.3 |
| Point 28 | 487 | 3,212.81 |
| Point 29 | 675 | 3,212.5758 |
| Point 30 | 343 | 3,260 |
| Point 31 | 370 | 3,260.7 |
| Point 32 | 442.89061 | 3,261.7413 |
| Point 33 | 461 | 3,262 |
| Point 34 | 487 | 3,262.81 |
| Point 35 | 493 | 3,262.5 |
| Point 36 | 600 | 3,232 |
| Point 37 | 620 | 3,231 |
| Point 38 | 640 | 3,232 |
| Point 39 | 675 | 3,239 |
| Point 40 | 457.8619 | 3,219 |
| Point 41 | 460.5095 | 3,219.11 |
| Point 42 | 675 | 3,195 |
| Point 43 | 74 | 3,257 |
| Point 44 | 266 | 3,260 |
| Point 45 | 278 | 3,266 |
| Point 46 | 74 | 3,234.6288 |
| Point 47 | 318.00001 | 3,265.975 |
| Point 48 | 74 | 3,227 |
| Point 49 | 74 | 3,223 |
| Point 50 | 74 | 3,195 |
| Point 51 | 460.33972 | 3,195 |
| Point 52 | 460.33972 | 3,213.4649 |
| Point 53 | 460.33972 | 3,219.1029 |
| Point 54 | 457.8619 | 3,214.0837 |
| Point 55 | 457.8619 | 3,195 |
| Point 56 | 675 | 3,206 |
| Point 57 | 460.33972 | 3,206 |

| | | |
|---|---|---|
| Point 58 | 459 | 3,237 |
| Point 59 | 459 | 3,230 |
| Point 60 | 74 | 3,237 |
| Point 61 | 435.81141 | 3,237 |
| Point 62 | 272.60612 | 3,237 |
| Point 63 | 123.84773 | 3,237 |
| Point 64 | 189.16667 | 3,227 |
| Point 65 | 177.83333 | 3,223 |
| Point 66 | 74 | 3,286 |
| Point 67 | 378.07507 | 3,286 |
| Point 68 | 369.07506 | 3,283 |
| Point 69 | 74 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Clinker Fill | 1,30,31,32,33,34,35,2,3,67,68,47 | 3,065.3 |
| Region 2 | Core - Sat. | 7,8,9,25,40,6,59,58,61 | 474.26 |
| Region 3 | Drain | 13,14,15,16,10,11,17,18 | 1,172.9 |
| Region 4 | Native Clinker | 25,24,23,54,40 | 46.429 |
| Region 5 | Embankment Fill - Sat. | 20,62,61,7,8,9,26 | 2,305.9 |
| Region 6 | Bottom Ash Fill | 4,19,30,1 | 673.66 |
| Region 7 | Paste | 43,60,63,4,1,44 | 3,824.6 |
| Region 8 | Paste | 4,19,62,63 | 629.71 |
| Region 9 | Clinker Ash - Sat. | 21,22,23,24,25,9,26,20,64,65 | 1,135.4 |
| Region 10 | Bedrock | 50,49,65,21,22,23,54,55 | 9,897.1 |
| Region 11 | Native Clinker | 27,28,29,14,15,16,10,41,53,52 | 2,171.1 |
| Region 12 | Cutoff Wall | 52,53,5,59,6,40,54,55,51,57 | 86.724 |
| Region 13 | Bedrock | 51,42,56,29,28,27,52,57 | 3,807.8 |
| Region 14 | Core | 5,53,41,10,11,12,61,58,59 | 1,052.4 |
| Region 15 | Embankment Fill | 19,30,31,32,33,34,35,36,37,38,39,13,18,17, 11,12,61,62 | 6,115.4 |
| Region 16 | Paste - Sat. | 20,64,48,46,63,62 | 1,773.9 |
| Region 17 | Paste - Sat. | 46,63,60 | 59.099 |
| Region 18 | Fly Ash Slurry - Sat. | 48,49,65,64 | 438 |
| Region 19 | Bottom Ash Fill | 47,45,44,1 | 204.91 |

| | | | |
|---|---|---|---|
| Region 20 | | 68,47,45,44,43,69 | 6,059.3 |

## Current Slip Surface

Slip Surface: 1,434
F of S: 2.95
Volume: 445.30186 ft³
Weight: 57,867.101 lbs
Resisting Moment: 5,381,976 lbs-ft
Activating Moment: 1,824,101.6 lbs-ft
Resisting Force: 48,113.374 lbs
Activating Force: 16,287.008 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (314.04455, 3,265.9775) ft
Entry: (392.66881, 3,290) ft
Radius: 105.16746 ft
Center: (325.07123, 3,370.5653) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 315.60325 | 3,265.8366 | -1,799.4012 | 13.602378 | 11.41375 | 0 |
| Slice 2 | 317.58098 | 3,265.6657 | -1,788.7412 | 39.62548 | 33.249726 | 50 |
| Slice 3 | 319.34409 | 3,265.5625 | -1,782.2996 | 122.28745 | 102.61136 | 50 |
| Slice 4 | 322.03225 | 3,265.4503 | -1,775.3003 | 263.63286 | 221.21424 | 50 |
| Slice 5 | 324.72041 | 3,265.407 | -1,772.5957 | 396.34334 | 332.57155 | 50 |
| Slice 6 | 327.40857 | 3,265.4324 | -1,774.1805 | 518.75632 | 435.28823 | 50 |
| Slice 7 | 330.09673 | 3,265.5266 | -1,780.0579 | 629.40321 | 528.132 | 50 |
| Slice 8 | 332.78489 | 3,265.6897 | -1,790.2393 | 727.10714 | 610.11533 | 50 |
| Slice 9 | 335.47305 | 3,265.9222 | -1,804.7451 | 811.05018 | 680.55191 | 50 |
| Slice 10 | 338.16121 | 3,266.2244 | -1,823.6039 | 880.80643 | 739.08435 | 50 |
| Slice 11 | 340.84937 | 3,266.597 | -1,846.854 | 936.34087 | 785.68327 | 50 |
| Slice 12 | 343.53753 | 3,267.0407 | -1,874.5426 | 977.97721 | 820.62032 | 50 |
| Slice 13 | 346.2257 | 3,267.5565 | -1,906.7273 | 1,006.3406 | 844.42006 | 50 |
| Slice 14 | 348.91386 | 3,268.1454 | -1,943.4759 | 1,022.2831 | 857.79734 | 50 |
| Slice 15 | 351.60202 | 3,268.8088 | -1,984.8679 | 1,026.7995 | 861.58711 | 50 |
| Slice 16 | 354.29018 | 3,269.548 | -2,030.9946 | 1,020.9439 | 856.67362 | 50 |
| Slice 17 | 356.97834 | 3,270.3648 | -2,081.9611 | 1,005.7506 | 843.92492 | 50 |
| Slice 18 | 359.6665 | 3,271.261 | -2,137.8868 | 982.16823 | 824.137 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 19 | 362.35466 | 3,272.2389 | -2,198.9074 | 951.00692 | 797.98955 | 50 |
| Slice 20 | 365.04282 | 3,273.3009 | -2,265.1768 | 912.89975 | 766.01384 | 50 |
| Slice 21 | 367.73098 | 3,274.4498 | -2,336.8691 | 868.27637 | 728.57038 | 50 |
| Slice 22 | 370.57506 | 3,275.7664 | -2,419.0225 | 813.90516 | 682.94752 | 50 |
| Slice 23 | 373.57507 | 3,277.2662 | -2,512.6113 | 749.13699 | 628.60057 | 50 |
| Slice 24 | 376.57507 | 3,278.8887 | -2,613.8561 | 676.0044 | 567.23504 | 50 |
| Slice 25 | 379.27507 | 3,280.4532 | -2,711.4822 | 602.93725 | 505.92442 | 50 |
| Slice 26 | 381.67507 | 3,281.9415 | -2,804.3495 | 530.37875 | 445.04061 | 50 |
| Slice 27 | 384.07508 | 3,283.5214 | -2,902.9337 | 450.15996 | 377.72906 | 50 |
| Slice 28 | 386.47508 | 3,285.198 | -3,007.5526 | 361.04788 | 302.95514 | 50 |
| Slice 29 | 388.87508 | 3,286.9771 | -3,118.5699 | 261.50501 | 219.42876 | 50 |
| Slice 30 | 391.37194 | 3,288.9465 | -3,241.4633 | 98.908355 | 82.993964 | 50 |

# Seismic Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/13/2016
Time: 8:34:19 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam D-D.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:34:23 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - Inboard [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Core

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Cutoff Wall

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Core - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 760 psf
Phi': 21.28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 0 psf
- Phi': 26.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 103.4 pcf
- Cohesion': 560 psf
- Phi': 22.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Native Clinker - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 140 pcf
- Cohesion': 0 psf
- Phi': 32 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Paste - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion': 0 psf
- Phi': 28 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Paste - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 112 pcf
- Cohesion': 0 psf
- Phi': 28 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

## Slip Surface Limits
- Left Coordinate: (74, 3,257) ft
- Right Coordinate: (675, 3,239) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 74 | 3,237 |
| Coordinate 2 | 456 | 3,237 |
| Coordinate 3 | 463 | 3,206 |
| Coordinate 4 | 675 | 3,206 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 303.07508 | 3,261 |
| Point 2 | 410.07508 | 3,290 |
| Point 3 | 390.07508 | 3,290 |
| Point 4 | 249.99957 | 3,243.0009 |
| Point 5 | 460.33972 | 3,230 |
| Point 6 | 457.8619 | 3,230 |
| Point 7 | 431.84708 | 3,224.2465 |
| Point 8 | 423.03161 | 3,224.3328 |
| Point 9 | 430.80994 | 3,219.11 |
| Point 10 | 481.97383 | 3,219.11 |
| Point 11 | 470.34694 | 3,257.4466 |
| Point 12 | 442.16709 | 3,257.4466 |
| Point 13 | 675 | 3,226.0714 |
| Point 14 | 675 | 3,222.0622 |
| Point 15 | 501.24367 | 3,225.0965 |
| Point 16 | 492.26398 | 3,219.11 |
| Point 17 | 480.78725 | 3,257.4466 |
| Point 18 | 489.22798 | 3,229.3108 |
| Point 19 | 300.00135 | 3,245.9509 |
| Point 20 | 242 | 3,227 |
| Point 21 | 224.4454 | 3,223 |

| | | |
|---|---|---|
| Point 22 | 370 | 3,218.7 |
| Point 23 | 452.95523 | 3,215.309 |
| Point 24 | 442.90022 | 3,217.82 |
| Point 25 | 442.89993 | 3,219.11 |
| Point 26 | 370 | 3,223.69 |
| Point 27 | 461 | 3,213.3 |
| Point 28 | 487 | 3,212.81 |
| Point 29 | 675 | 3,212.5758 |
| Point 30 | 343 | 3,260 |
| Point 31 | 370 | 3,260.7 |
| Point 32 | 442.89061 | 3,261.7413 |
| Point 33 | 461 | 3,262 |
| Point 34 | 487 | 3,262.81 |
| Point 35 | 493 | 3,262.5 |
| Point 36 | 600 | 3,232 |
| Point 37 | 620 | 3,231 |
| Point 38 | 640 | 3,232 |
| Point 39 | 675 | 3,239 |
| Point 40 | 457.8619 | 3,219 |
| Point 41 | 460.5095 | 3,219.11 |
| Point 42 | 675 | 3,195 |
| Point 43 | 74 | 3,257 |
| Point 44 | 266 | 3,260 |
| Point 45 | 278 | 3,266 |
| Point 46 | 74 | 3,234.6288 |
| Point 47 | 318.00001 | 3,265.975 |
| Point 48 | 74 | 3,227 |
| Point 49 | 74 | 3,223 |
| Point 50 | 74 | 3,195 |
| Point 51 | 460.33972 | 3,195 |
| Point 52 | 460.33972 | 3,213.4649 |
| Point 53 | 460.33972 | 3,219.1029 |
| Point 54 | 457.8619 | 3,214.0837 |
| Point 55 | 457.8619 | 3,195 |
| Point 56 | 675 | 3,206 |

| | | |
|---|---|---|
| Point 57 | 460.33972 | 3,206 |
| Point 58 | 459 | 3,237 |
| Point 59 | 459 | 3,230 |
| Point 60 | 74 | 3,237 |
| Point 61 | 435.81141 | 3,237 |
| Point 62 | 272.60612 | 3,237 |
| Point 63 | 123.84773 | 3,237 |
| Point 64 | 189.16667 | 3,227 |
| Point 65 | 177.83333 | 3,223 |
| Point 66 | 74 | 3,286 |
| Point 67 | 378.07507 | 3,286 |
| Point 68 | 369.07506 | 3,283 |
| Point 69 | 74 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Clinker Fill - Seismic | 1,30,31,32,33,34,35,2,3,67,68,47 | 3,065.3 |
| Region 2 | Core - Sat. | 7,8,9,25,40,6,59,58,61 | 474.26 |
| Region 3 | Drain - Seismic | 13,14,15,16,10,11,17,18 | 1,172.9 |
| Region 4 | Native Clinker | 25,24,23,54,40 | 46.429 |
| Region 5 | Embankment Fill - Sat. - Seismic | 20,62,61,7,8,9,26 | 2,305.9 |
| Region 6 | Bottom Ash Fill - Seismic | 4,19,30,1 | 673.66 |
| Region 7 | Paste - Seismic | 43,60,63,4,1,44 | 3,824.6 |
| Region 8 | Paste - Seismic | 4,19,62,63 | 629.71 |
| Region 9 | Clinker Ash - Sat. - Seismic | 21,22,23,24,25,9,26,20,64,65 | 1,135.4 |
| Region 10 | Bedrock | 50,49,65,21,22,23,54,55 | 9,897.1 |
| Region 11 | Native Clinker - Seismic | 27,28,29,14,15,16,10,41,53,52 | 2,171.1 |
| Region 12 | Cutoff Wall | 52,53,5,59,6,40,54,55,51,57 | 86.724 |
| Region 13 | Bedrock | 51,42,56,29,28,27,52,57 | 3,807.8 |
| Region 14 | Core | 5,53,41,10,11,12,61,58,59 | 1,052.4 |
| Region 15 | Embankment Fill - Seismic | 19,30,31,32,33,34,35,36,37,38,39,13,18,17,11,12,61,62 | 6,115.4 |
| Region 16 | Paste - Sat. - Seismic | 20,64,48,46,63,62 | 1,773.9 |
| Region 17 | Paste - Sat. - Seismic | 46,63,60 | 59.099 |
| Region 18 | Fly Ash Slurry - Sat. - Seismic | 48,49,65,64 | 438 |

| | | | |
|---|---|---|---|
| Region 19 | Bottom Ash Fill - Seismic | 47,45,44,1 | 204.91 |
| Region 20 | | 68,47,45,44,43,69 | 6,059.3 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.01
Volume: 445.30186 ft³
Weight: 57,867.101 lbs
Resisting Moment: 3,999,695.4 lbs-ft
Activating Moment: 1,989,354.2 lbs-ft
Resisting Force: 35,780.485 lbs
Activating Force: 17,776.851 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (314.04455, 3,265.9775) ft
Entry: (392.66881, 3,290) ft
Radius: 105.16746 ft
Center: (325.07123, 3,370.5653) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 315.60325 | 3,265.8366 | -1,799.4013 | 13.863588 | 8.662931 | 0 |
| Slice 2 | 317.58098 | 3,265.6657 | -1,788.7412 | 40.759658 | 25.469461 | 40 |
| Slice 3 | 319.34409 | 3,265.5625 | -1,782.2996 | 124.22034 | 77.621485 | 40 |
| Slice 4 | 322.03225 | 3,265.4503 | -1,775.3003 | 266.88942 | 166.77102 | 40 |
| Slice 5 | 324.72041 | 3,265.407 | -1,772.5957 | 400.84036 | 250.47286 | 40 |
| Slice 6 | 327.40857 | 3,265.4324 | -1,774.1805 | 524.23633 | 327.57921 | 40 |
| Slice 7 | 330.09673 | 3,265.5266 | -1,780.0579 | 635.45887 | 397.07877 | 40 |
| Slice 8 | 332.78489 | 3,265.6897 | -1,790.2393 | 733.2205 | 458.16702 | 40 |
| Slice 9 | 335.47305 | 3,265.9222 | -1,804.7451 | 816.6423 | 510.29475 | 40 |
| Slice 10 | 338.16121 | 3,266.2244 | -1,823.6039 | 885.2912 | 553.19134 | 40 |
| Slice 11 | 340.84937 | 3,266.597 | -1,846.854 | 939.17596 | 586.86228 | 40 |
| Slice 12 | 343.53753 | 3,267.0407 | -1,874.5426 | 978.71132 | 611.56671 | 40 |
| Slice 13 | 346.2257 | 3,267.5565 | -1,906.7273 | 1,004.6454 | 627.77209 | 40 |
| Slice 14 | 348.91386 | 3,268.1454 | -1,943.4759 | 1,017.9759 | 636.10197 | 40 |
| Slice 15 | 351.60202 | 3,268.8088 | -1,984.8679 | 1,019.8502 | 637.27312 | 40 |
| Slice 16 | 354.29018 | 3,269.548 | -2,030.9946 | 1,011.4694 | 632.03625 | 40 |
| Slice 17 | 356.97834 | 3,270.3648 | -2,081.9611 | 993.99715 | 621.11836 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 18 | 359.6665 | 3,271.261 | -2,137.8868 | 968.48786 | 605.17838 | 40 |
| Slice 19 | 362.35466 | 3,272.2389 | -2,198.9074 | 935.82852 | 584.77056 | 40 |
| Slice 20 | 365.04282 | 3,273.3009 | -2,265.1768 | 896.69898 | 560.31971 | 40 |
| Slice 21 | 367.73098 | 3,274.4498 | -2,336.8691 | 851.5499 | 532.10743 | 40 |
| Slice 22 | 370.57506 | 3,275.7664 | -2,419.0225 | 797.1665 | 498.12492 | 40 |
| Slice 23 | 373.57507 | 3,277.2662 | -2,512.6113 | 732.94945 | 457.99765 | 40 |
| Slice 24 | 376.57507 | 3,278.8887 | -2,613.8561 | 660.90727 | 412.9807 | 40 |
| Slice 25 | 379.27507 | 3,280.4532 | -2,711.4822 | 589.2203 | 368.18571 | 40 |
| Slice 26 | 381.67507 | 3,281.9415 | -2,804.3495 | 518.18227 | 323.79622 | 40 |
| Slice 27 | 384.07508 | 3,283.5214 | -2,902.9336 | 439.70435 | 274.75777 | 40 |
| Slice 28 | 386.47508 | 3,285.198 | -3,007.5525 | 352.50302 | 220.26833 | 40 |
| Slice 29 | 388.87508 | 3,286.9771 | -3,118.5699 | 254.98055 | 159.32953 | 40 |
| Slice 30 | 391.37194 | 3,288.9465 | -3,241.4633 | 95.308161 | 59.555149 | 40 |

# Static Safety Factor: Maximum Storage Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/13/2016
Time: 8:34:19 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam D-D.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:34:21 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat.**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (364.99993, 3,283) ft
Left-Zone Right Coordinate: (410.07508, 3,290) ft
Left-Zone Increment: 14
Right Projection: Range
Right-Zone Left Coordinate: (526.29458, 3,253.0095) ft
Right-Zone Right Coordinate: (640, 3,232) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (74, 3,283) ft

Right Coordinate: (675, 3,239) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 74 | 3,237 |
| Coordinate 2 | 456 | 3,237 |
| Coordinate 3 | 463 | 3,206 |
| Coordinate 4 | 675 | 3,206 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 303.07508 | 3,261 |
| Point 2 | 410.07508 | 3,290 |
| Point 3 | 390.07508 | 3,290 |
| Point 4 | 249.99957 | 3,243.0009 |
| Point 5 | 460.33972 | 3,230 |
| Point 6 | 457.8619 | 3,230 |
| Point 7 | 431.84708 | 3,224.2465 |
| Point 8 | 423.03161 | 3,224.3328 |
| Point 9 | 430.80994 | 3,219.11 |
| Point 10 | 481.97383 | 3,219.11 |
| Point 11 | 470.34694 | 3,257.4466 |
| Point 12 | 442.16709 | 3,257.4466 |
| Point 13 | 675 | 3,226.0714 |
| Point 14 | 675 | 3,222.0622 |
| Point 15 | 501.24367 | 3,225.0965 |
| Point 16 | 492.26398 | 3,219.11 |
| Point 17 | 480.78725 | 3,257.4466 |
| Point 18 | 489.22798 | 3,229.3108 |
| Point 19 | 300.00135 | 3,245.9509 |
| Point 20 | 242 | 3,227 |
| Point 21 | 224.4454 | 3,223 |
| Point 22 | 370 | 3,218.7 |

| | | |
|---|---|---|
| Point 23 | 452.95523 | 3,215.309 |
| Point 24 | 442.90022 | 3,217.82 |
| Point 25 | 442.89993 | 3,219.11 |
| Point 26 | 370 | 3,223.69 |
| Point 27 | 461 | 3,213.3 |
| Point 28 | 487 | 3,212.81 |
| Point 29 | 675 | 3,212.5758 |
| Point 30 | 343 | 3,260 |
| Point 31 | 370 | 3,260.7 |
| Point 32 | 442.89061 | 3,261.7413 |
| Point 33 | 461 | 3,262 |
| Point 34 | 487 | 3,262.81 |
| Point 35 | 493 | 3,262.5 |
| Point 36 | 600 | 3,232 |
| Point 37 | 620 | 3,231 |
| Point 38 | 640 | 3,232 |
| Point 39 | 675 | 3,239 |
| Point 40 | 457.8619 | 3,219 |
| Point 41 | 460.5095 | 3,219.11 |
| Point 42 | 675 | 3,195 |
| Point 43 | 74 | 3,257 |
| Point 44 | 266 | 3,260 |
| Point 45 | 278 | 3,266 |
| Point 46 | 74 | 3,234.6288 |
| Point 47 | 318.00001 | 3,265.975 |
| Point 48 | 74 | 3,227 |
| Point 49 | 74 | 3,223 |
| Point 50 | 74 | 3,195 |
| Point 51 | 460.33972 | 3,195 |
| Point 52 | 460.33972 | 3,213.4649 |
| Point 53 | 460.33972 | 3,219.1029 |
| Point 54 | 457.8619 | 3,214.0837 |
| Point 55 | 457.8619 | 3,195 |
| Point 56 | 675 | 3,206 |
| Point 57 | 460.33972 | 3,206 |

| | | |
|---|---|---|
| Point 58 | 459 | 3,237 |
| Point 59 | 459 | 3,230 |
| Point 60 | 74 | 3,237 |
| Point 61 | 435.81141 | 3,237 |
| Point 62 | 272.60612 | 3,237 |
| Point 63 | 123.84773 | 3,237 |
| Point 64 | 189.16667 | 3,227 |
| Point 65 | 177.83333 | 3,223 |
| Point 66 | 74 | 3,286 |
| Point 67 | 378.07507 | 3,286 |
| Point 68 | 369.07506 | 3,283 |
| Point 69 | 74 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Clinker Fill | 1,30,31,32,33,34,35,2,3,67,68,47 | 3,065.3 |
| Region 2 | Core - Sat. | 7,8,9,25,40,6,59,58,61 | 474.26 |
| Region 3 | Drain | 13,14,15,16,10,11,17,18 | 1,172.9 |
| Region 4 | Native Clinker | 25,24,23,54,40 | 46.429 |
| Region 5 | Embankment Fill - Sat. | 20,62,61,7,8,9,26 | 2,305.9 |
| Region 6 | Bottom Ash Fill | 4,19,30,1 | 673.66 |
| Region 7 | Paste | 43,60,63,4,1,44 | 3,824.6 |
| Region 8 | Paste | 4,19,62,63 | 629.71 |
| Region 9 | Clinker Ash - Sat. | 21,22,23,24,25,9,26,20,64,65 | 1,135.4 |
| Region 10 | Bedrock | 50,49,65,21,22,23,54,55 | 9,897.1 |
| Region 11 | Native Clinker | 27,28,29,14,15,16,10,41,53,52 | 2,171.1 |
| Region 12 | Cutoff Wall | 52,53,5,59,6,40,54,55,51,57 | 86.724 |
| Region 13 | Bedrock | 51,42,56,29,28,27,52,57 | 3,807.8 |
| Region 14 | Core | 5,53,41,10,11,12,61,58,59 | 1,052.4 |
| Region 15 | Embankment Fill | 19,30,31,32,33,34,35,36,37,38,39,13,18,17,11,12,61,62 | 6,115.4 |
| Region 16 | Paste - Sat. | 20,64,48,46,63,62 | 1,773.9 |
| Region 17 | Paste - Sat. | 46,63,60 | 59.099 |
| Region 18 | Fly Ash Slurry - Sat. | 48,49,65,64 | 438 |
| Region 19 | Bottom Ash Fill | 47,45,44,1 | 204.91 |

| | | | |
|---|---|---|---|
| Region 20 | Paste | 68,47,45,44,43,69 | 6,059.3 |

## Current Slip Surface

Slip Surface: 1,587
F of S: 2.35
Volume: 2,462.1934 ft³
Weight: 311,849.82 lbs
Resisting Moment: 50,762,901 lbs-ft
Activating Moment: 21,578,148 lbs-ft
Resisting Force: 193,911.95 lbs
Activating Force: 82,444.221 lbs
F of S Rank (Analysis): 1 of 1,755 slip surfaces
F of S Rank (Query): 1 of 1,755 slip surfaces
Exit: (591.75695, 3,234.3497) ft
Entry: (406.77429, 3,290) ft
Radius: 246.09021 ft
Center: (564.47221, 3,478.9226) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 408.42468 | 3,288.6465 | -3,222.7411 | 122.13515 | 102.48356 | 50 |
| Slice 2 | 413.28489 | 3,284.7932 | -2,982.2954 | 401.45096 | 336.85735 | 50 |
| Slice 3 | 419.70451 | 3,279.9579 | -2,680.5752 | 673.0334 | 564.74208 | 50 |
| Slice 4 | 426.12412 | 3,275.4401 | -2,398.6627 | 915.50033 | 768.19599 | 50 |
| Slice 5 | 432.54374 | 3,271.219 | -2,135.263 | 1,132.8823 | 950.60108 | 50 |
| Slice 6 | 438.96336 | 3,267.2767 | -1,889.2664 | 1,328.3409 | 1,114.6103 | 50 |
| Slice 7 | 445.38298 | 3,263.598 | -1,659.7153 | 1,504.2375 | 1,262.2051 | 50 |
| Slice 8 | 452.29639 | 3,259.9257 | -1,430.5621 | 1,698.8629 | 1,103.2545 | 0 |
| Slice 9 | 456.59665 | 3,257.7376 | -70.77862 | 1,782.9787 | 1,157.8799 | 0 |
| Slice 10 | 459.09665 | 3,256.5447 | -100.68411 | 1,840.0939 | 999.08949 | 0 |
| Slice 11 | 462 | 3,255.1848 | -135.49162 | 1,885.9895 | 1,024.0087 | 0 |
| Slice 12 | 466.67347 | 3,253.1356 | -2,941.2623 | 1,948.4879 | 1,057.9426 | 0 |
| Slice 13 | 471.36859 | 3,251.1269 | -2,815.9185 | 2,024.1709 | 1,099.0351 | 0 |
| Slice 14 | 476.58875 | 3,249.1038 | -2,689.678 | 2,088.0111 | 1,462.0411 | 0 |
| Slice 15 | 482.45652 | 3,246.9082 | -2,552.6727 | 2,130.9922 | 1,492.1368 | 0 |
| Slice 16 | 485.56289 | 3,245.8316 | -2,485.4937 | 2,131.8433 | 1,384.4352 | 0 |
| Slice 17 | 490 | 3,244.3925 | -2,395.6924 | 2,153.8964 | 1,398.7567 | 0 |
| Slice 18 | 496.08615 | 3,242.547 | -2,280.5349 | 2,192.245 | 1,423.6605 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 19 | 502.25846 | 3,240.8477 | -2,174.4965 | 2,232.6806 | 1,449.9197 | 0 |
| Slice 20 | 508.43077 | 3,239.3194 | -2,079.1304 | 2,252.6337 | 1,462.8775 | 0 |
| Slice 21 | 514.60308 | 3,237.9589 | -1,994.2333 | 2,250.1821 | 1,461.2854 | 0 |
| Slice 22 | 520.77539 | 3,236.7633 | -1,919.6287 | 2,223.4181 | 1,443.9046 | 0 |
| Slice 23 | 526.9477 | 3,235.7302 | -1,855.1646 | 2,170.5868 | 1,409.5956 | 0 |
| Slice 24 | 533.12001 | 3,234.8576 | -1,800.7122 | 2,090.2285 | 1,357.4103 | 0 |
| Slice 25 | 539.29232 | 3,234.1437 | -1,756.1643 | 1,981.3133 | 1,286.6799 | 0 |
| Slice 26 | 545.46463 | 3,233.5871 | -1,721.4344 | 1,843.3565 | 1,197.0897 | 0 |
| Slice 27 | 551.63694 | 3,233.1868 | -1,696.4557 | 1,676.5014 | 1,088.7327 | 0 |
| Slice 28 | 557.80925 | 3,232.942 | -1,681.1807 | 1,481.559 | 962.13566 | 0 |
| Slice 29 | 563.98156 | 3,232.8522 | -1,675.5804 | 1,259.9978 | 818.25216 | 0 |
| Slice 30 | 570.15387 | 3,232.9174 | -1,679.644 | 1,013.8793 | 658.42089 | 0 |
| Slice 31 | 576.32618 | 3,233.1375 | -1,693.3795 | 745.74069 | 484.28967 | 0 |
| Slice 32 | 582.49849 | 3,233.513 | -1,716.8127 | 458.43299 | 297.70987 | 0 |
| Slice 33 | 588.6708 | 3,234.0447 | -1,749.9883 | 154.92343 | 100.60845 | 0 |

# Static Safety Factor: Maximum Surcharge Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/13/2016
Time: 8:34:19 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam D-D.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:34:23 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Core - Sat.**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Ash - Sat.**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 950 psf
Phi': 26.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (364.99992, 3,283) ft
Left-Zone Right Coordinate: (410.07508, 3,290) ft
Left-Zone Increment: 14
Right Projection: Range
Right-Zone Left Coordinate: (526.29458, 3,253.0095) ft
Right-Zone Right Coordinate: (640, 3,232) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits
Left Coordinate: (74, 3,283) ft

Right Coordinate: (675, 3,239) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 74 | 3,237 |
| Coordinate 2 | 456 | 3,237 |
| Coordinate 3 | 463 | 3,206 |
| Coordinate 4 | 675 | 3,206 |

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 74 | 3,286 |
| | 378.07507 | 3,286 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 303.07508 | 3,261 |
| Point 2 | 410.07508 | 3,290 |
| Point 3 | 390.07508 | 3,290 |
| Point 4 | 249.99957 | 3,243.0009 |
| Point 5 | 460.33972 | 3,230 |
| Point 6 | 457.8619 | 3,230 |
| Point 7 | 431.84708 | 3,224.2465 |
| Point 8 | 423.03161 | 3,224.3328 |
| Point 9 | 430.80994 | 3,219.11 |
| Point 10 | 481.97383 | 3,219.11 |
| Point 11 | 470.34694 | 3,257.4466 |
| Point 12 | 442.16709 | 3,257.4466 |
| Point 13 | 675 | 3,226.0714 |

| | | |
|---|---|---|
| Point 14 | 675 | 3,222.0622 |
| Point 15 | 501.24367 | 3,225.0965 |
| Point 16 | 492.26398 | 3,219.11 |
| Point 17 | 480.78725 | 3,257.4466 |
| Point 18 | 489.22798 | 3,229.3108 |
| Point 19 | 300.00135 | 3,245.9509 |
| Point 20 | 242 | 3,227 |
| Point 21 | 224.4454 | 3,223 |
| Point 22 | 370 | 3,218.7 |
| Point 23 | 452.95523 | 3,215.309 |
| Point 24 | 442.90022 | 3,217.82 |
| Point 25 | 442.89993 | 3,219.11 |
| Point 26 | 370 | 3,223.69 |
| Point 27 | 461 | 3,213.3 |
| Point 28 | 487 | 3,212.81 |
| Point 29 | 675 | 3,212.5758 |
| Point 30 | 343 | 3,260 |
| Point 31 | 370 | 3,260.7 |
| Point 32 | 442.89061 | 3,261.7413 |
| Point 33 | 461 | 3,262 |
| Point 34 | 487 | 3,262.81 |
| Point 35 | 493 | 3,262.5 |
| Point 36 | 600 | 3,232 |
| Point 37 | 620 | 3,231 |
| Point 38 | 640 | 3,232 |
| Point 39 | 675 | 3,239 |
| Point 40 | 457.8619 | 3,219 |
| Point 41 | 460.5095 | 3,219.11 |
| Point 42 | 675 | 3,195 |
| Point 43 | 74 | 3,257 |
| Point 44 | 266 | 3,260 |
| Point 45 | 278 | 3,266 |
| Point 46 | 74 | 3,234.6288 |
| Point 47 | 318.00001 | 3,265.975 |
| Point 48 | 74 | 3,227 |

| | | |
|---|---|---|
| Point 49 | 74 | 3,223 |
| Point 50 | 74 | 3,195 |
| Point 51 | 460.33972 | 3,195 |
| Point 52 | 460.33972 | 3,213.4649 |
| Point 53 | 460.33972 | 3,219.1029 |
| Point 54 | 457.8619 | 3,214.0837 |
| Point 55 | 457.8619 | 3,195 |
| Point 56 | 675 | 3,206 |
| Point 57 | 460.33972 | 3,206 |
| Point 58 | 459 | 3,237 |
| Point 59 | 459 | 3,230 |
| Point 60 | 74 | 3,237 |
| Point 61 | 435.81141 | 3,237 |
| Point 62 | 272.60612 | 3,237 |
| Point 63 | 123.84773 | 3,237 |
| Point 64 | 189.16667 | 3,227 |
| Point 65 | 177.83333 | 3,223 |
| Point 66 | 74 | 3,286 |
| Point 67 | 378.07507 | 3,286 |
| Point 68 | 369.07506 | 3,283 |
| Point 69 | 74 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Clinker Fill | 1,30,31,32,33,34,35,2,3,67,68,47 | 3,065.3 |
| Region 2 | Core - Sat. | 7,8,9,25,40,6,59,58,61 | 474.26 |
| Region 3 | Drain | 13,14,15,16,10,11,17,18 | 1,172.9 |
| Region 4 | Native Clinker | 25,24,23,54,40 | 46.429 |
| Region 5 | Embankment Fill - Sat. | 20,62,61,7,8,9,26 | 2,305.9 |
| Region 6 | Bottom Ash Fill | 4,19,30,1 | 673.66 |
| Region 7 | Paste | 43,60,63,4,1,44 | 3,824.6 |
| Region 8 | Paste | 4,19,62,63 | 629.71 |
| Region 9 | Clinker Ash - Sat. | 21,22,23,24,25,9,26,20,64,65 | 1,135.4 |
| Region 10 | Bedrock | 50,49,65,21,22,23,54,55 | 9,897.1 |
| Region 11 | Native Clinker | 27,28,29,14,15,16,10,41,53,52 | 2,171.1 |

| | | | |
|---|---|---|---|
| Region 12 | Cutoff Wall | 52,53,5,59,6,40,54,55,51,57 | 86.724 |
| Region 13 | Bedrock | 51,42,56,29,28,27,52,57 | 3,807.8 |
| Region 14 | Core | 5,53,41,10,11,12,61,58,59 | 1,052.4 |
| Region 15 | Embankment Fill | 19,30,31,32,33,34,35,36,37,38,39,13,18,17,11,12,61,62 | 6,115.4 |
| Region 16 | Paste - Sat. | 20,64,48,46,63,62 | 1,773.9 |
| Region 17 | Paste - Sat. | 46,63,60 | 59.099 |
| Region 18 | Fly Ash Slurry - Sat. | 48,49,65,64 | 438 |
| Region 19 | Bottom Ash Fill | 47,45,44,1 | 204.91 |
| Region 20 | Paste | 68,47,45,44,43,69 | 6,059.3 |

## Current Slip Surface

Slip Surface: 1,587
F of S: 2.35
Volume: 2,462.1935 ft³
Weight: 311,849.83 lbs
Resisting Moment: 50,762,902 lbs-ft
Activating Moment: 21,578,148 lbs-ft
Resisting Force: 193,911.95 lbs
Activating Force: 82,444.223 lbs
F of S Rank (Analysis): 1 of 1,755 slip surfaces
F of S Rank (Query): 1 of 1,755 slip surfaces
Exit: (591.75695, 3,234.3497) ft
Entry: (406.77429, 3,290) ft
Radius: 246.09021 ft
Center: (564.47221, 3,478.9226) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 408.42468 | 3,288.6465 | -3,222.7411 | 122.13518 | 102.48358 | 50 |
| Slice 2 | 413.28489 | 3,284.7932 | -2,982.2954 | 401.45101 | 336.85739 | 50 |
| Slice 3 | 419.70451 | 3,279.9579 | -2,680.5751 | 673.03344 | 564.74211 | 50 |
| Slice 4 | 426.12412 | 3,275.4401 | -2,398.6627 | 915.50037 | 768.19602 | 50 |
| Slice 5 | 432.54374 | 3,271.219 | -2,135.263 | 1,132.8823 | 950.60111 | 50 |
| Slice 6 | 438.96336 | 3,267.2767 | -1,889.2664 | 1,328.3409 | 1,114.6104 | 50 |
| Slice 7 | 445.38297 | 3,263.598 | -1,659.7153 | 1,504.2375 | 1,262.2052 | 50 |
| Slice 8 | 452.29639 | 3,259.9257 | -1,430.5621 | 1,698.863 | 1,103.2545 | 0 |
| Slice 9 | 456.59665 | 3,257.7376 | -70.778615 | 1,782.9787 | 1,157.8799 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 10 | 459.09665 | 3,256.5447 | -100.68411 | 1,840.094 | 999.08951 | 0 |
| Slice 11 | 462 | 3,255.1848 | -135.49162 | 1,885.9895 | 1,024.0088 | 0 |
| Slice 12 | 466.67347 | 3,253.1356 | -2,941.2623 | 1,948.488 | 1,057.9426 | 0 |
| Slice 13 | 471.36859 | 3,251.1269 | -2,815.9185 | 2,024.171 | 1,099.0352 | 0 |
| Slice 14 | 476.58875 | 3,249.1038 | -2,689.6779 | 2,088.0111 | 1,462.0411 | 0 |
| Slice 15 | 482.45652 | 3,246.9082 | -2,552.6727 | 2,130.9922 | 1,492.1368 | 0 |
| Slice 16 | 485.56289 | 3,245.8316 | -2,485.4937 | 2,131.8433 | 1,384.4352 | 0 |
| Slice 17 | 490 | 3,244.3925 | -2,395.6924 | 2,153.8964 | 1,398.7567 | 0 |
| Slice 18 | 496.08615 | 3,242.547 | -2,280.5349 | 2,192.245 | 1,423.6605 | 0 |
| Slice 19 | 502.25846 | 3,240.8477 | -2,174.4965 | 2,232.6806 | 1,449.9197 | 0 |
| Slice 20 | 508.43077 | 3,239.3194 | -2,079.1304 | 2,252.6338 | 1,462.8775 | 0 |
| Slice 21 | 514.60308 | 3,237.9589 | -1,994.2333 | 2,250.1821 | 1,461.2854 | 0 |
| Slice 22 | 520.77539 | 3,236.7633 | -1,919.6287 | 2,223.4181 | 1,443.9046 | 0 |
| Slice 23 | 526.9477 | 3,235.7302 | -1,855.1646 | 2,170.5869 | 1,409.5956 | 0 |
| Slice 24 | 533.12001 | 3,234.8576 | -1,800.7121 | 2,090.2285 | 1,357.4103 | 0 |
| Slice 25 | 539.29232 | 3,234.1437 | -1,756.1642 | 1,981.3133 | 1,286.6799 | 0 |
| Slice 26 | 545.46463 | 3,233.5871 | -1,721.4344 | 1,843.3565 | 1,197.0897 | 0 |
| Slice 27 | 551.63694 | 3,233.1868 | -1,696.4557 | 1,676.5014 | 1,088.7327 | 0 |
| Slice 28 | 557.80925 | 3,232.942 | -1,681.1807 | 1,481.559 | 962.13566 | 0 |
| Slice 29 | 563.98156 | 3,232.8522 | -1,675.5804 | 1,259.9978 | 818.25217 | 0 |
| Slice 30 | 570.15387 | 3,232.9174 | -1,679.644 | 1,013.8793 | 658.42089 | 0 |
| Slice 31 | 576.32618 | 3,233.1375 | -1,693.3795 | 745.7407 | 484.28967 | 0 |
| Slice 32 | 582.49849 | 3,233.513 | -1,716.8127 | 458.433 | 297.70987 | 0 |
| Slice 33 | 588.6708 | 3,234.0447 | -1,749.9883 | 154.92343 | 100.60845 | 0 |

# Seismic Safety Factor - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/13/2016
Time: 8:34:19 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam D-D.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:34:22 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - Outboard [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Native Clinker
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Cutoff Wall
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Ash - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 760 psf
Phi': 21.28 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Core - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion': 0 psf
- Phi': 26.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 103.4 pcf
- Cohesion': 560 psf
- Phi': 22.4 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Native Clinker - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 140 pcf
- Cohesion': 0 psf
- Phi': 32 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Paste - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion': 0 psf
- Phi': 28 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

**Paste - Sat. - Seismic**
- Model: Mohr-Coulomb
- Unit Weight: 112 pcf
- Cohesion': 0 psf
- Phi': 28 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

## Slip Surface Limits
- Left Coordinate: (74, 3,283) ft
- Right Coordinate: (675, 3,239) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 74 | 3,237 |
| Coordinate 2 | 456 | 3,237 |
| Coordinate 3 | 463 | 3,206 |
| Coordinate 4 | 675 | 3,206 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 303.07508 | 3,261 |
| Point 2 | 410.07508 | 3,290 |
| Point 3 | 390.07508 | 3,290 |
| Point 4 | 249.99957 | 3,243.0009 |
| Point 5 | 460.33972 | 3,230 |
| Point 6 | 457.8619 | 3,230 |
| Point 7 | 431.84708 | 3,224.2465 |
| Point 8 | 423.03161 | 3,224.3328 |
| Point 9 | 430.80994 | 3,219.11 |
| Point 10 | 481.97383 | 3,219.11 |
| Point 11 | 470.34694 | 3,257.4466 |
| Point 12 | 442.16709 | 3,257.4466 |
| Point 13 | 675 | 3,226.0714 |
| Point 14 | 675 | 3,222.0622 |
| Point 15 | 501.24367 | 3,225.0965 |
| Point 16 | 492.26398 | 3,219.11 |
| Point 17 | 480.78725 | 3,257.4466 |
| Point 18 | 489.22798 | 3,229.3108 |
| Point 19 | 300.00135 | 3,245.9509 |
| Point 20 | 242 | 3,227 |
| Point 21 | 224.4454 | 3,223 |

| | | |
|---|---|---|
| Point 22 | 370 | 3,218.7 |
| Point 23 | 452.95523 | 3,215.309 |
| Point 24 | 442.90022 | 3,217.82 |
| Point 25 | 442.89993 | 3,219.11 |
| Point 26 | 370 | 3,223.69 |
| Point 27 | 461 | 3,213.3 |
| Point 28 | 487 | 3,212.81 |
| Point 29 | 675 | 3,212.5758 |
| Point 30 | 343 | 3,260 |
| Point 31 | 370 | 3,260.7 |
| Point 32 | 442.89061 | 3,261.7413 |
| Point 33 | 461 | 3,262 |
| Point 34 | 487 | 3,262.81 |
| Point 35 | 493 | 3,262.5 |
| Point 36 | 600 | 3,232 |
| Point 37 | 620 | 3,231 |
| Point 38 | 640 | 3,232 |
| Point 39 | 675 | 3,239 |
| Point 40 | 457.8619 | 3,219 |
| Point 41 | 460.5095 | 3,219.11 |
| Point 42 | 675 | 3,195 |
| Point 43 | 74 | 3,257 |
| Point 44 | 266 | 3,260 |
| Point 45 | 278 | 3,266 |
| Point 46 | 74 | 3,234.6288 |
| Point 47 | 318.00001 | 3,265.975 |
| Point 48 | 74 | 3,227 |
| Point 49 | 74 | 3,223 |
| Point 50 | 74 | 3,195 |
| Point 51 | 460.33972 | 3,195 |
| Point 52 | 460.33972 | 3,213.4649 |
| Point 53 | 460.33972 | 3,219.1029 |
| Point 54 | 457.8619 | 3,214.0837 |
| Point 55 | 457.8619 | 3,195 |
| Point 56 | 675 | 3,206 |

| | | |
|---|---|---|
| Point 57 | 460.33972 | 3,206 |
| Point 58 | 459 | 3,237 |
| Point 59 | 459 | 3,230 |
| Point 60 | 74 | 3,237 |
| Point 61 | 435.81141 | 3,237 |
| Point 62 | 272.60612 | 3,237 |
| Point 63 | 123.84773 | 3,237 |
| Point 64 | 189.16667 | 3,227 |
| Point 65 | 177.83333 | 3,223 |
| Point 66 | 74 | 3,286 |
| Point 67 | 378.07507 | 3,286 |
| Point 68 | 369.07506 | 3,283 |
| Point 69 | 74 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Clinker Fill - Seismic | 1,30,31,32,33,34,35,2,3,67,68,47 | 3,065.3 |
| Region 2 | Core - Sat. - Seismic | 7,8,9,25,40,6,59,58,61 | 474.26 |
| Region 3 | Drain - Seismic | 13,14,15,16,10,11,17,18 | 1,172.9 |
| Region 4 | Native Clinker | 25,24,23,54,40 | 46.429 |
| Region 5 | Embankment Fill - Sat. - Seismic | 20,62,61,7,8,9,26 | 2,305.9 |
| Region 6 | Bottom Ash Fill - Seismic | 4,19,30,1 | 673.66 |
| Region 7 | Paste - Seismic | 43,60,63,4,1,44 | 3,824.6 |
| Region 8 | Paste - Seismic | 4,19,62,63 | 629.71 |
| Region 9 | Clinker Ash - Sat. - Seismic | 21,22,23,24,25,9,26,20,64,65 | 1,135.4 |
| Region 10 | Bedrock | 50,49,65,21,22,23,54,55 | 9,897.1 |
| Region 11 | Native Clinker - Seismic | 27,28,29,14,15,16,10,41,53,52 | 2,171.1 |
| Region 12 | Cutoff Wall | 52,53,5,59,6,40,54,55,51,57 | 86.724 |
| Region 13 | Bedrock | 51,42,56,29,28,27,52,57 | 3,807.8 |
| Region 14 | Core - Seismic | 5,53,41,10,11,12,61,58,59 | 1,052.4 |
| Region 15 | Embankment Fill - Seismic | 19,30,31,32,33,34,35,36,37,38,39,13,18,17,11,12,61,62 | 6,115.4 |
| Region 16 | Paste - Sat. - Seismic | 20,64,48,46,63,62 | 1,773.9 |
| Region 17 | Paste - Sat. - Seismic | 46,63,60 | 59.099 |
| Region 18 | Fly Ash Slurry - Sat. - Seismic | 48,49,65,64 | 438 |

| | | | |
|---|---|---|---|
| Region 19 | Bottom Ash Fill - Seismic | 47,45,44,1 | 204.91 |
| Region 20 | Paste - Seismic | 68,47,45,44,43,69 | 6,059.3 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.62
Volume: 2,462.1934 ft³
Weight: 311,849.82 lbs
Resisting Moment: 38,336,218 lbs-ft
Activating Moment: 23,674,745 lbs-ft
Resisting Force: 146,641.82 lbs
Activating Force: 90,499.831 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (591.75695, 3,234.3497) ft
Entry: (406.77429, 3,290) ft
Radius: 246.09021 ft
Center: (564.47221, 3,478.9226) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 408.42468 | 3,288.6465 | -3,222.7411 | 117.75292 | 73.580188 | 40 |
| Slice 2 | 413.28489 | 3,284.7932 | -2,982.2954 | 391.5938 | 244.69497 | 40 |
| Slice 3 | 419.70451 | 3,279.9579 | -2,680.5751 | 657.23253 | 410.68447 | 40 |
| Slice 4 | 426.12412 | 3,275.4401 | -2,398.6627 | 894.07419 | 558.67956 | 40 |
| Slice 5 | 432.54374 | 3,271.219 | -2,135.263 | 1,106.4454 | 691.3838 | 40 |
| Slice 6 | 438.96336 | 3,267.2767 | -1,889.2664 | 1,297.7448 | 810.92098 | 40 |
| Slice 7 | 445.38298 | 3,263.598 | -1,659.7153 | 1,470.522 | 918.8841 | 40 |
| Slice 8 | 452.29639 | 3,259.9257 | -1,430.5622 | 1,658.3613 | 823.21768 | 0 |
| Slice 9 | 456.59665 | 3,257.7376 | -70.77862 | 1,741.4254 | 864.45107 | 0 |
| Slice 10 | 459.09665 | 3,256.5447 | -100.68411 | 1,795.8656 | 754.91239 | 0 |
| Slice 11 | 462 | 3,255.1848 | -135.49162 | 1,841.4619 | 774.07929 | 0 |
| Slice 12 | 466.67347 | 3,253.1356 | -2,941.2623 | 1,904.2435 | 800.47025 | 0 |
| Slice 13 | 471.36859 | 3,251.1269 | -2,815.9185 | 1,980.5101 | 832.5298 | 0 |
| Slice 14 | 476.58875 | 3,249.1038 | -2,689.678 | 2,051.1721 | 1,090.6276 | 0 |
| Slice 15 | 482.45652 | 3,246.9082 | -2,552.6727 | 2,098.1235 | 1,115.592 | 0 |
| Slice 16 | 485.56289 | 3,245.8316 | -2,485.4937 | 2,099.9049 | 1,042.4018 | 0 |
| Slice 17 | 490 | 3,244.3925 | -2,395.6924 | 2,125.7374 | 1,055.2252 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 18 | 496.08615 | 3,242.547 | -2,280.5349 | 2,169.6867 | 1,077.0419 | 0 |
| Slice 19 | 502.25846 | 3,240.8477 | -2,174.4965 | 2,216.2662 | 1,100.1641 | 0 |
| Slice 20 | 508.43077 | 3,239.3194 | -2,079.1304 | 2,242.7554 | 1,113.3135 | 0 |
| Slice 21 | 514.60308 | 3,237.9589 | -1,994.2333 | 2,246.8743 | 1,115.3581 | 0 |
| Slice 22 | 520.77539 | 3,236.7633 | -1,919.6287 | 2,226.3365 | 1,105.163 | 0 |
| Slice 23 | 526.9477 | 3,235.7302 | -1,855.1646 | 2,179.0155 | 1,081.6727 | 0 |
| Slice 24 | 533.12001 | 3,234.8576 | -1,800.7121 | 2,103.1204 | 1,043.998 | 0 |
| Slice 25 | 539.29232 | 3,234.1437 | -1,756.1643 | 1,997.3635 | 991.49983 | 0 |
| Slice 26 | 545.46463 | 3,233.5871 | -1,721.4344 | 1,861.1023 | 923.8592 | 0 |
| Slice 27 | 551.63694 | 3,233.1868 | -1,696.4558 | 1,694.4457 | 841.13013 | 0 |
| Slice 28 | 557.80925 | 3,232.942 | -1,681.1807 | 1,498.3028 | 743.76397 | 0 |
| Slice 29 | 563.98156 | 3,232.8522 | -1,675.5804 | 1,274.3719 | 632.60369 | 0 |
| Slice 30 | 570.15387 | 3,232.9174 | -1,679.644 | 1,025.0591 | 508.84377 | 0 |
| Slice 31 | 576.32618 | 3,233.1375 | -1,693.3794 | 753.33495 | 373.95872 | 0 |
| Slice 32 | 582.49849 | 3,233.513 | -1,716.8126 | 462.53101 | 229.60239 | 0 |
| Slice 33 | 588.6708 | 3,234.0447 | -1,749.9883 | 156.09812 | 77.487778 | 0 |

# Static Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 652
Date: 10/13/2016
Time: 8:52:12 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam E-E.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:52:15 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Sat.**

Model: Mohr-Coulomb
Unit Weight: 124 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (288.56298, 3,247.5361) ft
Left-Zone Right Coordinate: (361.4372, 3,255.8245) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (437.25616, 3,281.0974) ft
Right-Zone Right Coordinate: (483.96399, 3,290) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (0, 3,242) ft
Right Coordinate: (696, 3,230) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Coordinate 1 | 0 | 3,238 |
| Coordinate 2 | 516.76109 | 3,238 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 599.48311 | 3,252.1509 |
| Point 2 | 574.93769 | 3,264.0168 |
| Point 3 | 569.82513 | 3,265.12 |
| Point 4 | 559.54194 | 3,262.5653 |
| Point 5 | 525 | 3,261 |
| Point 6 | 433.38681 | 3,261.5 |
| Point 7 | 418 | 3,260 |
| Point 8 | 376.82417 | 3,247.5976 |
| Point 9 | 331.98039 | 3,233.9958 |
| Point 10 | 433.38681 | 3,236.5 |
| Point 11 | 470.66758 | 3,236.5 |
| Point 12 | 494.91606 | 3,245.3509 |
| Point 13 | 489.4627 | 3,248.9865 |
| Point 14 | 500.23564 | 3,248.9775 |
| Point 15 | 503.1 | 3,257.9502 |
| Point 16 | 527.67985 | 3,257.9502 |
| Point 17 | 538.0118 | 3,257.831 |
| Point 18 | 539.40151 | 3,253.1986 |
| Point 19 | 610.33845 | 3,247.9553 |
| Point 20 | 532.02078 | 3,243 |
| Point 21 | 542.31094 | 3,243 |
| Point 22 | 551.29063 | 3,248.9865 |
| Point 23 | 519.23891 | 3,243 |
| Point 24 | 519.23891 | 3,248 |
| Point 25 | 516.76109 | 3,248 |
| Point 26 | 516.76109 | 3,243 |
| Point 27 | 498.44239 | 3,243 |
| Point 28 | 519.23891 | 3,223.2182 |
| Point 29 | 696 | 3,221 |
| Point 30 | 696 | 3,230 |

| | | |
|---|---|---|
| Point 31 | 632.96626 | 3,240.3258 |
| Point 32 | 516.76109 | 3,223.312 |
| Point 33 | 434.75137 | 3,227.3832 |
| Point 34 | 425.18336 | 3,226.923 |
| Point 35 | 313.81983 | 3,228.6 |
| Point 36 | 300.00292 | 3,223.99 |
| Point 37 | 0 | 3,228.7723 |
| Point 38 | 0 | 3,228.6 |
| Point 39 | 256.77031 | 3,228.6 |
| Point 40 | 329.69277 | 3,245.2431 |
| Point 41 | 373.96373 | 3,260 |
| Point 42 | 543.96416 | 3,270 |
| Point 43 | 463.96399 | 3,290 |
| Point 44 | 483.96399 | 3,290 |
| Point 45 | 0 | 3,224 |
| Point 46 | 696 | 3,215 |
| Point 47 | 0 | 3,215 |
| Point 48 | 125 | 3,246 |
| Point 49 | 118 | 3,243 |
| Point 50 | 337.96352 | 3,248 |
| Point 51 | 0 | 3,242 |
| Point 52 | 0 | 3,238 |
| Point 53 | 516.76109 | 3,238 |
| Point 54 | 474.77707 | 3,238 |
| Point 55 | 345.18184 | 3,238 |
| Point 56 | 184.70906 | 3,238 |
| Point 57 | 0 | 3,286 |
| Point 58 | 451.96396 | 3,286 |
| Point 59 | 442.96393 | 3,283 |
| Point 60 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,4,5,6,7,8,55,54,12,13,14,15,16,17,18 | 3,209.9 |
| Region 2 | Drain | 19,1,18,17,16,20,21,22 | 446.71 |

| | | | |
|---|---|---|---|
| Region 3 | Core | 16,20,23,24,25,26,27,12,13,14,15 | 455.07 |
| Region 4 | Native Clinker | 19,22,21,20,23,28,29,30,31 | 3,574.4 |
| Region 5 | Native Clinker | 32,53,54,11,33,34 | 855.29 |
| Region 6 | Cutoff Wall | 28,23,24,25,26,53,32 | 61.289 |
| Region 7 | Foundation Soil - Sat. | 33,11,10,9,35,36,34 | 1,273.1 |
| Region 8 | Paste | 8,40,56,55 | 770.08 |
| Region 9 | Bottom Ash Fill | 41,50,40,8,7 | 568.72 |
| Region 10 | Clinker Fill | 41,7,6,5,4,3,42,44,43,58,59 | 3,118.4 |
| Region 11 | Fly Ash Slurry - Sat. | 35,36,45,38,39 | 1,413.4 |
| Region 12 | Bedrock | 45,36,34,32,28,29,46,47 | 6,211.1 |
| Region 13 | Paste - Sat. | 37,52,56 | 852.22 |
| Region 14 | Native Clinker | 26,27,12,54,53 | 187.39 |
| Region 15 | Embankment Fill - Sat. | 9,10,11,54,55 | 311.65 |
| Region 16 | Paste - Sat. | 37,38,39,35,9,55,56 | 2,245.8 |
| Region 17 | Paste | 51,49,48,50,40,56,52 | 1,896.8 |
| Region 18 | | 59,41,50,48,49,51,60 | 14,553 |

## Current Slip Surface

Slip Surface: 868
F of S: 2.20
Volume: 1,517.8553 ft³
Weight: 172,387.35 lbs
Resisting Moment: 14,833,322 lbs-ft
Activating Moment: 6,766,940.3 lbs-ft
Resisting Force: 109,341.98 lbs
Activating Force: 49,738.757 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (331.81298, 3,247.9422) ft
Entry: (456.29012, 3,287.442) ft
Radius: 124.38891 ft
Center: (362.02919, 3,368.6053) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 333.56556 | 3,247.5302 | -594.686 | 49.014056 | 34.320012 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 2 | 336.64083 | 3,246.8424 | -551.76701 | 125.39746 | 105.22096 | 0 |
| Slice 3 | 339.93877 | 3,246.2101 | -512.31198 | 257.50792 | 216.0748 | 0 |
| Slice 4 | 343.91057 | 3,245.5596 | -471.72106 | 464.14925 | 325.00081 | 0 |
| Slice 5 | 347.90366 | 3,245.0374 | -439.13414 | 669.28193 | 468.63625 | 0 |
| Slice 6 | 351.89675 | 3,244.646 | -414.70888 | 858.30332 | 600.99046 | 0 |
| Slice 7 | 355.88984 | 3,244.3841 | -398.36805 | 1,028.5032 | 720.16568 | 0 |
| Slice 8 | 359.88293 | 3,244.251 | -390.06053 | 1,177.667 | 824.6113 | 0 |
| Slice 9 | 363.87602 | 3,244.2462 | -389.76048 | 1,304.2058 | 913.2147 | 0 |
| Slice 10 | 367.89536 | 3,244.3713 | -397.5707 | 1,411.625 | 916.72001 | 0 |
| Slice 11 | 371.94094 | 3,244.6286 | -413.62202 | 1,514.3098 | 983.40431 | 0 |
| Slice 12 | 375.39395 | 3,244.9448 | -433.35863 | 1,601.2938 | 1,039.8924 | 0 |
| Slice 13 | 378.88296 | 3,245.381 | -460.57502 | 1,700.5091 | 1,104.3235 | 0 |
| Slice 14 | 383.00054 | 3,246.0148 | -500.12297 | 1,797.9501 | 1,167.6025 | 0 |
| Slice 15 | 387.11813 | 3,246.791 | -548.55934 | 1,868.5916 | 1,213.4776 | 0 |
| Slice 16 | 391.23571 | 3,247.7124 | -606.05553 | 1,914.6287 | 1,243.3744 | 0 |
| Slice 17 | 395.35329 | 3,248.7824 | -672.82081 | 1,938.4771 | 1,258.8618 | 0 |
| Slice 18 | 399.47088 | 3,250.0049 | -749.1064 | 1,942.5755 | 1,261.5233 | 0 |
| Slice 19 | 403.58846 | 3,251.3848 | -835.21057 | 1,929.2149 | 1,252.8468 | 0 |
| Slice 20 | 407.70604 | 3,252.9276 | -931.48523 | 1,900.4069 | 1,234.1387 | 0 |
| Slice 21 | 411.82363 | 3,254.6401 | -1,038.3441 | 1,857.7904 | 1,206.4632 | 0 |
| Slice 22 | 415.94121 | 3,256.53 | -1,156.2732 | 1,802.5738 | 1,170.6051 | 0 |
| Slice 23 | 420.8235 | 3,259.0354 | -1,312.6112 | 1,694.3315 | 1,100.3117 | 0 |
| Slice 24 | 425.5787 | 3,261.6988 | -1,478.8038 | 1,514.8556 | 1,271.1148 | 50 |
| Slice 25 | 429.44208 | 3,264.093 | -1,628.2058 | 1,376.5462 | 1,155.0594 | 50 |
| Slice 26 | 433.30547 | 3,266.69 | -1,790.2555 | 1,227.2327 | 1,029.7705 | 50 |
| Slice 27 | 437.16885 | 3,269.5056 | -1,965.9499 | 1,065.3885 | 893.96709 | 50 |
| Slice 28 | 441.03224 | 3,272.5592 | -2,156.4929 | 888.83157 | 745.81824 | 50 |
| Slice 29 | 445.21394 | 3,276.173 | -2,381.9952 | 676.40071 | 567.56758 | 50 |
| Slice 30 | 449.71395 | 3,280.4355 | -2,647.9772 | 420.05511 | 352.46809 | 50 |
| Slice 31 | 454.12704 | 3,285.0576 | -2,936.3945 | 132.23389 | 110.95741 | 50 |

# Seismic Safety Factor: Existing Conditions - Inboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 652
Date: 10/13/2016
Time: 8:52:12 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam E-E.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:52:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - Inboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - Inboard [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 22.8 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 124 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,242) ft
Right Coordinate: (696, 3,230) ft

## Piezometric Lines

### Piezometric Line 1

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,238 |
| Coordinate 2 | 516.76109 | 3,238 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Point 1 | 599.48311 | 3,252.1509 |
| Point 2 | 574.93769 | 3,264.0168 |
| Point 3 | 569.82513 | 3,265.12 |
| Point 4 | 559.54194 | 3,262.5653 |
| Point 5 | 525 | 3,261 |
| Point 6 | 433.38681 | 3,261.5 |
| Point 7 | 418 | 3,260 |
| Point 8 | 376.82417 | 3,247.5976 |
| Point 9 | 331.98039 | 3,233.9958 |
| Point 10 | 433.38681 | 3,236.5 |
| Point 11 | 470.66758 | 3,236.5 |
| Point 12 | 494.91606 | 3,245.3509 |
| Point 13 | 489.4627 | 3,248.9865 |
| Point 14 | 500.23564 | 3,248.9775 |
| Point 15 | 503.1 | 3,257.9502 |
| Point 16 | 527.67985 | 3,257.9502 |
| Point 17 | 538.0118 | 3,257.831 |
| Point 18 | 539.40151 | 3,253.1986 |
| Point 19 | 610.33845 | 3,247.9553 |
| Point 20 | 532.02078 | 3,243 |
| Point 21 | 542.31094 | 3,243 |
| Point 22 | 551.29063 | 3,248.9865 |
| Point 23 | 519.23891 | 3,243 |
| Point 24 | 519.23891 | 3,248 |
| Point 25 | 516.76109 | 3,248 |
| Point 26 | 516.76109 | 3,243 |
| Point 27 | 498.44239 | 3,243 |
| Point 28 | 519.23891 | 3,223.2182 |
| Point 29 | 696 | 3,221 |
| Point 30 | 696 | 3,230 |
| Point 31 | 632.96626 | 3,240.3258 |
| Point 32 | 516.76109 | 3,223.312 |
| Point 33 | 434.75137 | 3,227.3832 |
| Point 34 | 425.18336 | 3,226.923 |
| Point 35 | 313.81983 | 3,228.6 |
| Point 36 | 300.00292 | 3,223.99 |
| Point 37 | 0 | 3,228.7723 |
| Point 38 | 0 | 3,228.6 |
| Point 39 | 256.77031 | 3,228.6 |

| | | |
|---|---|---|
| Point 40 | 329.69277 | 3,245.2431 |
| Point 41 | 373.96373 | 3,260 |
| Point 42 | 543.96416 | 3,270 |
| Point 43 | 463.96399 | 3,290 |
| Point 44 | 483.96399 | 3,290 |
| Point 45 | 0 | 3,224 |
| Point 46 | 696 | 3,215 |
| Point 47 | 0 | 3,215 |
| Point 48 | 125 | 3,246 |
| Point 49 | 118 | 3,243 |
| Point 50 | 337.96352 | 3,248 |
| Point 51 | 0 | 3,242 |
| Point 52 | 0 | 3,238 |
| Point 53 | 516.76109 | 3,238 |
| Point 54 | 474.77707 | 3,238 |
| Point 55 | 345.18184 | 3,238 |
| Point 56 | 184.70906 | 3,238 |
| Point 57 | 0 | 3,286 |
| Point 58 | 451.96396 | 3,286 |
| Point 59 | 442.96393 | 3,283 |
| Point 60 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill - Seismic | 1,2,3,4,5,6,7,8,55,54,12,13,14,15,16,17,18 | 3,209.9 |
| Region 2 | Drain - Seismic | 19,1,18,17,16,20,21,22 | 446.71 |
| Region 3 | Core - Seismic | 16,20,23,24,25,26,27,12,13,14,15 | 455.07 |
| Region 4 | Native Clinker - Seismic | 19,22,21,20,23,28,29,30,31 | 3,574.4 |
| Region 5 | Native Clinker - Seismic | 32,53,54,11,33,34 | 855.29 |
| Region 6 | Cutoff Wall | 28,23,24,25,26,53,32 | 61.289 |
| Region 7 | Foundation Soil - Sat. - Seismic | 33,11,10,9,35,36,34 | 1,273.1 |
| Region 8 | Paste - Seismic | 8,40,56,55 | 770.08 |
| Region 9 | Bottom Ash Fill - Seismic | 41,50,40,8,7 | 568.72 |
| Region 10 | Clinker Fill - Seismic | 41,7,6,5,4,3,42,44,43,58,59 | 3,118.4 |
| Region 11 | Fly Ash Slurry - Sat. - Seismic | 35,36,45,38,39 | 1,413.4 |
| Region | Bedrock | 45,36,34,32,28,29,46,47 | 6,211.1 |

| | | | |
|---|---|---|---|
| 12 | | | |
| Region 13 | Paste - Sat. - Seismic | 37,52,56 | 852.22 |
| Region 14 | Native Clinker - Seismic | 26,27,12,54,53 | 187.39 |
| Region 15 | Embankment Fill - Sat. - Seismic | 9,10,11,54,55 | 311.65 |
| Region 16 | Paste - Sat. - Seismic | 37,38,39,35,9,55,56 | 2,245.8 |
| Region 17 | Paste - Seismic | 51,49,48,50,40,56,52 | 1,896.8 |
| Region 18 | | 59,41,50,48,49,51,60 | 14,553 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.52
Volume: 1,517.8553 ft³
Weight: 172,387.35 lbs
Resisting Moment: 11,162,517 lbs-ft
Activating Moment: 7,320,263.4 lbs-ft
Resisting Force: 82,393.44 lbs
Activating Force: 54,063.764 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (331.81298, 3,247.9422) ft
Entry: (456.29012, 3,287.442) ft
Radius: 124.38891 ft
Center: (362.02919, 3,368.6053) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 333.56556 | 3,247.5302 | -594.68601 | 49.753237 | 26.454265 | 0 |
| Slice 2 | 336.64083 | 3,246.8424 | -551.76701 | 127.35903 | 79.582753 | 0 |
| Slice 3 | 339.93877 | 3,246.2101 | -512.31199 | 261.20053 | 163.2162 | 0 |
| Slice 4 | 343.91057 | 3,245.5596 | -471.72107 | 470.18311 | 250.00079 | 0 |
| Slice 5 | 347.90366 | 3,245.0374 | -439.13413 | 677.44565 | 360.20424 | 0 |
| Slice | 351.89675 | 3,244.646 | -414.70887 | 868.11856 | 461.58683 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | | | | | | |
| Slice 7 | 355.88984 | 3,244.3841 | -398.36806 | 1,039.3354 | 552.62442 | 0 |
| Slice 8 | 359.88293 | 3,244.251 | -390.06053 | 1,188.7683 | 632.07933 | 0 |
| Slice 9 | 363.87602 | 3,244.2462 | -389.76048 | 1,314.7683 | 699.07472 | 0 |
| Slice 10 | 367.89536 | 3,244.3713 | -397.57071 | 1,420.2674 | 705.02686 | 0 |
| Slice 11 | 371.94094 | 3,244.6286 | -413.62202 | 1,520.7537 | 754.90871 | 0 |
| Slice 12 | 375.39395 | 3,244.9448 | -433.35864 | 1,605.3128 | 796.8842 | 0 |
| Slice 13 | 378.88296 | 3,245.381 | -460.57502 | 1,701.5464 | 844.65496 | 0 |
| Slice 14 | 383.00054 | 3,246.0148 | -500.12296 | 1,794.928 | 891.00998 | 0 |
| Slice 15 | 387.11813 | 3,246.791 | -548.55934 | 1,861.1308 | 923.87335 | 0 |
| Slice 16 | 391.23571 | 3,247.7124 | -606.05554 | 1,902.5907 | 944.45424 | 0 |
| Slice 17 | 395.35329 | 3,248.7824 | -672.82082 | 1,921.9586 | 954.06855 | 0 |
| Slice 18 | 399.47088 | 3,250.0049 | -749.10642 | 1,921.8861 | 954.03254 | 0 |
| Slice 19 | 403.58846 | 3,251.3848 | -835.21058 | 1,904.8415 | 945.57155 | 0 |
| Slice 20 | 407.70604 | 3,252.9276 | -931.48524 | 1,872.9687 | 929.74974 | 0 |
| Slice 21 | 411.82363 | 3,254.6401 | -1,038.3441 | 1,827.9933 | 907.42375 | 0 |
| Slice 22 | 415.94121 | 3,256.53 | -1,156.2732 | 1,771.1663 | 879.21461 | 0 |
| Slice 23 | 420.8235 | 3,259.0354 | -1,312.6112 | 1,662.4577 | 825.25116 | 0 |
| Slice 24 | 425.5787 | 3,261.6988 | -1,478.8038 | 1,486.2609 | 928.71891 | 40 |
| Slice 25 | 429.44208 | 3,264.093 | -1,628.2058 | 1,349.3589 | 843.17305 | 40 |
| Slice 26 | 433.30547 | 3,266.69 | -1,790.2555 | 1,202.0414 | 751.1188 | 40 |
| Slice | 437.16885 | 3,269.5056 | - | 1,042.7378 | 651.5749 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 27 | | | 1,965.9499 | | | |
| Slice 28 | 441.03224 | 3,272.5592 | -2,156.4929 | 869.23657 | 543.15929 | 40 |
| Slice 29 | 445.21394 | 3,276.173 | -2,381.9953 | 660.70276 | 412.8529 | 40 |
| Slice 30 | 449.71395 | 3,280.4355 | -2,647.9772 | 409.22505 | 255.71219 | 40 |
| Slice 31 | 454.12704 | 3,285.0576 | -2,936.3946 | 126.96571 | 79.336983 | 40 |

# Static Safety Factor: Maximum Storage Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 652
Date: 10/13/2016
Time: 8:52:12 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam E-E.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:52:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Sat.**

Model: Mohr-Coulomb
Unit Weight: 124 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (444.18489, 3,283.407) ft
Left-Zone Right Coordinate: (483.96399, 3,290) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (574.16134, 3,264.1843) ft
Right-Zone Right Coordinate: (632.96626, 3,240.3258) ft
Right-Zone Increment: 16
Radius Increments: 12

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (696, 3,230) ft

## Piezometric Lines

### Piezometric Line 1

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Coordinate 1 | 0 | 3,238 |
| Coordinate 2 | 516.76109 | 3,238 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 599.48311 | 3,252.1509 |
| Point 2 | 574.93769 | 3,264.0168 |
| Point 3 | 569.82513 | 3,265.12 |
| Point 4 | 559.54194 | 3,262.5653 |
| Point 5 | 525 | 3,261 |
| Point 6 | 433.38681 | 3,261.5 |
| Point 7 | 418 | 3,260 |
| Point 8 | 376.82417 | 3,247.5976 |
| Point 9 | 331.98039 | 3,233.9958 |
| Point 10 | 433.38681 | 3,236.5 |
| Point 11 | 470.66758 | 3,236.5 |
| Point 12 | 494.91606 | 3,245.3509 |
| Point 13 | 489.4627 | 3,248.9865 |
| Point 14 | 500.23564 | 3,248.9775 |
| Point 15 | 503.1 | 3,257.9502 |
| Point 16 | 527.67985 | 3,257.9502 |
| Point 17 | 538.0118 | 3,257.831 |
| Point 18 | 539.40151 | 3,253.1986 |
| Point 19 | 610.33845 | 3,247.9553 |
| Point 20 | 532.02078 | 3,243 |
| Point 21 | 542.31094 | 3,243 |
| Point 22 | 551.29063 | 3,248.9865 |
| Point 23 | 519.23891 | 3,243 |
| Point 24 | 519.23891 | 3,248 |
| Point 25 | 516.76109 | 3,248 |
| Point 26 | 516.76109 | 3,243 |
| Point 27 | 498.44239 | 3,243 |
| Point 28 | 519.23891 | 3,223.2182 |
| Point 29 | 696 | 3,221 |
| Point 30 | 696 | 3,230 |

| | | |
|---|---|---|
| Point 31 | 632.96626 | 3,240.3258 |
| Point 32 | 516.76109 | 3,223.312 |
| Point 33 | 434.75137 | 3,227.3832 |
| Point 34 | 425.18336 | 3,226.923 |
| Point 35 | 313.81983 | 3,228.6 |
| Point 36 | 300.00292 | 3,223.99 |
| Point 37 | 0 | 3,228.7723 |
| Point 38 | 0 | 3,228.6 |
| Point 39 | 256.77031 | 3,228.6 |
| Point 40 | 329.69277 | 3,245.2431 |
| Point 41 | 373.96373 | 3,260 |
| Point 42 | 543.96416 | 3,270 |
| Point 43 | 463.96399 | 3,290 |
| Point 44 | 483.96399 | 3,290 |
| Point 45 | 0 | 3,224 |
| Point 46 | 696 | 3,215 |
| Point 47 | 0 | 3,215 |
| Point 48 | 125 | 3,246 |
| Point 49 | 118 | 3,243 |
| Point 50 | 337.96352 | 3,248 |
| Point 51 | 0 | 3,242 |
| Point 52 | 0 | 3,238 |
| Point 53 | 516.76109 | 3,238 |
| Point 54 | 474.77707 | 3,238 |
| Point 55 | 345.18184 | 3,238 |
| Point 56 | 184.70906 | 3,238 |
| Point 57 | 0 | 3,286 |
| Point 58 | 451.96396 | 3,286 |
| Point 59 | 442.96393 | 3,283 |
| Point 60 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,4,5,6,7,8,55,54,12,13,14,15,16,17,18 | 3,209.9 |
| Region 2 | Drain | 19,1,18,17,16,20,21,22 | 446.71 |

| | | | |
|---|---|---|---|
| Region 3 | Core | 16,20,23,24,25,26,27,12,13,14,15 | 455.07 |
| Region 4 | Native Clinker | 19,22,21,20,23,28,29,30,31 | 3,574.4 |
| Region 5 | Native Clinker | 32,53,54,11,33,34 | 855.29 |
| Region 6 | Cutoff Wall | 28,23,24,25,26,53,32 | 61.289 |
| Region 7 | Foundation Soil - Sat. | 33,11,10,9,35,36,34 | 1,273.1 |
| Region 8 | Paste | 8,40,56,55 | 770.08 |
| Region 9 | Bottom Ash Fill | 41,50,40,8,7 | 568.72 |
| Region 10 | Clinker Fill | 41,7,6,5,4,3,42,44,43,58,59 | 3,118.4 |
| Region 11 | Fly Ash Slurry - Sat. | 35,36,45,38,39 | 1,413.4 |
| Region 12 | Bedrock | 45,36,34,32,28,29,46,47 | 6,211.1 |
| Region 13 | Paste - Sat. | 37,52,56 | 852.22 |
| Region 14 | Native Clinker | 26,27,12,54,53 | 187.39 |
| Region 15 | Embankment Fill - Sat. | 9,10,11,54,55 | 311.65 |
| Region 16 | Paste - Sat. | 37,38,39,35,9,55,56 | 2,245.8 |
| Region 17 | Paste | 51,49,48,50,40,56,52 | 1,896.8 |
| Region 18 | Paste | 59,41,50,48,49,51,60 | 14,553 |

## Current Slip Surface

Slip Surface: 3,733
F of S: 2.44
Volume: 838.92607 ft³
Weight: 108,111.87 lbs
Resisting Moment: 34,545,034 lbs-ft
Activating Moment: 14,154,709 lbs-ft
Resisting Force: 76,318.146 lbs
Activating Force: 31,398.815 lbs
F of S Rank (Analysis): 1 of 3,757 slip surfaces
F of S Rank (Query): 1 of 3,757 slip surfaces
Exit: (629.20111, 3,241.5953) ft
Entry: (483.96399, 3,290) ft
Radius: 428.23168 ft
Center: (689.80134, 3,665.5175) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 486.30664 | 3,288.7348 | -3,165.8496 | 43.788867 | 36.743222 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 2 | 490.99194 | 3,286.2416 | -3,010.2737 | 146.88044 | 123.24732 | 50 |
| Slice 3 | 495.67724 | 3,283.8222 | -2,859.3026 | 242.7362 | 203.67986 | 50 |
| Slice 4 | 500.36254 | 3,281.4752 | -2,712.8494 | 331.38783 | 278.06741 | 50 |
| Slice 5 | 505.04784 | 3,279.1992 | -2,570.8317 | 412.86457 | 346.4345 | 50 |
| Slice 6 | 509.73314 | 3,276.9931 | -2,433.1714 | 487.19315 | 408.80359 | 50 |
| Slice 7 | 514.41844 | 3,274.8557 | -2,299.7948 | 554.39787 | 465.19505 | 50 |
| Slice 8 | 519.02801 | 3,272.8182 | 0 | 613.64535 | 514.90959 | 50 |
| Slice 9 | 523.56186 | 3,270.8774 | 0 | 665.17197 | 558.14555 | 50 |
| Slice 10 | 528.0957 | 3,268.998 | 0 | 710.08147 | 595.8291 | 50 |
| Slice 11 | 532.62955 | 3,267.1791 | 0 | 748.38701 | 627.97127 | 50 |
| Slice 12 | 537.16339 | 3,265.4198 | 0 | 780.0996 | 654.58129 | 50 |
| Slice 13 | 541.69724 | 3,263.7194 | 0 | 805.22806 | 675.66657 | 50 |
| Slice 14 | 545.23206 | 3,262.429 | 0 | 842.05396 | 706.56716 | 50 |
| Slice 15 | 548.67362 | 3,261.2155 | 0 | 935.37284 | 607.43823 | 0 |
| Slice 16 | 553.02095 | 3,259.7241 | 0 | 1,010.4287 | 656.18005 | 0 |
| Slice 17 | 557.36828 | 3,258.2846 | 0 | 1,079.9229 | 701.31013 | 0 |
| Slice 18 | 562.11274 | 3,256.7746 | 0 | 1,146.7269 | 744.69317 | 0 |
| Slice 19 | 567.25433 | 3,255.2037 | 0 | 1,209.7551 | 785.62416 | 0 |
| Slice 20 | 572.38141 | 3,253.707 | 0 | 1,262.0239 | 819.56789 | 0 |
| Slice 21 | 575.70837 | 3,252.7651 | 0 | 1,266.8118 | 822.67722 | 0 |
| Slice 22 | 578.60964 | 3,251.9792 | 0 | 1,193.5146 | 835.70793 | 0 |
| Slice 23 | 582.87083 | 3,250.8569 | 0 | 1,092.757 | 765.15665 | 0 |
| Slice 24 | 587.13201 | 3,249.7813 | 0 | 985.71234 | 690.20321 | 0 |
| Slice 25 | 591.3932 | 3,248.752 | 0 | 872.37813 | 610.84574 | 0 |
| Slice 26 | 596.50345 | 3,247.5838 | 0 | 724.61304 | 608.02254 | 0 |
| Slice 27 | 602.19695 | 3,246.3514 | 0 | 592.5026 | 497.16872 | 0 |
| Slice 28 | 607.62461 | 3,245.2536 | 0 | 482.65449 | 404.9952 | 0 |
| Slice 29 | 612.69628 | 3,244.2913 | 0 | 377.89533 | 317.09183 | 0 |
| Slice 30 | 617.41195 | 3,243.4553 | 0 | 279.62206 | 234.63077 | 0 |
| Slice 31 | 622.12761 | 3,242.6736 | 0 | 173.40859 | 145.50708 | 0 |
| Slice 32 | 626.84327 | 3,241.9458 | 0 | 59.212639 | 49.685304 | 0 |

# Static Safety Factor: Maximum Surcharge Pool - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 652
Date: 10/13/2016
Time: 8:52:12 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam E-E.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:52:14 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Embankment Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Core**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 28.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker**

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Cutoff Wall**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill**

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

Pore Water Pressure
Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Sat.**

Model: Mohr-Coulomb
Unit Weight: 124 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (444.18489, 3,283.407) ft
Left-Zone Right Coordinate: (483.96399, 3,290) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (574.16134, 3,264.1843) ft
Right-Zone Right Coordinate: (632.96626, 3,240.3258) ft
Right-Zone Increment: 16
Radius Increments: 12

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (696, 3,230) ft

## Piezometric Lines

### Piezometric Line 1

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Coordinate 1 | 0 | 3,238 |
| Coordinate 2 | 516.76109 | 3,238 |

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 0 | 3,286 |
| | 451.96396 | 3,286 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 599.48311 | 3,252.1509 |
| Point 2 | 574.93769 | 3,264.0168 |
| Point 3 | 569.82513 | 3,265.12 |
| Point 4 | 559.54194 | 3,262.5653 |
| Point 5 | 525 | 3,261 |
| Point 6 | 433.38681 | 3,261.5 |
| Point 7 | 418 | 3,260 |
| Point 8 | 376.82417 | 3,247.5976 |
| Point 9 | 331.98039 | 3,233.9958 |
| Point 10 | 433.38681 | 3,236.5 |
| Point 11 | 470.66758 | 3,236.5 |
| Point 12 | 494.91606 | 3,245.3509 |
| Point 13 | 489.4627 | 3,248.9865 |
| Point 14 | 500.23564 | 3,248.9775 |
| Point 15 | 503.1 | 3,257.9502 |
| Point 16 | 527.67985 | 3,257.9502 |
| Point 17 | 538.0118 | 3,257.831 |
| Point 18 | 539.40151 | 3,253.1986 |
| Point 19 | 610.33845 | 3,247.9553 |
| Point 20 | 532.02078 | 3,243 |
| Point 21 | 542.31094 | 3,243 |

| | | |
|---|---|---|
| Point 22 | 551.29063 | 3,248.9865 |
| Point 23 | 519.23891 | 3,243 |
| Point 24 | 519.23891 | 3,248 |
| Point 25 | 516.76109 | 3,248 |
| Point 26 | 516.76109 | 3,243 |
| Point 27 | 498.44239 | 3,243 |
| Point 28 | 519.23891 | 3,223.2182 |
| Point 29 | 696 | 3,221 |
| Point 30 | 696 | 3,230 |
| Point 31 | 632.96626 | 3,240.3258 |
| Point 32 | 516.76109 | 3,223.312 |
| Point 33 | 434.75137 | 3,227.3832 |
| Point 34 | 425.18336 | 3,226.923 |
| Point 35 | 313.81983 | 3,228.6 |
| Point 36 | 300.00292 | 3,223.99 |
| Point 37 | 0 | 3,228.7723 |
| Point 38 | 0 | 3,228.6 |
| Point 39 | 256.77031 | 3,228.6 |
| Point 40 | 329.69277 | 3,245.2431 |
| Point 41 | 373.96373 | 3,260 |
| Point 42 | 543.96416 | 3,270 |
| Point 43 | 463.96399 | 3,290 |
| Point 44 | 483.96399 | 3,290 |
| Point 45 | 0 | 3,224 |
| Point 46 | 696 | 3,215 |
| Point 47 | 0 | 3,215 |
| Point 48 | 125 | 3,246 |
| Point 49 | 118 | 3,243 |
| Point 50 | 337.96352 | 3,248 |
| Point 51 | 0 | 3,242 |
| Point 52 | 0 | 3,238 |
| Point 53 | 516.76109 | 3,238 |
| Point 54 | 474.77707 | 3,238 |
| Point 55 | 345.18184 | 3,238 |
| Point 56 | 184.70906 | 3,238 |

| | | |
|---|---|---|
| Point 57 | 0 | 3,286 |
| Point 58 | 451.96396 | 3,286 |
| Point 59 | 442.96393 | 3,283 |
| Point 60 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill | 1,2,3,4,5,6,7,8,55,54,12,13,14,15,16,17,18 | 3,209.9 |
| Region 2 | Drain | 19,1,18,17,16,20,21,22 | 446.71 |
| Region 3 | Core | 16,20,23,24,25,26,27,12,13,14,15 | 455.07 |
| Region 4 | Native Clinker | 19,22,21,20,23,28,29,30,31 | 3,574.4 |
| Region 5 | Native Clinker | 32,53,54,11,33,34 | 855.29 |
| Region 6 | Cutoff Wall | 28,23,24,25,26,53,32 | 61.289 |
| Region 7 | Foundation Soil - Sat. | 33,11,10,9,35,36,34 | 1,273.1 |
| Region 8 | Paste | 8,40,56,55 | 770.08 |
| Region 9 | Bottom Ash Fill | 41,50,40,8,7 | 568.72 |
| Region 10 | Clinker Fill | 41,7,6,5,4,3,42,44,43,58,59 | 3,118.4 |
| Region 11 | Fly Ash Slurry - Sat. | 35,36,45,38,39 | 1,413.4 |
| Region 12 | Bedrock | 45,36,34,32,28,29,46,47 | 6,211.1 |
| Region 13 | Paste - Sat. | 37,52,56 | 852.22 |
| Region 14 | Native Clinker | 26,27,12,54,53 | 187.39 |
| Region 15 | Embankment Fill - Sat. | 9,10,11,54,55 | 311.65 |
| Region 16 | Paste - Sat. | 37,38,39,35,9,55,56 | 2,245.8 |
| Region 17 | Paste | 51,49,48,50,40,56,52 | 1,896.8 |
| Region 18 | Paste | 59,41,50,48,49,51,60 | 14,553 |

## Current Slip Surface

Slip Surface: 3,733
F of S: 2.44
Volume: 838.92607 ft³
Weight: 108,111.87 lbs
Resisting Moment: 34,545,034 lbs-ft
Activating Moment: 14,154,709 lbs-ft
Resisting Force: 76,318.146 lbs
Activating Force: 31,398.815 lbs
F of S Rank (Analysis): 1 of 3,757 slip surfaces

F of S Rank (Query): 1 of 3,757 slip surfaces
Exit: (629.20111, 3,241.5953) ft
Entry: (483.96399, 3,290) ft
Radius: 428.23168 ft
Center: (689.80134, 3,665.5175) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 486.30664 | 3,288.7348 | -3,165.8496 | 43.788867 | 36.743222 | 50 |
| Slice 2 | 490.99194 | 3,286.2416 | -3,010.2737 | 146.88044 | 123.24732 | 50 |
| Slice 3 | 495.67724 | 3,283.8222 | -2,859.3026 | 242.7362 | 203.67986 | 50 |
| Slice 4 | 500.36254 | 3,281.4752 | -2,712.8494 | 331.38783 | 278.06741 | 50 |
| Slice 5 | 505.04784 | 3,279.1992 | -2,570.8317 | 412.86457 | 346.4345 | 50 |
| Slice 6 | 509.73314 | 3,276.9931 | -2,433.1714 | 487.19315 | 408.80359 | 50 |
| Slice 7 | 514.41844 | 3,274.8557 | -2,299.7948 | 554.39787 | 465.19505 | 50 |
| Slice 8 | 519.02801 | 3,272.8182 | 0 | 613.64535 | 514.90959 | 50 |
| Slice 9 | 523.56186 | 3,270.8774 | 0 | 665.17197 | 558.14555 | 50 |
| Slice 10 | 528.0957 | 3,268.998 | 0 | 710.08147 | 595.8291 | 50 |
| Slice 11 | 532.62955 | 3,267.1791 | 0 | 748.38701 | 627.97127 | 50 |
| Slice 12 | 537.16339 | 3,265.4198 | 0 | 780.0996 | 654.58129 | 50 |
| Slice 13 | 541.69724 | 3,263.7194 | 0 | 805.22806 | 675.66657 | 50 |
| Slice 14 | 545.23206 | 3,262.429 | 0 | 842.05396 | 706.56716 | 50 |
| Slice 15 | 548.67362 | 3,261.2155 | 0 | 935.37284 | 607.43823 | 0 |
| Slice 16 | 553.02095 | 3,259.7241 | 0 | 1,010.4287 | 656.18005 | 0 |
| Slice 17 | 557.36828 | 3,258.2846 | 0 | 1,079.9229 | 701.31013 | 0 |
| Slice 18 | 562.11274 | 3,256.7746 | 0 | 1,146.7269 | 744.69317 | 0 |
| Slice 19 | 567.25433 | 3,255.2037 | 0 | 1,209.7551 | 785.62416 | 0 |
| Slice 20 | 572.38141 | 3,253.707 | 0 | 1,262.0239 | 819.56789 | 0 |
| Slice 21 | 575.70837 | 3,252.7651 | 0 | 1,266.8118 | 822.67722 | 0 |
| Slice 22 | 578.60964 | 3,251.9792 | 0 | 1,193.5146 | 835.70793 | 0 |
| Slice 23 | 582.87083 | 3,250.8569 | 0 | 1,092.757 | 765.15665 | 0 |
| Slice 24 | 587.13201 | 3,249.7813 | 0 | 985.71234 | 690.20321 | 0 |
| Slice 25 | 591.3932 | 3,248.752 | 0 | 872.37813 | 610.84574 | 0 |
| Slice 26 | 596.50345 | 3,247.5838 | 0 | 724.61304 | 608.02254 | 0 |
| Slice 27 | 602.19695 | 3,246.3514 | 0 | 592.5026 | 497.16872 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 28 | 607.62461 | 3,245.2536 | 0 | 482.65449 | 404.9952 | 0 |
| Slice 29 | 612.69628 | 3,244.2913 | 0 | 377.89533 | 317.09183 | 0 |
| Slice 30 | 617.41195 | 3,243.4553 | 0 | 279.62206 | 234.63077 | 0 |
| Slice 31 | 622.12761 | 3,242.6736 | 0 | 173.40859 | 145.50708 | 0 |
| Slice 32 | 626.84327 | 3,241.9458 | 0 | 59.212639 | 49.685304 | 0 |

# Seismic Safety Factor - Outboard

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 652
Date: 10/13/2016
Time: 8:52:12 PM
Tool Version: 8.15.1.11236
File Name: Saddle Dam E-E.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\MD and SD 2011 Report\
Last Solved Date: 10/13/2016
Last Solved Time: 8:52:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - Outboard

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A2 Static Safety Factor: Maximum Surcharge Pool - Outboard [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °

Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Cutoff Wall

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Core - Seismic

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf

Phi': 22.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Drain - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Seismic**
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Embankment Fill - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Native Clinker - Seismic**
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 124 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (696, 3,230) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,238 |
| Coordinate 2 | 516.76109 | 3,238 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Point 1 | 599.48311 | 3,252.1509 |
| Point 2 | 574.93769 | 3,264.0168 |
| Point 3 | 569.82513 | 3,265.12 |
| Point 4 | 559.54194 | 3,262.5653 |
| Point 5 | 525 | 3,261 |
| Point 6 | 433.38681 | 3,261.5 |
| Point 7 | 418 | 3,260 |
| Point 8 | 376.82417 | 3,247.5976 |
| Point 9 | 331.98039 | 3,233.9958 |
| Point 10 | 433.38681 | 3,236.5 |
| Point 11 | 470.66758 | 3,236.5 |
| Point 12 | 494.91606 | 3,245.3509 |
| Point 13 | 489.4627 | 3,248.9865 |
| Point 14 | 500.23564 | 3,248.9775 |
| Point 15 | 503.1 | 3,257.9502 |
| Point 16 | 527.67985 | 3,257.9502 |
| Point 17 | 538.0118 | 3,257.831 |
| Point 18 | 539.40151 | 3,253.1986 |
| Point 19 | 610.33845 | 3,247.9553 |
| Point 20 | 532.02078 | 3,243 |
| Point 21 | 542.31094 | 3,243 |
| Point 22 | 551.29063 | 3,248.9865 |
| Point 23 | 519.23891 | 3,243 |
| Point 24 | 519.23891 | 3,248 |
| Point 25 | 516.76109 | 3,248 |
| Point 26 | 516.76109 | 3,243 |
| Point 27 | 498.44239 | 3,243 |
| Point 28 | 519.23891 | 3,223.2182 |
| Point 29 | 696 | 3,221 |
| Point 30 | 696 | 3,230 |
| Point 31 | 632.96626 | 3,240.3258 |
| Point 32 | 516.76109 | 3,223.312 |
| Point 33 | 434.75137 | 3,227.3832 |
| Point 34 | 425.18336 | 3,226.923 |
| Point 35 | 313.81983 | 3,228.6 |

| | | |
|---|---|---|
| Point 36 | 300.00292 | 3,223.99 |
| Point 37 | 0 | 3,228.7723 |
| Point 38 | 0 | 3,228.6 |
| Point 39 | 256.77031 | 3,228.6 |
| Point 40 | 329.69277 | 3,245.2431 |
| Point 41 | 373.96373 | 3,260 |
| Point 42 | 543.96416 | 3,270 |
| Point 43 | 463.96399 | 3,290 |
| Point 44 | 483.96399 | 3,290 |
| Point 45 | 0 | 3,224 |
| Point 46 | 696 | 3,215 |
| Point 47 | 0 | 3,215 |
| Point 48 | 125 | 3,246 |
| Point 49 | 118 | 3,243 |
| Point 50 | 337.96352 | 3,248 |
| Point 51 | 0 | 3,242 |
| Point 52 | 0 | 3,238 |
| Point 53 | 516.76109 | 3,238 |
| Point 54 | 474.77707 | 3,238 |
| Point 55 | 345.18184 | 3,238 |
| Point 56 | 184.70906 | 3,238 |
| Point 57 | 0 | 3,286 |
| Point 58 | 451.96396 | 3,286 |
| Point 59 | 442.96393 | 3,283 |
| Point 60 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Embankment Fill - Seismic | 1,2,3,4,5,6,7,8,55,54,12,13,14,15,16,17,18 | 3,209.9 |
| Region 2 | Drain - Seismic | 19,1,18,17,16,20,21,22 | 446.71 |
| Region 3 | Core - Seismic | 16,20,23,24,25,26,27,12,13,14,15 | 455.07 |
| Region 4 | Native Clinker - Seismic | 19,22,21,20,23,28,29,30,31 | 3,574.4 |
| Region 5 | Native Clinker - Seismic | 32,53,54,11,33,34 | 855.29 |
| Region 6 | Cutoff Wall | 28,23,24,25,26,53,32 | 61.289 |

| | | | |
|---|---|---|---|
| Region 7 | Foundation Soil - Sat. - Seismic | 33,11,10,9,35,36,34 | 1,273.1 |
| Region 8 | Paste - Seismic | 8,40,56,55 | 770.08 |
| Region 9 | Bottom Ash Fill - Seismic | 41,50,40,8,7 | 568.72 |
| Region 10 | Clinker Fill - Seismic | 41,7,6,5,4,3,42,44,43,58,59 | 3,118.4 |
| Region 11 | Fly Ash Slurry - Sat. - Seismic | 35,36,45,38,39 | 1,413.4 |
| Region 12 | Bedrock | 45,36,34,32,28,29,46,47 | 6,211.1 |
| Region 13 | Paste - Sat. - Seismic | 37,52,56 | 852.22 |
| Region 14 | Native Clinker - Seismic | 26,27,12,54,53 | 187.39 |
| Region 15 | Embankment Fill - Sat. - Seismic | 9,10,11,54,55 | 311.65 |
| Region 16 | Paste - Sat. - Seismic | 37,38,39,35,9,55,56 | 2,245.8 |
| Region 17 | Paste - Seismic | 51,49,48,50,40,56,52 | 1,896.8 |
| Region 18 | Paste - Seismic | 59,41,50,48,49,51,60 | 14,553 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.67
Volume: 838.92608 ft³
Weight: 108,111.87 lbs
Resisting Moment: 25,831,406 lbs-ft
Activating Moment: 15,460,797 lbs-ft
Resisting Force: 57,053.384 lbs
Activating Force: 34,333.419 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (629.20111, 3,241.5953) ft
Entry: (483.96399, 3,290) ft
Radius: 428.23168 ft
Center: (689.80134, 3,665.5175) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 486.30664 | 3,288.7348 | -3,165.8496 | 41.521282 | 25.945376 | 40 |
| Slice 2 | 490.99194 | 3,286.2416 | -3,010.2737 | 143.36092 | 89.581846 | 40 |
| Slice 3 | 495.67724 | 3,283.8222 | -2,859.3027 | 238.47427 | 149.01526 | 40 |
| Slice 4 | 500.36254 | 3,281.4752 | -2,712.8494 | 326.73756 | 204.16829 | 40 |
| Slice 5 | 505.04784 | 3,279.1992 | -2,570.8316 | 408.03655 | 254.96953 | 40 |
| Slice 6 | 509.73314 | 3,276.9931 | -2,433.1714 | 482.27188 | 301.35692 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 7 | 514.41844 | 3,274.8557 | -2,299.7948 | 549.36362 | 343.28049 | 40 |
| Slice 8 | 519.02801 | 3,272.8182 | 0 | 608.4034 | 380.17264 | 40 |
| Slice 9 | 523.56186 | 3,270.8774 | 0 | 659.58261 | 412.15296 | 40 |
| Slice 10 | 528.0957 | 3,268.998 | 0 | 703.97783 | 439.89417 | 40 |
| Slice 11 | 532.62955 | 3,267.1791 | 0 | 741.60025 | 463.40327 | 40 |
| Slice 12 | 537.16339 | 3,265.4198 | 0 | 772.48001 | 482.69909 | 40 |
| Slice 13 | 541.69724 | 3,263.7194 | 0 | 796.66318 | 497.81041 | 40 |
| Slice 14 | 545.23206 | 3,262.429 | 0 | 832.52995 | 520.22245 | 40 |
| Slice 15 | 548.67362 | 3,261.2155 | 0 | 933.58673 | 463.43648 | 0 |
| Slice 16 | 553.02095 | 3,259.7241 | 0 | 1,007.5814 | 500.16775 | 0 |
| Slice 17 | 557.36828 | 3,258.2846 | 0 | 1,075.7367 | 534.00031 | 0 |
| Slice 18 | 562.11274 | 3,256.7746 | 0 | 1,140.8359 | 566.31586 | 0 |
| Slice 19 | 567.25433 | 3,255.2037 | 0 | 1,201.8385 | 596.59781 | 0 |
| Slice 20 | 572.38141 | 3,253.707 | 0 | 1,252.0445 | 621.52027 | 0 |
| Slice 21 | 575.70837 | 3,252.7651 | 0 | 1,255.7042 | 623.33697 | 0 |
| Slice 22 | 578.60964 | 3,251.9792 | 0 | 1,180.0444 | 627.44074 | 0 |
| Slice 23 | 582.87083 | 3,250.8569 | 0 | 1,079.4115 | 573.93329 | 0 |
| Slice 24 | 587.13201 | 3,249.7813 | 0 | 972.88137 | 517.2902 | 0 |
| Slice 25 | 591.3932 | 3,248.752 | 0 | 860.43423 | 457.50099 | 0 |
| Slice 26 | 596.50345 | 3,247.5838 | 0 | 712.29179 | 445.08931 | 0 |
| Slice 27 | 602.19695 | 3,246.3514 | 0 | 582.88378 | 364.22621 | 0 |
| Slice 28 | 607.62461 | 3,245.2536 | 0 | 475.48928 | 297.11868 | 0 |
| Slice 29 | 612.69628 | 3,244.2913 | 0 | 372.97285 | 233.0593 | 0 |
| Slice 30 | 617.41195 | 3,243.4553 | 0 | 276.57794 | 172.82508 | 0 |
| Slice 31 | 622.12761 | 3,242.6736 | 0 | 171.95318 | 107.44827 | 0 |
| Slice 32 | 626.84327 | 3,241.9458 | 0 | 58.86915 | 36.785528 | 0 |

# Seismic Safety Factor

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 72
Date: 10/13/2016
Time: 9:15:28 PM
Tool Version: 8.15.1.11236
File Name: H-15-P22 Section F-F.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:15:29 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 3 Seismic Safety Factor

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
    Initial Slip Surface Source: Other GeoStudio Analysis
    Slip Surface Other Analysis: 1 Static Safety Factor: Maximum Storage Pool [(last)]
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Critical Slip Surfaces from Other
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)

### Concrete Cut-Off Wall
Model: Bedrock (Impenetrable)

### Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (-115, 3,275.7801) ft
Right Coordinate: (174.32789, 3,245.5743) ft

## Surcharge Loads

### Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -115 | 3,289 |

| | | |
|---|---|---|
| | -73.47025 | 3,289 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -107.16364 | 3,278.1596 |
| Point 2 | -114.47731 | 3,275.8065 |
| Point 3 | -71.85117 | 3,263.886 |
| Point 4 | -34.92044 | 3,264.2001 |
| Point 5 | -11.4299 | 3,264.6231 |
| Point 6 | 173.56318 | 3,273.8065 |
| Point 7 | 152.47781 | 3,275.8065 |
| Point 8 | 143.06116 | 3,275.8747 |
| Point 9 | 127.59717 | 3,276.7903 |
| Point 10 | 116.01195 | 3,277.8008 |
| Point 11 | 113.67097 | 3,277.8065 |
| Point 12 | 69.81587 | 3,281.7492 |
| Point 13 | 50.66176 | 3,282.6842 |
| Point 14 | 23.5701 | 3,264.6231 |
| Point 15 | 52.9842 | 3,265.3268 |
| Point 16 | 82.90382 | 3,266.6084 |
| Point 17 | 120.49749 | 3,267.6439 |
| Point 18 | 161.72301 | 3,268.4956 |
| Point 19 | 173.7055 | 3,268.5521 |
| Point 20 | 9.99207 | 3,291.7671 |
| Point 21 | -3.31068 | 3,294.9231 |
| Point 22 | -41.99884 | 3,293.6413 |
| Point 23 | -50.89725 | 3,293.9623 |
| Point 24 | -61.76287 | 3,292.7667 |
| Point 25 | 27.67037 | 3,283.8065 |
| Point 26 | 23.73857 | 3,284.568 |
| Point 27 | 27.7701 | 3,267.4231 |
| Point 28 | -15.6299 | 3,267.4231 |
| Point 29 | -3.9299 | 3,259.6231 |

| | | |
|---|---|---|
| Point 30 | 5.0701 | 3,259.6231 |
| Point 31 | 5.0701 | 3,280 |
| Point 32 | 7.0701 | 3,280 |
| Point 33 | 7.0701 | 3,259.6231 |
| Point 34 | 16.0701 | 3,259.6231 |
| Point 35 | 174.32789 | 3,245.5743 |
| Point 36 | 4.05111 | 3,294.8784 |
| Point 37 | 2.0701 | 3,294.8904 |
| Point 38 | -79.68588 | 3,287.0002 |
| Point 39 | -31.18701 | 3,277.7945 |
| Point 40 | -115 | 3,275.7801 |
| Point 41 | -115 | 3,263.3559 |
| Point 42 | -115 | 3,245.5743 |
| Point 43 | -115 | 3,289 |
| Point 44 | -115 | 3,292 |
| Point 45 | -64.14587 | 3,292 |
| Point 46 | -73.47025 | 3,289 |
| Point 47 | 5.0701 | 3,245.5743 |
| Point 48 | 7.0701 | 3,245.5743 |

## Regions

| | Material | Points | Area ($ft^2$) |
|---|---|---|---|
| Region 1 | Foundation Soil - Seismic | 6,7,8,9,10,11,12,13,27,14,15,16,17,18,19 | 1,592.8 |
| Region 2 | Embankment Fill - Seismic | 28,5,29,30,31,32,33,34,14,27,13,25,26,20,36,37,21,22,23,24,45,46,38,1,39 | 2,595.1 |
| Region 3 | Bedrock | 19,18,17,16,15,14,34,33,48,35 | 3,451.1 |
| Region 4 | Concrete Cut-Off Wall | 33,32,31,30,47,48 | 68.851 |
| Region 5 | Foundation Soil - Seismic | 1,2,40,41,3,4,5,28,39 | 1,310.6 |
| Region 6 | Bedrock | 30,29,5,4,3,41,42,47 | 2,153.8 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.38
Volume: 71.995372 $ft^3$
Weight: 8,999.4215 lbs
Resisting Moment: 158,041.7 lbs-ft
Activating Moment: 114,886.18 lbs-ft

Resisting Force: 4,782.6859 lbs
Activating Force: 3,476.8422 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (27.67037, 3,283.8065) ft
Entry: (1.4188139, 3,294.8944) ft
Radius: 29.554035 ft
Center: (24.619019, 3,313.2026) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 1.744457 | 3,294.4962 | 0 | 10.231965 | 5.0791913 | 40 |
| Slice 2 | 2.5653525 | 3,293.5424 | 0 | 93.555361 | 46.441285 | 40 |
| Slice 3 | 3.5558575 | 3,292.4834 | 0 | 184.11707 | 91.396505 | 40 |
| Slice 4 | 4.4754643 | 3,291.5845 | 0 | 241.91319 | 120.08675 | 40 |
| Slice 5 | 5.3241729 | 3,290.8232 | 0 | 270.07742 | 134.0676 | 40 |
| Slice 6 | 6.1728814 | 3,290.1183 | 0 | 295.01921 | 146.44881 | 40 |
| Slice 7 | 7.02159 | 3,289.4646 | 0 | 317.41112 | 157.56425 | 40 |
| Slice 8 | 7.8702986 | 3,288.8581 | 0 | 337.72913 | 167.6502 | 40 |
| Slice 9 | 8.7190071 | 3,288.2952 | 0 | 356.28394 | 176.86089 | 40 |
| Slice 10 | 9.5677157 | 3,287.7732 | 0 | 373.24377 | 185.27982 | 40 |
| Slice 11 | 10.421648 | 3,287.2867 | 0 | 388.72434 | 192.96444 | 40 |
| Slice 12 | 11.280804 | 3,286.834 | 0 | 402.62448 | 199.86453 | 40 |
| Slice 13 | 12.139961 | 3,286.4166 | 0 | 414.61826 | 205.81829 | 40 |
| Slice 14 | 12.999117 | 3,286.0327 | 0 | 424.36703 | 210.65762 | 40 |
| Slice 15 | 13.858273 | 3,285.6811 | 0 | 431.41828 | 214.15789 | 40 |
| Slice 16 | 14.717429 | 3,285.3603 | 0 | 435.21633 | 216.04326 | 40 |
| Slice 17 | 15.576586 | 3,285.0695 | 0 | 435.12521 | 215.99803 | 40 |
| Slice 18 | 16.435742 | 3,284.8076 | 0 | 430.45738 | 213.6809 | 40 |
| Slice 19 | 17.294898 | 3,284.5739 | 0 | 420.51503 | 208.74547 | 40 |
| Slice 20 | 18.154054 | 3,284.3677 | 0 | 404.64752 | 200.86877 | 40 |
| Slice 21 | 19.013211 | 3,284.1884 | 0 | 382.30931 | 189.77999 | 40 |
| Slice 22 | 19.872367 | 3,284.0355 | 0 | 353.13114 | 175.29582 | 40 |
| Slice 23 | 20.731523 | 3,283.9086 | 0 | 316.97586 | 157.34818 | 40 |
| Slice 24 | 21.590679 | 3,283.8073 | 0 | 273.99049 | 136.01006 | 40 |
| Slice 25 | 22.449836 | 3,283.7314 | 0 | 224.6203 | 111.50248 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | 23.308992 | 3,283.6807 | 0 | 169.60281 | 84.191566 | 40 |
| Slice 27 | 24.230045 | 3,283.6552 | 0 | 126.78436 | 62.936303 | 40 |
| Slice 28 | 25.212995 | 3,283.6586 | 0 | 96.255886 | 47.781837 | 40 |
| Slice 29 | 26.195945 | 3,283.6948 | 0 | 61.271673 | 30.415522 | 40 |
| Slice 30 | 27.178895 | 3,283.7638 | 0 | 22.885958 | 11.360688 | 40 |

# Static Safety Factor: Maximum Storage Pool

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## File Information

File Version: 8.15
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Tool Version: 8.15.1.11236
File Name: H-15-P22 Section F-F.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:15:29 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 1 Static Safety Factor: Maximum Storage Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-17, 3,294.4696) ft
Left-Zone Right Coordinate: (4.05111, 3,294.8784) ft
Left-Zone Increment: 8
Right Projection: Range
Right-Zone Left Coordinate: (27.67037, 3,283.8065) ft
Right-Zone Right Coordinate: (81, 3,280.7437) ft
Right-Zone Increment: 8
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (-115, 3,275.7801) ft
Right Coordinate: (174.32789, 3,245.5743) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -115 | 3,289 |
| | -73.47025 | 3,289 |

## Seismic Coefficients

Horz Seismic Coef.: 0

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -107.16364 | 3,278.1596 |
| Point 2 | -114.47731 | 3,275.8065 |
| Point 3 | -71.85117 | 3,263.886 |
| Point 4 | -34.92044 | 3,264.2001 |
| Point 5 | -11.4299 | 3,264.6231 |
| Point 6 | 173.56318 | 3,273.8065 |
| Point 7 | 152.47781 | 3,275.8065 |
| Point 8 | 143.06116 | 3,275.8747 |
| Point 9 | 127.59717 | 3,276.7903 |
| Point 10 | 116.01195 | 3,277.8008 |
| Point 11 | 113.67097 | 3,277.8065 |
| Point 12 | 69.81587 | 3,281.7492 |
| Point 13 | 50.66176 | 3,282.6842 |
| Point 14 | 23.5701 | 3,264.6231 |
| Point 15 | 52.9842 | 3,265.3268 |
| Point 16 | 82.90382 | 3,266.6084 |
| Point 17 | 120.49749 | 3,267.6439 |
| Point 18 | 161.72301 | 3,268.4956 |
| Point 19 | 173.7055 | 3,268.5521 |
| Point 20 | 9.99207 | 3,291.7671 |
| Point 21 | -3.31068 | 3,294.9231 |

| | | |
|---|---|---|
| Point 22 | -41.99884 | 3,293.6413 |
| Point 23 | -50.89725 | 3,293.9623 |
| Point 24 | -61.76287 | 3,292.7667 |
| Point 25 | 27.67037 | 3,283.8065 |
| Point 26 | 23.73857 | 3,284.568 |
| Point 27 | 27.7701 | 3,267.4231 |
| Point 28 | -15.6299 | 3,267.4231 |
| Point 29 | -3.9299 | 3,259.6231 |
| Point 30 | 5.0701 | 3,259.6231 |
| Point 31 | 5.0701 | 3,280 |
| Point 32 | 7.0701 | 3,280 |
| Point 33 | 7.0701 | 3,259.6231 |
| Point 34 | 16.0701 | 3,259.6231 |
| Point 35 | 174.32789 | 3,245.5743 |
| Point 36 | 4.05111 | 3,294.8784 |
| Point 37 | 2.0701 | 3,294.8904 |
| Point 38 | -79.68588 | 3,287.0002 |
| Point 39 | -31.18701 | 3,277.7945 |
| Point 40 | -115 | 3,275.7801 |
| Point 41 | -115 | 3,263.3559 |
| Point 42 | -115 | 3,245.5743 |
| Point 43 | -115 | 3,289 |
| Point 44 | -115 | 3,292 |
| Point 45 | -64.14587 | 3,292 |
| Point 46 | -73.47025 | 3,289 |
| Point 47 | 5.0701 | 3,245.5743 |
| Point 48 | 7.0701 | 3,245.5743 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 6,7,8,9,10,11,12,13,27,14,15,16,17,18,19 | 1,592.8 |
| Region 2 | Embankment Fill | 28,5,29,30,31,32,33,34,14,27,13,25,26,20,36,37, 21,22,23,24,45,46,38,1,39 | 2,595.1 |
| Region 3 | Bedrock | 19,18,17,16,15,14,34,33,48,35 | 3,451.1 |
| Region 4 | Concrete Cut-Off Wall | 33,32,31,30,47,48 | 68.851 |

| | | | |
|---|---|---|---|
| Region 5 | Foundation Soil | 1,2,40,41,3,4,5,28,39 | 1,310.6 |
| Region 6 | Bedrock | 30,29,5,4,3,41,42,47 | 2,153.8 |

## Current Slip Surface

Slip Surface: 571
F of S: 1.91
Volume: 71.995372 ft³
Weight: 8,999.4215 lbs
Resisting Moment: 206,566.1 lbs-ft
Activating Moment: 108,264.7 lbs-ft
Resisting Force: 6,244.3664 lbs
Activating Force: 3,272.8566 lbs
F of S Rank (Analysis): 1 of 729 slip surfaces
F of S Rank (Query): 1 of 729 slip surfaces
Exit: (27.67037, 3,283.8065) ft
Entry: (1.4188139, 3,294.8944) ft
Radius: 29.554035 ft
Center: (24.619019, 3,313.2026) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 1.744457 | 3,294.4962 | 0 | 12.749992 | 8.2799417 | 50 |
| Slice 2 | 2.5653525 | 3,293.5424 | 0 | 97.362962 | 63.228247 | 50 |
| Slice 3 | 3.5558575 | 3,292.4834 | 0 | 189.74505 | 123.22188 | 50 |
| Slice 4 | 4.4754643 | 3,291.5845 | 0 | 248.94456 | 161.66649 | 50 |
| Slice 5 | 5.3241729 | 3,290.8232 | 0 | 277.90904 | 180.47624 | 50 |
| Slice 6 | 6.1728814 | 3,290.1183 | 0 | 303.53773 | 197.11971 | 50 |
| Slice 7 | 7.02159 | 3,289.4646 | 0 | 326.47254 | 212.01374 | 50 |
| Slice 8 | 7.8702986 | 3,288.8581 | 0 | 347.16195 | 225.4496 | 50 |
| Slice 9 | 8.7190071 | 3,288.2952 | 0 | 365.8928 | 237.61356 | 50 |
| Slice 10 | 9.5677157 | 3,287.7732 | 0 | 382.81149 | 248.60069 | 50 |
| Slice 11 | 10.421648 | 3,287.2867 | 0 | 398.01518 | 258.47408 | 50 |
| Slice 12 | 11.280804 | 3,286.834 | 0 | 411.38949 | 267.15946 | 50 |
| Slice 13 | 12.139961 | 3,286.4166 | 0 | 422.60766 | 274.44462 | 50 |
| Slice 14 | 12.999117 | 3,286.0327 | 0 | 431.34234 | 280.11699 | 50 |
| Slice 15 | 13.858273 | 3,285.6811 | 0 | 437.16599 | 283.89891 | 50 |
| Slice 16 | 14.717429 | 3,285.3603 | 0 | 439.56486 | 285.45676 | 50 |
| Slice 17 | 15.576586 | 3,285.0695 | 0 | 437.95986 | 284.41446 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 18 | 16.435742 | 3,284.8076 | 0 | 431.73596 | 280.37261 | 50 |
| Slice 19 | 17.294898 | 3,284.5739 | 0 | 420.28095 | 272.93364 | 50 |
| Slice 20 | 18.154054 | 3,284.3677 | 0 | 403.03316 | 261.7328 | 50 |
| Slice 21 | 19.013211 | 3,284.1884 | 0 | 379.53552 | 246.47325 | 50 |
| Slice 22 | 19.872367 | 3,284.0355 | 0 | 349.49125 | 226.96227 | 50 |
| Slice 23 | 20.731523 | 3,283.9086 | 0 | 312.81446 | 203.14408 | 50 |
| Slice 24 | 21.590679 | 3,283.8073 | 0 | 269.66743 | 175.12408 | 50 |
| Slice 25 | 22.449836 | 3,283.7314 | 0 | 220.47689 | 143.17936 | 50 |
| Slice 26 | 23.308992 | 3,283.6807 | 0 | 165.92337 | 107.75189 | 50 |
| Slice 27 | 24.230045 | 3,283.6552 | 0 | 123.76081 | 80.371207 | 50 |
| Slice 28 | 25.212995 | 3,283.6586 | 0 | 94.007171 | 61.048971 | 50 |
| Slice 29 | 26.195945 | 3,283.6948 | 0 | 59.844146 | 38.863243 | 50 |
| Slice 30 | 27.178895 | 3,283.7638 | 0 | 22.224875 | 14.433002 | 50 |

# Static Safety Factor: Maximum Surcharge Pool

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 72
Date: 10/13/2016
Time: 9:15:28 PM
Tool Version: 8.15.1.11236
File Name: H-15-P22 Section F-F.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:15:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 2 Static Safety Factor: Maximum Surcharge Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-17, 3,294.4696) ft
Left-Zone Right Coordinate: (4.05111, 3,294.8784) ft
Left-Zone Increment: 8
Right Projection: Range
Right-Zone Left Coordinate: (27.67037, 3,283.8065) ft
Right-Zone Right Coordinate: (81, 3,280.7437) ft
Right-Zone Increment: 8
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (-115, 3,275.7801) ft
Right Coordinate: (174.32789, 3,245.5743) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -115 | 3,292 |
| | -64.14587 | 3,292 |

## Seismic Coefficients

Horz Seismic Coef.: 0

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -107.16364 | 3,278.1596 |
| Point 2 | -114.47731 | 3,275.8065 |
| Point 3 | -71.85117 | 3,263.886 |
| Point 4 | -34.92044 | 3,264.2001 |
| Point 5 | -11.4299 | 3,264.6231 |
| Point 6 | 173.56318 | 3,273.8065 |
| Point 7 | 152.47781 | 3,275.8065 |
| Point 8 | 143.06116 | 3,275.8747 |
| Point 9 | 127.59717 | 3,276.7903 |
| Point 10 | 116.01195 | 3,277.8008 |
| Point 11 | 113.67097 | 3,277.8065 |
| Point 12 | 69.81587 | 3,281.7492 |
| Point 13 | 50.66176 | 3,282.6842 |
| Point 14 | 23.5701 | 3,264.6231 |
| Point 15 | 52.9842 | 3,265.3268 |
| Point 16 | 82.90382 | 3,266.6084 |
| Point 17 | 120.49749 | 3,267.6439 |
| Point 18 | 161.72301 | 3,268.4956 |
| Point 19 | 173.7055 | 3,268.5521 |
| Point 20 | 9.99207 | 3,291.7671 |
| Point 21 | -3.31068 | 3,294.9231 |

| | | |
|---|---|---|
| Point 22 | -41.99884 | 3,293.6413 |
| Point 23 | -50.89725 | 3,293.9623 |
| Point 24 | -61.76287 | 3,292.7667 |
| Point 25 | 27.67037 | 3,283.8065 |
| Point 26 | 23.73857 | 3,284.568 |
| Point 27 | 27.7701 | 3,267.4231 |
| Point 28 | -15.6299 | 3,267.4231 |
| Point 29 | -3.9299 | 3,259.6231 |
| Point 30 | 5.0701 | 3,259.6231 |
| Point 31 | 5.0701 | 3,280 |
| Point 32 | 7.0701 | 3,280 |
| Point 33 | 7.0701 | 3,259.6231 |
| Point 34 | 16.0701 | 3,259.6231 |
| Point 35 | 174.32789 | 3,245.5743 |
| Point 36 | 4.05111 | 3,294.8784 |
| Point 37 | 2.0701 | 3,294.8904 |
| Point 38 | -79.68588 | 3,287.0002 |
| Point 39 | -31.18701 | 3,277.7945 |
| Point 40 | -115 | 3,275.7801 |
| Point 41 | -115 | 3,263.3559 |
| Point 42 | -115 | 3,245.5743 |
| Point 43 | -115 | 3,289 |
| Point 44 | -115 | 3,292 |
| Point 45 | -64.14587 | 3,292 |
| Point 46 | -73.47025 | 3,289 |
| Point 47 | 5.0701 | 3,245.5743 |
| Point 48 | 7.0701 | 3,245.5743 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 6,7,8,9,10,11,12,13,27,14,15,16,17,18,19 | 1,592.8 |
| Region 2 | Embankment Fill | 28,5,29,30,31,32,33,34,14,27,13,25,26,20,36,37,21,22,23,24,45,46,38,1,39 | 2,595.1 |
| Region 3 | Bedrock | 19,18,17,16,15,14,34,33,48,35 | 3,451.1 |
| Region 4 | Concrete Cut-Off Wall | 33,32,31,30,47,48 | 68.851 |

| | | | |
|---|---|---|---|
| Region 5 | Foundation Soil | 1,2,40,41,3,4,5,28,39 | 1,310.6 |
| Region 6 | Bedrock | 30,29,5,4,3,41,42,47 | 2,153.8 |

## Current Slip Surface

Slip Surface: 571
F of S: 1.91
Volume: 71.995372 ft³
Weight: 8,999.4215 lbs
Resisting Moment: 206,566.1 lbs-ft
Activating Moment: 108,264.7 lbs-ft
Resisting Force: 6,244.3664 lbs
Activating Force: 3,272.8566 lbs
F of S Rank (Analysis): 1 of 729 slip surfaces
F of S Rank (Query): 1 of 729 slip surfaces
Exit: (27.67037, 3,283.8065) ft
Entry: (1.4188139, 3,294.8944) ft
Radius: 29.554035 ft
Center: (24.619019, 3,313.2026) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 1.744457 | 3,294.4962 | 0 | 12.749992 | 8.2799417 | 50 |
| Slice 2 | 2.5653525 | 3,293.5424 | 0 | 97.362962 | 63.228247 | 50 |
| Slice 3 | 3.5558575 | 3,292.4834 | 0 | 189.74505 | 123.22188 | 50 |
| Slice 4 | 4.4754643 | 3,291.5845 | 0 | 248.94456 | 161.66649 | 50 |
| Slice 5 | 5.3241729 | 3,290.8232 | 0 | 277.90904 | 180.47624 | 50 |
| Slice 6 | 6.1728814 | 3,290.1183 | 0 | 303.53773 | 197.11971 | 50 |
| Slice 7 | 7.02159 | 3,289.4646 | 0 | 326.47254 | 212.01374 | 50 |
| Slice 8 | 7.8702986 | 3,288.8581 | 0 | 347.16195 | 225.4496 | 50 |
| Slice 9 | 8.7190071 | 3,288.2952 | 0 | 365.8928 | 237.61356 | 50 |
| Slice 10 | 9.5677157 | 3,287.7732 | 0 | 382.81149 | 248.60069 | 50 |
| Slice 11 | 10.421648 | 3,287.2867 | 0 | 398.01518 | 258.47408 | 50 |
| Slice 12 | 11.280804 | 3,286.834 | 0 | 411.38949 | 267.15946 | 50 |
| Slice 13 | 12.139961 | 3,286.4166 | 0 | 422.60766 | 274.44462 | 50 |
| Slice 14 | 12.999117 | 3,286.0327 | 0 | 431.34234 | 280.11699 | 50 |
| Slice 15 | 13.858273 | 3,285.6811 | 0 | 437.16599 | 283.89891 | 50 |
| Slice 16 | 14.717429 | 3,285.3603 | 0 | 439.56486 | 285.45676 | 50 |
| Slice 17 | 15.576586 | 3,285.0695 | 0 | 437.95986 | 284.41446 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 18 | 16.435742 | 3,284.8076 | 0 | 431.73596 | 280.37261 | 50 |
| Slice 19 | 17.294898 | 3,284.5739 | 0 | 420.28095 | 272.93364 | 50 |
| Slice 20 | 18.154054 | 3,284.3677 | 0 | 403.03316 | 261.7328 | 50 |
| Slice 21 | 19.013211 | 3,284.1884 | 0 | 379.53552 | 246.47325 | 50 |
| Slice 22 | 19.872367 | 3,284.0355 | 0 | 349.49125 | 226.96227 | 50 |
| Slice 23 | 20.731523 | 3,283.9086 | 0 | 312.81446 | 203.14408 | 50 |
| Slice 24 | 21.590679 | 3,283.8073 | 0 | 269.66743 | 175.12408 | 50 |
| Slice 25 | 22.449836 | 3,283.7314 | 0 | 220.47689 | 143.17936 | 50 |
| Slice 26 | 23.308992 | 3,283.6807 | 0 | 165.92337 | 107.75189 | 50 |
| Slice 27 | 24.230045 | 3,283.6552 | 0 | 123.76081 | 80.371207 | 50 |
| Slice 28 | 25.212995 | 3,283.6586 | 0 | 94.007171 | 61.048971 | 50 |
| Slice 29 | 26.195945 | 3,283.6948 | 0 | 59.844146 | 38.863243 | 50 |
| Slice 30 | 27.178895 | 3,283.7638 | 0 | 22.224875 | 14.433002 | 50 |

# Static Safety Factor: Maximum Storage Pool

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 79
Date: 10/13/2016
Time: 9:24:39 PM
Tool Version: 8.15.1.11236
File Name: H-15-P25 Section G-G.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:24:40 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 1 Static Safety Factor: Maximum Storage Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-23.3772, 3,293.9683) ft
Left-Zone Right Coordinate: (3.75199, 3,294.2162) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (9.5216, 3,289.9354) ft
Right-Zone Right Coordinate: (51.31888, 3,285.0099) ft
Right-Zone Increment: 10
Radius Increments: 6

## Slip Surface Limits

Left Coordinate: (-140, 3,273.7531) ft
Right Coordinate: (77, 3,284.1107) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -140 | 3,289 |
| | -73.22362 | 3,289 |

## Seismic Coefficients

Horz Seismic Coef.: 0

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -140 | 3,289 |
| Point 2 | 4.98731 | 3,280 |
| Point 3 | 2.98731 | 3,280 |
| Point 4 | 2.98731 | 3,260.1323 |
| Point 5 | 4.98731 | 3,260.1323 |
| Point 6 | 51.30445 | 3,285.0104 |
| Point 7 | 28.66651 | 3,285.803 |
| Point 8 | 9.5216 | 3,289.9354 |
| Point 9 | 8.51849 | 3,290.6796 |
| Point 10 | -6.01269 | 3,260.1323 |
| Point 11 | 13.98731 | 3,260.1323 |
| Point 12 | -4.49883 | 3,294.3323 |
| Point 13 | -41.73356 | 3,293.6144 |
| Point 14 | -51.60134 | 3,293.8236 |
| Point 15 | -58.27032 | 3,293.4869 |
| Point 16 | -98.39836 | 3,281.3772 |
| Point 17 | -96.76262 | 3,281.3198 |
| Point 18 | -79.03736 | 3,279.8236 |
| Point 19 | -71.65769 | 3,283.8236 |
| Point 20 | -61.16116 | 3,283.8736 |
| Point 21 | -116.29297 | 3,275.8236 |

| | | |
|---|---|---|
| Point 22 | -130.39095 | 3,273.8218 |
| Point 23 | -132.52173 | 3,262.9304 |
| Point 24 | -79.00022 | 3,264.0102 |
| Point 25 | -13.51269 | 3,265.1323 |
| Point 26 | -43.61992 | 3,285.2038 |
| Point 27 | 76.91051 | 3,284.1138 |
| Point 28 | 21.48731 | 3,265.1323 |
| Point 29 | 3.75199 | 3,294.2162 |
| Point 30 | 1.98731 | 3,294.241 |
| Point 31 | -140 | 3,292 |
| Point 32 | -63.31594 | 3,292 |
| Point 33 | -73.22362 | 3,289 |
| Point 34 | 2.98731 | 3,243.7531 |
| Point 35 | 4.98731 | 3,243.7531 |
| Point 36 | 77 | 3,284.1107 |
| Point 37 | 77 | 3,266.1548 |
| Point 38 | 77 | 3,243.7531 |
| Point 39 | -140 | 3,273.7531 |
| Point 40 | -140 | 3,262.8946 |
| Point 41 | -140 | 3,243.7531 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 20,19,18,17,16,21,22,39,40,23,24,25,26 | 1,865.5 |
| Region 2 | Concrete Cut-Off Wall | 5,2,3,4,34,35 | 72.494 |
| Region 3 | Embankment Fill | 29,30,12,13,14,15,32,33,16,17,18,19,20, 26,25,10,4,3,2,5,11,28,6,7,8,9 | 2,270.9 |
| Region 4 | Bedrock | 4,10,25,24,23,40,41,34 | 2,850.9 |
| Region 5 | Foundation Soil | 27,6,28,37,36 | 767.19 |
| Region 6 | Bedrock | 28,11,5,35,38,37 | 1,504.2 |

## Current Slip Surface

Slip Surface: 468
F of S: 2.07
Volume: 7.1282129 ft³
Weight: 891.02661 lbs
Resisting Moment: 4,736.7591 lbs-ft

Activating Moment: 2,292.2376 lbs-ft
Resisting Force: 728.01839 lbs
Activating Force: 352.28741 lbs
F of S Rank (Analysis): 1 of 539 slip surfaces
F of S Rank (Query): 1 of 539 slip surfaces
Exit: (9.5216, 3,289.9354) ft
Entry: (3.75199, 3,294.2162) ft
Radius: 5.1843824 ft
Center: (8.8642522, 3,295.0779) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 3.84732 | 3,293.8323 | 0 | -23.146061 | -15.031228 | 50 |
| Slice 2 | 4.03798 | 3,293.2029 | 0 | 22.57456 | 14.660091 | 50 |
| Slice 3 | 4.22864 | 3,292.7664 | 0 | 50.979671 | 33.106586 | 50 |
| Slice 4 | 4.4193 | 3,292.416 | 0 | 71.408336 | 46.373115 | 50 |
| Slice 5 | 4.60996 | 3,292.1197 | 0 | 87.205762 | 56.632084 | 50 |
| Slice 6 | 4.80062 | 3,291.8622 | 0 | 100.06708 | 64.984325 | 50 |
| Slice 7 | 4.99128 | 3,291.6345 | 0 | 110.97557 | 72.068375 | 50 |
| Slice 8 | 5.18194 | 3,291.431 | 0 | 120.54201 | 78.280896 | 50 |
| Slice 9 | 5.3726 | 3,291.2479 | 0 | 129.15612 | 83.874963 | 50 |
| Slice 10 | 5.56326 | 3,291.0822 | 0 | 137.06238 | 89.009348 | 50 |
| Slice 11 | 5.75392 | 3,290.9319 | 0 | 144.40074 | 93.774938 | 50 |
| Slice 12 | 5.94458 | 3,290.7954 | 0 | 151.2292 | 98.20939 | 50 |
| Slice 13 | 6.13524 | 3,290.6714 | 0 | 157.53644 | 102.30536 | 50 |
| Slice 14 | 6.3259 | 3,290.5588 | 0 | 163.2491 | 106.01521 | 50 |
| Slice 15 | 6.51656 | 3,290.4568 | 0 | 168.23653 | 109.25408 | 50 |
| Slice 16 | 6.70722 | 3,290.3648 | 0 | 172.315 | 111.90267 | 50 |
| Slice 17 | 6.89788 | 3,290.282 | 0 | 175.25346 | 113.81093 | 50 |
| Slice 18 | 7.08854 | 3,290.2082 | 0 | 176.78226 | 114.80374 | 50 |
| Slice 19 | 7.2792 | 3,290.1428 | 0 | 176.60637 | 114.68952 | 50 |
| Slice 20 | 7.46986 | 3,290.0856 | 0 | 174.424 | 113.27227 | 50 |
| Slice 21 | 7.66052 | 3,290.0362 | 0 | 169.95078 | 110.36733 | 50 |
| Slice 22 | 7.85118 | 3,289.9944 | 0 | 162.94838 | 105.81992 | 50 |
| Slice 23 | 8.04184 | 3,289.9601 | 0 | 153.25501 | 99.524968 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 24 | 8.2325 | 3,289.9331 | 0 | 140.81383 | 91.445568 | 50 |
| Slice 25 | 8.42316 | 3,289.9132 | 0 | 125.69421 | 81.626773 | 50 |
| Slice 26 | 8.618801 | 3,289.9003 | 0 | 107.59763 | 69.874718 | 50 |
| Slice 27 | 8.819423 | 3,289.8947 | 0 | 86.73375 | 56.325556 | 50 |
| Slice 28 | 9.020045 | 3,289.8969 | 0 | 64.030186 | 41.581689 | 50 |
| Slice 29 | 9.220667 | 3,289.9068 | 0 | 40.083468 | 26.030508 | 50 |
| Slice 30 | 9.421289 | 3,289.9246 | 0 | 15.509715 | 10.072126 | 50 |

# Static Safety Factor: Maximum Surcharge Pool

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 79
Date: 10/13/2016
Time: 9:24:39 PM
Tool Version: 8.15.1.11236
File Name: H-15-P25 Section G-G.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:24:40 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 2 Static Safety Factor: Maximum Surcharge Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-23.3772, 3,293.9683) ft
Left-Zone Right Coordinate: (3.75199, 3,294.2162) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (9.5216, 3,289.9354) ft
Right-Zone Right Coordinate: (51.31888, 3,285.0099) ft
Right-Zone Increment: 10
Radius Increments: 6

## Slip Surface Limits

Left Coordinate: (-140, 3,273.7531) ft
Right Coordinate: (77, 3,284.1107) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -140 | 3,292 |
| | -63.31594 | 3,292 |

## Seismic Coefficients

Horz Seismic Coef.: 0

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -140 | 3,289 |
| Point 2 | 4.98731 | 3,280 |
| Point 3 | 2.98731 | 3,280 |
| Point 4 | 2.98731 | 3,260.1323 |
| Point 5 | 4.98731 | 3,260.1323 |
| Point 6 | 51.30445 | 3,285.0104 |
| Point 7 | 28.66651 | 3,285.803 |
| Point 8 | 9.5216 | 3,289.9354 |
| Point 9 | 8.51849 | 3,290.6796 |
| Point 10 | -6.01269 | 3,260.1323 |
| Point 11 | 13.98731 | 3,260.1323 |
| Point 12 | -4.49883 | 3,294.3323 |
| Point 13 | -41.73356 | 3,293.6144 |
| Point 14 | -51.60134 | 3,293.8236 |
| Point 15 | -58.27032 | 3,293.4869 |
| Point 16 | -98.39836 | 3,281.3772 |
| Point 17 | -96.76262 | 3,281.3198 |
| Point 18 | -79.03736 | 3,279.8236 |
| Point 19 | -71.65769 | 3,283.8236 |
| Point 20 | -61.16116 | 3,283.8736 |
| Point 21 | -116.29297 | 3,275.8236 |

| | | |
|---|---|---|
| Point 22 | -130.39095 | 3,273.8218 |
| Point 23 | -132.52173 | 3,262.9304 |
| Point 24 | -79.00022 | 3,264.0102 |
| Point 25 | -13.51269 | 3,265.1323 |
| Point 26 | -43.61992 | 3,285.2038 |
| Point 27 | 76.91051 | 3,284.1138 |
| Point 28 | 21.48731 | 3,265.1323 |
| Point 29 | 3.75199 | 3,294.2162 |
| Point 30 | 1.98731 | 3,294.241 |
| Point 31 | -140 | 3,292 |
| Point 32 | -63.31594 | 3,292 |
| Point 33 | -73.22362 | 3,289 |
| Point 34 | 2.98731 | 3,243.7531 |
| Point 35 | 4.98731 | 3,243.7531 |
| Point 36 | 77 | 3,284.1107 |
| Point 37 | 77 | 3,266.1548 |
| Point 38 | 77 | 3,243.7531 |
| Point 39 | -140 | 3,273.7531 |
| Point 40 | -140 | 3,262.8946 |
| Point 41 | -140 | 3,243.7531 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 20,19,18,17,16,21,22,39,40,23,24,25,26 | 1,865.5 |
| Region 2 | Concrete Cut-Off Wall | 5,2,3,4,34,35 | 72.494 |
| Region 3 | Embankment Fill | 29,30,12,13,14,15,32,33,16,17,18,19,20,26,25,10,4,3,2,5,11,28,6,7,8,9 | 2,270.9 |
| Region 4 | Bedrock | 4,10,25,24,23,40,41,34 | 2,850.9 |
| Region 5 | Foundation Soil | 27,6,28,37,36 | 767.19 |
| Region 6 | Bedrock | 28,11,5,35,38,37 | 1,504.2 |

## Current Slip Surface

Slip Surface: 468
F of S: 2.07
Volume: 7.1282129 ft³
Weight: 891.02661 lbs
Resisting Moment: 4,736.7591 lbs-ft

Activating Moment: 2,292.2376 lbs-ft
Resisting Force: 728.01839 lbs
Activating Force: 352.28741 lbs
F of S Rank (Analysis): 1 of 539 slip surfaces
F of S Rank (Query): 1 of 539 slip surfaces
Exit: (9.5216, 3,289.9354) ft
Entry: (3.75199, 3,294.2162) ft
Radius: 5.1843824 ft
Center: (8.8642522, 3,295.0779) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 3.84732 | 3,293.8323 | 0 | -23.146061 | -15.031228 | 50 |
| Slice 2 | 4.03798 | 3,293.2029 | 0 | 22.57456 | 14.660091 | 50 |
| Slice 3 | 4.22864 | 3,292.7664 | 0 | 50.979671 | 33.106586 | 50 |
| Slice 4 | 4.4193 | 3,292.416 | 0 | 71.408336 | 46.373115 | 50 |
| Slice 5 | 4.60996 | 3,292.1197 | 0 | 87.205762 | 56.632084 | 50 |
| Slice 6 | 4.80062 | 3,291.8622 | 0 | 100.06708 | 64.984325 | 50 |
| Slice 7 | 4.99128 | 3,291.6345 | 0 | 110.97557 | 72.068375 | 50 |
| Slice 8 | 5.18194 | 3,291.431 | 0 | 120.54201 | 78.280896 | 50 |
| Slice 9 | 5.3726 | 3,291.2479 | 0 | 129.15612 | 83.874963 | 50 |
| Slice 10 | 5.56326 | 3,291.0822 | 0 | 137.06238 | 89.009348 | 50 |
| Slice 11 | 5.75392 | 3,290.9319 | 0 | 144.40074 | 93.774938 | 50 |
| Slice 12 | 5.94458 | 3,290.7954 | 0 | 151.2292 | 98.20939 | 50 |
| Slice 13 | 6.13524 | 3,290.6714 | 0 | 157.53644 | 102.30536 | 50 |
| Slice 14 | 6.3259 | 3,290.5588 | 0 | 163.2491 | 106.01521 | 50 |
| Slice 15 | 6.51656 | 3,290.4568 | 0 | 168.23653 | 109.25408 | 50 |
| Slice 16 | 6.70722 | 3,290.3648 | 0 | 172.315 | 111.90267 | 50 |
| Slice 17 | 6.89788 | 3,290.282 | 0 | 175.25346 | 113.81093 | 50 |
| Slice 18 | 7.08854 | 3,290.2082 | 0 | 176.78226 | 114.80374 | 50 |
| Slice 19 | 7.2792 | 3,290.1428 | 0 | 176.60637 | 114.68952 | 50 |
| Slice 20 | 7.46986 | 3,290.0856 | 0 | 174.424 | 113.27227 | 50 |
| Slice 21 | 7.66052 | 3,290.0362 | 0 | 169.95078 | 110.36733 | 50 |
| Slice 22 | 7.85118 | 3,289.9944 | 0 | 162.94838 | 105.81992 | 50 |
| Slice 23 | 8.04184 | 3,289.9601 | 0 | 153.25501 | 99.524968 | 50 |
| Slice 24 | 8.2325 | 3,289.9331 | 0 | 140.81383 | 91.445568 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 25 | 8.42316 | 3,289.9132 | 0 | 125.69421 | 81.626773 | 50 |
| Slice 26 | 8.618801 | 3,289.9003 | 0 | 107.59763 | 69.874718 | 50 |
| Slice 27 | 8.819423 | 3,289.8947 | 0 | 86.73375 | 56.325556 | 50 |
| Slice 28 | 9.020045 | 3,289.8969 | 0 | 64.030186 | 41.581689 | 50 |
| Slice 29 | 9.220667 | 3,289.9068 | 0 | 40.083468 | 26.030508 | 50 |
| Slice 30 | 9.421289 | 3,289.9246 | 0 | 15.509715 | 10.072126 | 50 |

# Seismic Safety Factor

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 79
Date: 10/13/2016
Time: 9:24:39 PM
Tool Version: 8.15.1.11236
File Name: H-15-P25 Section G-G.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:24:40 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 3 Seismic Safety Factor

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: 1 Static Safety Factor: Maximum Storage Pool [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)

### Concrete Cut-Off Wall
Model: Bedrock (Impenetrable)

### Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (-140, 3,273.7531) ft
Right Coordinate: (77, 3,284.1107) ft

## Surcharge Loads

### Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | -140 | 3,289 |

| | | |
|---|---|---|
| | -73.22362 | 3,289 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -140 | 3,289 |
| Point 2 | 4.98731 | 3,280 |
| Point 3 | 2.98731 | 3,280 |
| Point 4 | 2.98731 | 3,260.1323 |
| Point 5 | 4.98731 | 3,260.1323 |
| Point 6 | 51.30445 | 3,285.0104 |
| Point 7 | 28.66651 | 3,285.803 |
| Point 8 | 9.5216 | 3,289.9354 |
| Point 9 | 8.51849 | 3,290.6796 |
| Point 10 | -6.01269 | 3,260.1323 |
| Point 11 | 13.98731 | 3,260.1323 |
| Point 12 | -4.49883 | 3,294.3323 |
| Point 13 | -41.73356 | 3,293.6144 |
| Point 14 | -51.60134 | 3,293.8236 |
| Point 15 | -58.27032 | 3,293.4869 |
| Point 16 | -98.39836 | 3,281.3772 |
| Point 17 | -96.76262 | 3,281.3198 |
| Point 18 | -79.03736 | 3,279.8236 |
| Point 19 | -71.65769 | 3,283.8236 |
| Point 20 | -61.16116 | 3,283.8736 |
| Point 21 | -116.29297 | 3,275.8236 |
| Point 22 | -130.39095 | 3,273.8218 |
| Point 23 | -132.52173 | 3,262.9304 |
| Point 24 | -79.00022 | 3,264.0102 |
| Point 25 | -13.51269 | 3,265.1323 |
| Point 26 | -43.61992 | 3,285.2038 |
| Point 27 | 76.91051 | 3,284.1138 |
| Point 28 | 21.48731 | 3,265.1323 |
| Point 29 | 3.75199 | 3,294.2162 |

| | | |
|---|---|---|
| Point 30 | 1.98731 | 3,294.241 |
| Point 31 | -140 | 3,292 |
| Point 32 | -63.31594 | 3,292 |
| Point 33 | -73.22362 | 3,289 |
| Point 34 | 2.98731 | 3,243.7531 |
| Point 35 | 4.98731 | 3,243.7531 |
| Point 36 | 77 | 3,284.1107 |
| Point 37 | 77 | 3,266.1548 |
| Point 38 | 77 | 3,243.7531 |
| Point 39 | -140 | 3,273.7531 |
| Point 40 | -140 | 3,262.8946 |
| Point 41 | -140 | 3,243.7531 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil - Seismic | 20,19,18,17,16,21,22,39,40,23,24,25,26 | 1,865.5 |
| Region 2 | Concrete Cut-Off Wall | 5,2,3,4,34,35 | 72.494 |
| Region 3 | Embankment Fill - Seismic | 29,30,12,13,14,15,32,33,16,17,18,19,20,26,25,10,4,3,2,5,11,28,6,7,8,9 | 2,270.9 |
| Region 4 | Bedrock | 4,10,25,24,23,40,41,34 | 2,850.9 |
| Region 5 | Foundation Soil - Seismic | 27,6,28,37,36 | 767.19 |
| Region 6 | Bedrock | 28,11,5,35,38,37 | 1,504.2 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.53
Volume: 7.1282129 ft³
Weight: 891.02662 lbs
Resisting Moment: 3,659.054 lbs-ft
Activating Moment: 2,385.1021 lbs-ft
Resisting Force: 562.99529 lbs
Activating Force: 366.9186 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (9.5216, 3,289.9354) ft
Entry: (3.75199, 3,294.2162) ft
Radius: 5.1843824 ft
Center: (8.8642522, 3,295.0779) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 3.84732 | 3,293.8323 | 0 | -25.598943 | -12.707425 | 40 |
| Slice 2 | 4.03798 | 3,293.2029 | 0 | 20.325679 | 10.089755 | 40 |
| Slice 3 | 4.22864 | 3,292.7664 | 0 | 48.526072 | 24.088551 | 40 |
| Slice 4 | 4.4193 | 3,292.416 | 0 | 68.62091 | 34.063716 | 40 |
| Slice 5 | 4.60996 | 3,292.1197 | 0 | 84.054211 | 41.724873 | 40 |
| Slice 6 | 4.80062 | 3,291.8622 | 0 | 96.568037 | 47.93679 | 40 |
| Slice 7 | 4.99128 | 3,291.6345 | 0 | 107.17273 | 53.201005 | 40 |
| Slice 8 | 5.18194 | 3,291.431 | 0 | 116.49891 | 57.83056 | 40 |
| Slice 9 | 5.3726 | 3,291.2479 | 0 | 124.9496 | 62.025521 | 40 |
| Slice 10 | 5.56326 | 3,291.0822 | 0 | 132.78169 | 65.913404 | 40 |
| Slice 11 | 5.75392 | 3,290.9319 | 0 | 140.14466 | 69.568413 | 40 |
| Slice 12 | 5.94458 | 3,290.7954 | 0 | 147.10592 | 73.024011 | 40 |
| Slice 13 | 6.13524 | 3,290.6714 | 0 | 153.65942 | 76.277201 | 40 |
| Slice 14 | 6.3259 | 3,290.5588 | 0 | 159.73448 | 79.292885 | 40 |
| Slice 15 | 6.51656 | 3,290.4568 | 0 | 165.19909 | 82.005538 | 40 |
| Slice 16 | 6.70722 | 3,290.3648 | 0 | 169.86035 | 84.31941 | 40 |
| Slice 17 | 6.89788 | 3,290.282 | 0 | 173.47015 | 86.111328 | 40 |
| Slice 18 | 7.08854 | 3,290.2082 | 0 | 175.73464 | 87.235431 | 40 |
| Slice 19 | 7.2792 | 3,290.1428 | 0 | 176.32441 | 87.528197 | 40 |
| Slice 20 | 7.46986 | 3,290.0856 | 0 | 174.89535 | 86.818807 | 40 |
| Slice 21 | 7.66052 | 3,290.0362 | 0 | 171.11436 | 84.941907 | 40 |
| Slice 22 | 7.85118 | 3,289.9944 | 0 | 164.69649 | 81.756047 | 40 |
| Slice 23 | 8.04184 | 3,289.9601 | 0 | 155.43583 | 77.159014 | 40 |
| Slice 24 | 8.2325 | 3,289.9331 | 0 | 143.24366 | 71.10677 | 40 |
| Slice 25 | 8.42316 | 3,289.9132 | 0 | 128.17361 | 63.625933 | 40 |
| Slice 26 | 8.618801 | 3,289.9003 | 0 | 109.92904 | 54.56925 | 40 |
| Slice 27 | 8.819423 | 3,289.8947 | 0 | 88.734885 | 44.048379 | 40 |
| Slice 28 | 9.020045 | 3,289.8969 | 0 | 65.571997 | 32.550222 | 40 |
| Slice 29 | 9.220667 | 3,289.9068 | 0 | 41.101975 | 20.403198 | 40 |
| Slice 30 | 9.421289 | 3,289.9246 | 0 | 16.008629 | 7.9467523 | 40 |

# Static Safety Factor: Maximum Storage Pool

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 57
Date: 10/13/2016
Time: 9:55:07 PM
Tool Version: 8.15.1.11236
File Name: F-15-P24 Section H-H.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:57:21 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 1 Static Safety Factor: Maximum Storage Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 31 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-70.91495, 3,279.2838) ft
Left-Zone Right Coordinate: (-35.99998, 3,289.6835) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (-30.39978, 3,293.0353) ft
Right-Zone Right Coordinate: (31.62932, 3,285.853) ft
Right-Zone Increment: 16
Radius Increments: 10

## Slip Surface Limits

Left Coordinate: (-80, 3,279.3015) ft
Right Coordinate: (60, 3,279.1502) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 26.93941 | 3,287.0041 |
| | 60 | 3,287 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -61.81439 | 3,279.8322 |
| Point 2 | -67.13617 | 3,279.2764 |
| Point 3 | -44.95231 | 3,268.5908 |
| Point 4 | -30.5288 | 3,293.0344 |
| Point 5 | -33.91244 | 3,290.7094 |
| Point 6 | -45.95816 | 3,284.7896 |
| Point 7 | -52.07612 | 3,284.1736 |
| Point 8 | -56.99045 | 3,282.1736 |
| Point 9 | -60.90536 | 3,280.1736 |
| Point 10 | -61.79787 | 3,279.8212 |
| Point 11 | -60.87214 | 3,279.204 |
| Point 12 | -61.5289 | 3,279.6419 |
| Point 13 | -0.92738 | 3,279.063 |
| Point 14 | -9.52406 | 3,273.3319 |
| Point 15 | -54.59088 | 3,275.0165 |
| Point 16 | -54.59085 | 3,275.0165 |
| Point 17 | 58.35476 | 3,279.1736 |
| Point 18 | -0.90892 | 3,279.0753 |
| Point 19 | -18.38179 | 3,267.4267 |
| Point 20 | 27.25732 | 3,286.9457 |
| Point 21 | 14.79383 | 3,289.2353 |
| Point 22 | -3.35899 | 3,292.7999 |
| Point 23 | -22.57004 | 3,293.0763 |
| Point 24 | -30.52847 | 3,293.0346 |

| | | |
|---|---|---|
| Point 25 | -40.79396 | 3,265.8186 |
| Point 26 | -31.79396 | 3,265.8186 |
| Point 27 | -31.79396 | 3,280 |
| Point 28 | -29.79396 | 3,280 |
| Point 29 | -29.79396 | 3,265.8186 |
| Point 30 | -20.79396 | 3,265.8186 |
| Point 31 | 5.42809 | 3,292.8848 |
| Point 32 | 60 | 3,257.5939 |
| Point 33 | 60 | 3,266.2547 |
| Point 34 | 60 | 3,279.1502 |
| Point 35 | 60 | 3,287 |
| Point 36 | 60 | 3,292 |
| Point 37 | 26.93941 | 3,287.0041 |
| Point 38 | 7.70259 | 3,291.9985 |
| Point 39 | -29.79396 | 3,257.5939 |
| Point 40 | -31.79396 | 3,257.5939 |
| Point 41 | -80 | 3,279.3015 |
| Point 42 | -80 | 3,270.5024 |
| Point 43 | -80 | 3,257.5939 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,2,41,42,3,16,15,11,12 | 257.24 |
| Region 2 | Concrete Cut-Off Wall | 29,28,27,26,40,39 | 44.812 |
| Region 3 | Embankment Fill | 4,5,6,7,8,9,10,12,11,15,3,25,26,27,28,29,30,14,13,18,17,20,37,21,38,31,22,23,24 | 1,554.2 |
| Region 4 | Bedrock | 19,30,29,39,32,33 | 820.58 |
| Region 5 | Foundation Soil | 17,18,13,14,19,33,34 | 860.26 |
| Region 6 | Bedrock | 26,25,3,42,43,40 | 532.9 |

## Current Slip Surface

Slip Surface: 1,324
F of S: 2.04
Volume: 44.559886 ft³
Weight: 5,569.9857 lbs
Resisting Moment: 117,184.26 lbs-ft
Activating Moment: 57,545.204 lbs-ft

Resisting Force: 4,049.6015 lbs
Activating Force: 1,988.2515 lbs
F of S Rank (Analysis): 1 of 2,057 slip surfaces
F of S Rank (Query): 1 of 2,057 slip surfaces
Exit: (-45.97895, 3,284.7875) ft
Entry: (-26.458548, 3,293.0559) ft
Radius: 26.125258 ft
Center: (-45.532061, 3,310.9089) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | -45.968555 | 3,284.7873 | 0 | 0.60500829 | 0.39289698 | 50 |
| Slice 2 | -45.641167 | 3,284.7858 | 0 | 21.677473 | 14.077516 | 50 |
| Slice 3 | -45.007182 | 3,284.7909 | 0 | 63.108313 | 40.983018 | 50 |
| Slice 4 | -44.373197 | 3,284.8113 | 0 | 103.20436 | 67.021697 | 50 |
| Slice 5 | -43.739212 | 3,284.8472 | 0 | 141.39413 | 91.82242 | 50 |
| Slice 6 | -43.105226 | 3,284.8986 | 0 | 177.11158 | 115.01761 | 50 |
| Slice 7 | -42.471241 | 3,284.9656 | 0 | 209.83778 | 136.27025 | 50 |
| Slice 8 | -41.837256 | 3,285.0483 | 0 | 239.13775 | 155.29787 | 50 |
| Slice 9 | -41.203271 | 3,285.1468 | 0 | 264.68862 | 171.8908 | 50 |
| Slice 10 | -40.569285 | 3,285.2614 | 0 | 286.29624 | 185.92295 | 50 |
| Slice 11 | -39.9353 | 3,285.3923 | 0 | 303.89926 | 197.35448 | 50 |
| Slice 12 | -39.301315 | 3,285.5397 | 0 | 317.56157 | 206.22689 | 50 |
| Slice 13 | -38.667329 | 3,285.7039 | 0 | 327.45532 | 212.65197 | 50 |
| Slice 14 | -38.033344 | 3,285.8852 | 0 | 333.83755 | 216.79664 | 50 |
| Slice 15 | -37.399359 | 3,286.084 | 0 | 337.02375 | 218.86578 | 50 |
| Slice 16 | -36.765374 | 3,286.3008 | 0 | 337.36133 | 219.08501 | 50 |
| Slice 17 | -36.131388 | 3,286.536 | 0 | 335.20525 | 217.68483 | 50 |
| Slice 18 | -35.497403 | 3,286.7901 | 0 | 330.8972 | 214.88715 | 50 |
| Slice 19 | -34.863418 | 3,287.0638 | 0 | 324.74897 | 210.89445 | 50 |
| Slice 20 | -34.229433 | 3,287.3578 | 0 | 317.0299 | 205.88163 | 50 |
| Slice 21 | -33.574076 | 3,287.6842 | 0 | 314.23825 | 204.06871 | 50 |
| Slice 22 | -32.897348 | 3,288.0454 | 0 | 316.1711 | 205.32391 | 50 |
| Slice 23 | -32.22062 | 3,288.4327 | 0 | 316.5633 | 205.57861 | 50 |
| Slice 24 | -31.543892 | 3,288.8477 | 0 | 315.5862 | 204.94408 | 50 |
| Slice 25 | -30.867164 | 3,289.2918 | 0 | 313.3345 | 203.48181 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | -30.528635 | 3,289.5214 | 0 | 312.04441 | 202.64401 | 50 |
| Slice 27 | -30.18931 | 3,289.7677 | 0 | 288.08589 | 187.08517 | 50 |
| Slice 28 | -29.51099 | 3,290.2772 | 0 | 239.84457 | 155.75689 | 50 |
| Slice 29 | -28.832669 | 3,290.8225 | 0 | 189.46447 | 123.03966 | 50 |
| Slice 30 | -28.154349 | 3,291.4067 | 0 | 135.93752 | 88.278856 | 50 |
| Slice 31 | -27.476029 | 3,292.0333 | 0 | 78.029896 | 50.673207 | 50 |
| Slice 32 | -26.797708 | 3,292.7068 | 0 | 14.219248 | 9.2340877 | 50 |

# Static Safety Factor: Maximum Surcharge Pool

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 57
Date: 10/13/2016
Time: 9:55:07 PM
Tool Version: 8.15.1.11236
File Name: F-15-P24 Section H-H.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:57:22 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 2 Static Safety Factor: Maximum Surcharge Pool

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock

Model: Bedrock (Impenetrable)

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 31 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

### Concrete Cut-Off Wall

Model: Bedrock (Impenetrable)

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-70.86667, 3,279.2837) ft
Left-Zone Right Coordinate: (-35.99998, 3,289.6835) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (-30.39978, 3,293.0353) ft
Right-Zone Right Coordinate: (31.62932, 3,285.853) ft
Right-Zone Increment: 16
Radius Increments: 10

## Slip Surface Limits

Left Coordinate: (-80, 3,279.3015) ft
Right Coordinate: (60, 3,279.1502) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 7.70259 | 3,291.9985 |
| | 60 | 3,292 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -61.81439 | 3,279.8322 |
| Point 2 | -67.13617 | 3,279.2764 |
| Point 3 | -44.95231 | 3,268.5908 |
| Point 4 | -30.5288 | 3,293.0344 |
| Point 5 | -33.91244 | 3,290.7094 |
| Point 6 | -45.95816 | 3,284.7896 |
| Point 7 | -52.07612 | 3,284.1736 |
| Point 8 | -56.99045 | 3,282.1736 |
| Point 9 | -60.90536 | 3,280.1736 |
| Point 10 | -61.79787 | 3,279.8212 |
| Point 11 | -60.87214 | 3,279.204 |
| Point 12 | -61.5289 | 3,279.6419 |
| Point 13 | -0.92738 | 3,279.063 |
| Point 14 | -9.52406 | 3,273.3319 |
| Point 15 | -54.59088 | 3,275.0165 |
| Point 16 | -54.59085 | 3,275.0165 |
| Point 17 | 58.35476 | 3,279.1736 |
| Point 18 | -0.90892 | 3,279.0753 |
| Point 19 | -18.38179 | 3,267.4267 |
| Point 20 | 27.25732 | 3,286.9457 |
| Point 21 | 14.79383 | 3,289.2353 |
| Point 22 | -3.35899 | 3,292.7999 |
| Point 23 | -22.57004 | 3,293.0763 |
| Point 24 | -30.52847 | 3,293.0346 |

| | | |
|---|---|---|
| Point 25 | -40.79396 | 3,265.8186 |
| Point 26 | -31.79396 | 3,265.8186 |
| Point 27 | -31.79396 | 3,280 |
| Point 28 | -29.79396 | 3,280 |
| Point 29 | -29.79396 | 3,265.8186 |
| Point 30 | -20.79396 | 3,265.8186 |
| Point 31 | 5.42809 | 3,292.8848 |
| Point 32 | 60 | 3,257.5939 |
| Point 33 | 60 | 3,266.2547 |
| Point 34 | 60 | 3,279.1502 |
| Point 35 | 60 | 3,287 |
| Point 36 | 60 | 3,292 |
| Point 37 | 26.93941 | 3,287.0041 |
| Point 38 | 7.70259 | 3,291.9985 |
| Point 39 | -29.79396 | 3,257.5939 |
| Point 40 | -31.79396 | 3,257.5939 |
| Point 41 | -80 | 3,279.3015 |
| Point 42 | -80 | 3,270.5024 |
| Point 43 | -80 | 3,257.5939 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,2,41,42,3,16,15,11,12 | 257.24 |
| Region 2 | Concrete Cut-Off Wall | 29,28,27,26,40,39 | 44.812 |
| Region 3 | Embankment Fill | 4,5,6,7,8,9,10,12,11,15,3,25,26,27,28,29,30,14,13,18,17,20,37,21,38,31,22,23,24 | 1,554.2 |
| Region 4 | Bedrock | 19,30,29,39,32,33 | 820.58 |
| Region 5 | Foundation Soil | 17,18,13,14,19,33,34 | 860.26 |
| Region 6 | Bedrock | 26,25,3,42,43,40 | 532.9 |

## Current Slip Surface

Slip Surface: 1,324
F of S: 2.04
Volume: 44.556327 ft³
Weight: 5,569.5409 lbs
Resisting Moment: 117,104.7 lbs-ft
Activating Moment: 57,511.935 lbs-ft

Resisting Force: 4,048.6179 lbs
Activating Force: 1,987.9707 lbs
F of S Rank (Analysis): 1 of 2,057 slip surfaces
F of S Rank (Query): 1 of 2,057 slip surfaces
Exit: (-45.964538, 3,284.789) ft
Entry: (-26.458548, 3,293.0559) ft
Radius: 26.11345 ft
Center: (-45.525459, 3,310.8987) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | -45.961349 | 3,284.7889 | 0 | 0.47114725 | 0.3059666 | 50 |
| Slice 2 | -45.641167 | 3,284.7874 | 0 | 21.420321 | 13.910519 | 50 |
| Slice 3 | -45.007182 | 3,284.7923 | 0 | 62.86323 | 40.823859 | 50 |
| Slice 4 | -44.373197 | 3,284.8126 | 0 | 102.97879 | 66.875207 | 50 |
| Slice 5 | -43.739212 | 3,284.8484 | 0 | 141.19485 | 91.693006 | 50 |
| Slice 6 | -43.105226 | 3,284.8996 | 0 | 176.94409 | 114.90884 | 50 |
| Slice 7 | -42.471241 | 3,284.9665 | 0 | 209.70577 | 136.18452 | 50 |
| Slice 8 | -41.837256 | 3,285.049 | 0 | 239.04286 | 155.23625 | 50 |
| Slice 9 | -41.203271 | 3,285.1475 | 0 | 264.63038 | 171.85298 | 50 |
| Slice 10 | -40.569285 | 3,285.2619 | 0 | 286.27225 | 185.90738 | 50 |
| Slice 11 | -39.9353 | 3,285.3927 | 0 | 303.90556 | 197.35858 | 50 |
| Slice 12 | -39.301315 | 3,285.54 | 0 | 317.5931 | 206.24737 | 50 |
| Slice 13 | -38.667329 | 3,285.7041 | 0 | 327.50641 | 212.68515 | 50 |
| Slice 14 | -38.033344 | 3,285.8853 | 0 | 333.90242 | 216.83877 | 50 |
| Slice 15 | -37.399359 | 3,286.0841 | 0 | 337.09689 | 218.91328 | 50 |
| Slice 16 | -36.765374 | 3,286.3007 | 0 | 337.43782 | 219.13468 | 50 |
| Slice 17 | -36.131388 | 3,286.5359 | 0 | 335.28097 | 217.73401 | 50 |
| Slice 18 | -35.497403 | 3,286.79 | 0 | 330.96893 | 214.93374 | 50 |
| Slice 19 | -34.863418 | 3,287.0636 | 0 | 324.81439 | 210.93693 | 50 |
| Slice 20 | -34.229433 | 3,287.3575 | 0 | 317.08755 | 205.91906 | 50 |
| Slice 21 | -33.574076 | 3,287.6838 | 0 | 314.28708 | 204.10042 | 50 |
| Slice 22 | -32.897348 | 3,288.045 | 0 | 316.21033 | 205.34939 | 50 |
| Slice 23 | -32.22062 | 3,288.4323 | 0 | 316.59302 | 205.59791 | 50 |
| Slice 24 | -31.543892 | 3,288.8472 | 0 | 315.6071 | 204.95765 | 50 |
| Slice 25 | -30.867164 | 3,289.2913 | 0 | 313.34772 | 203.49039 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | -30.528635 | 3,289.521 | 0 | 312.05436 | 202.65047 | 50 |
| Slice 27 | -30.18931 | 3,289.7672 | 0 | 288.09478 | 187.09094 | 50 |
| Slice 28 | -29.51099 | 3,290.2768 | 0 | 239.8529 | 155.7623 | 50 |
| Slice 29 | -28.832669 | 3,290.8222 | 0 | 189.47325 | 123.04537 | 50 |
| Slice 30 | -28.154349 | 3,291.4064 | 0 | 135.94644 | 88.28465 | 50 |
| Slice 31 | -27.476029 | 3,292.0331 | 0 | 78.036833 | 50.677712 | 50 |
| Slice 32 | -26.797708 | 3,292.7068 | 0 | 14.219629 | 9.2343348 | 50 |

# Seismic Safety Factor

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## File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 57
Date: 10/13/2016
Time: 9:55:07 PM
Tool Version: 8.15.1.11236
File Name: F-15-P24 Section H-H.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\
Last Solved Date: 10/13/2016
Last Solved Time: 9:57:22 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### 3 Seismic Safety Factor

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: 1 Static Safety Factor: Maximum Storage Pool [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)

### Concrete Cut-Off Wall
Model: Bedrock (Impenetrable)

### Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 24.8 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (-80, 3,279.3015) ft
Right Coordinate: (60, 3,279.1502) ft

## Surcharge Loads

### Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 26.93941 | 3,287.0041 |

| | | |
|---|---|---|
| | 60 | 3,287 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -61.81439 | 3,279.8322 |
| Point 2 | -67.13617 | 3,279.2764 |
| Point 3 | -44.95231 | 3,268.5908 |
| Point 4 | -30.5288 | 3,293.0344 |
| Point 5 | -33.91244 | 3,290.7094 |
| Point 6 | -45.95816 | 3,284.7896 |
| Point 7 | -52.07612 | 3,284.1736 |
| Point 8 | -56.99045 | 3,282.1736 |
| Point 9 | -60.90536 | 3,280.1736 |
| Point 10 | -61.79787 | 3,279.8212 |
| Point 11 | -60.87214 | 3,279.204 |
| Point 12 | -61.5289 | 3,279.6419 |
| Point 13 | -0.92738 | 3,279.063 |
| Point 14 | -9.52406 | 3,273.3319 |
| Point 15 | -54.59088 | 3,275.0165 |
| Point 16 | -54.59085 | 3,275.0165 |
| Point 17 | 58.35476 | 3,279.1736 |
| Point 18 | -0.90892 | 3,279.0753 |
| Point 19 | -18.38179 | 3,267.4267 |
| Point 20 | 27.25732 | 3,286.9457 |
| Point 21 | 14.79383 | 3,289.2353 |
| Point 22 | -3.35899 | 3,292.7999 |
| Point 23 | -22.57004 | 3,293.0763 |
| Point 24 | -30.52847 | 3,293.0346 |
| Point 25 | -40.79396 | 3,265.8186 |
| Point 26 | -31.79396 | 3,265.8186 |
| Point 27 | -31.79396 | 3,280 |
| Point 28 | -29.79396 | 3,280 |
| Point 29 | -29.79396 | 3,265.8186 |

| | | |
|---|---|---|
| Point 30 | -20.79396 | 3,265.8186 |
| Point 31 | 5.42809 | 3,292.8848 |
| Point 32 | 60 | 3,257.5939 |
| Point 33 | 60 | 3,266.2547 |
| Point 34 | 60 | 3,279.1502 |
| Point 35 | 60 | 3,287 |
| Point 36 | 60 | 3,292 |
| Point 37 | 26.93941 | 3,287.0041 |
| Point 38 | 7.70259 | 3,291.9985 |
| Point 39 | -29.79396 | 3,257.5939 |
| Point 40 | -31.79396 | 3,257.5939 |
| Point 41 | -80 | 3,279.3015 |
| Point 42 | -80 | 3,270.5024 |
| Point 43 | -80 | 3,257.5939 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil - Seismic | 1,2,41,42,3,16,15,11,12 | 257.24 |
| Region 2 | Concrete Cut-Off Wall | 29,28,27,26,40,39 | 44.812 |
| Region 3 | Embankment Fill - Seismic | 4,5,6,7,8,9,10,12,11,15,3,25,26,27,28,29, 30,14,13,18,17,20,37,21,38,31,22,23,24 | 1,554.2 |
| Region 4 | Bedrock | 19,30,29,39,32,33 | 820.58 |
| Region 5 | Foundation Soil - Seismic | 17,18,13,14,19,33,34 | 860.26 |
| Region 6 | Bedrock | 26,25,3,42,43,40 | 532.9 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.47
Volume: 44.559887 ft³
Weight: 5,569.9859 lbs
Resisting Moment: 89,806.308 lbs-ft
Activating Moment: 61,241.84 lbs-ft
Resisting Force: 3,106.1236 lbs
Activating Force: 2,117.5824 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-45.97895, 3,284.7875) ft
Entry: (-26.458548, 3,293.0559) ft

Radius: 26.125258 ft
Center: (-45.532061, 3,310.9089) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | -45.968555 | 3,284.7873 | 0 | 0.66086883 | 0.32805814 | 40 |
| Slice 2 | -45.641167 | 3,284.7858 | 0 | 22.016158 | 10.928916 | 40 |
| Slice 3 | -45.007182 | 3,284.7909 | 0 | 64.061432 | 31.800371 | 40 |
| Slice 4 | -44.373197 | 3,284.8113 | 0 | 104.82554 | 52.035849 | 40 |
| Slice 5 | -43.739212 | 3,284.8472 | 0 | 143.66541 | 71.31613 | 40 |
| Slice 6 | -43.105226 | 3,284.8986 | 0 | 179.94073 | 89.323352 | 40 |
| Slice 7 | -42.471241 | 3,284.9656 | 0 | 213.06217 | 105.76498 | 40 |
| Slice 8 | -41.837256 | 3,285.0483 | 0 | 242.53852 | 120.39717 | 40 |
| Slice 9 | -41.203271 | 3,285.1468 | 0 | 268.01066 | 133.04165 | 40 |
| Slice 10 | -40.569285 | 3,285.2614 | 0 | 289.27074 | 143.59524 | 40 |
| Slice 11 | -39.9353 | 3,285.3923 | 0 | 306.26899 | 152.03325 | 40 |
| Slice 12 | -39.301315 | 3,285.5397 | 0 | 319.09985 | 158.40254 | 40 |
| Slice 13 | -38.667329 | 3,285.7039 | 0 | 327.98456 | 162.81295 | 40 |
| Slice 14 | -38.033344 | 3,285.8852 | 0 | 333.23805 | 165.4208 | 40 |
| Slice 15 | -37.399359 | 3,286.084 | 0 | 335.23892 | 166.41405 | 40 |
| Slice 16 | -36.765374 | 3,286.3008 | 0 | 334.39458 | 165.99491 | 40 |
| Slice 17 | -36.131388 | 3,286.536 | 0 | 331.11453 | 164.36668 | 40 |
| Slice 18 | -35.497403 | 3,286.7901 | 0 | 325.78693 | 161.72203 | 40 |
| Slice 19 | -34.863418 | 3,287.0638 | 0 | 318.75834 | 158.23302 | 40 |
| Slice 20 | -34.229433 | 3,287.3578 | 0 | 310.32286 | 154.04561 | 40 |
| Slice 21 | -33.574076 | 3,287.6842 | 0 | 306.83734 | 152.31538 | 40 |
| Slice 22 | -32.897348 | 3,288.0454 | 0 | 308.11611 | 152.95017 | 40 |
| Slice 23 | -32.22062 | 3,288.4327 | 0 | 308.07481 | 152.92966 | 40 |
| Slice 24 | -31.543892 | 3,288.8477 | 0 | 306.88994 | 152.34149 | 40 |
| Slice 25 | -30.867164 | 3,289.2918 | 0 | 304.65763 | 151.23336 | 40 |
| Slice 26 | -30.528635 | 3,289.5214 | 0 | 303.18971 | 150.50468 | 40 |
| Slice 27 | -30.18931 | 3,289.7677 | 0 | 280.14118 | 139.06329 | 40 |
| Slice 28 | -29.51099 | 3,290.2772 | 0 | 233.2407 | 115.78169 | 40 |
| Slice 29 | -28.832669 | 3,290.8225 | 0 | 184.20369 | 91.439504 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 30 | -28.154349 | 3,291.4067 | 0 | 131.94286 | 65.497005 | 40 |
| Slice 31 | -27.476029 | 3,292.0333 | 0 | 75.129266 | 37.294492 | 40 |
| Slice 32 | -26.797708 | 3,292.7068 | 0 | 12.120212 | 6.0165254 | 40 |

# Static Safety Factor: Maximum Storage Pool – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 658
Date: 10/14/2016
Time: 1:56:28 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:56:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Maximum Storage Pool - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (396, 3,270.5476) ft
Left-Zone Right Coordinate: (489.0001, 3,281.5415) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (523.97089, 3,291) ft
Right-Zone Right Coordinate: (600.00005, 3,283.5087) ft

Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 587.08687 | 3,287.0451 |
| | 817.63967 | 3,287 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |

| | | |
|---|---|---|
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 293.98092 | 3,200 |
| Point 22 | 294 | 3,176 |
| Point 23 | 817.63967 | 3,176 |
| Point 24 | 509.18177 | 3,287 |
| Point 25 | 294 | 3,287 |
| Point 26 | 520.27361 | 3,290 |
| Point 27 | 294 | 3,290 |
| Point 28 | 587.08687 | 3,287.0451 |
| Point 29 | 576.29685 | 3,290 |
| Point 30 | 817.63967 | 3,287 |
| Point 31 | 817.63967 | 3,290 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,28,29,6,7,26,24,8,17,9,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill | 2,1,10,11,12,3 | 17,127 |
| Region 3 | Fly Ash Slurry | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry | 10,9,20,21,11 | 10,389 |
| Region 6 | Foundation Soil | 21,22,23,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1,056
F of S: 3.79
Volume: 399.85513 ft³
Weight: 35,994.234 lbs
Resisting Moment: 3,204,251.2 lbs-ft
Activating Moment: 845,652.68 lbs-ft
Resisting Force: 32,085.126 lbs
Activating Force: 8,458.5866 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (449.04201, 3,271.539) ft
Entry: (523.97089, 3,291) ft
Radius: 95.107494 ft
Center: (464.66748, 3,365.3542) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP | Base Normal | Frictional | Cohesive |
|---|---|---|---|---|---|---|

| | | | (psf) | Stress (psf) | Strength (psf) | Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 449.76835 | 3,271.4238 | 0 | 15.025529 | 10.520989 | 0 |
| Slice 2 | 451.05177 | 3,271.228 | 0 | 38.509836 | 32.313589 | 50 |
| Slice 3 | 452.89316 | 3,270.9872 | 0 | 90.687532 | 76.095874 | 50 |
| Slice 4 | 455.46178 | 3,270.702 | 0 | 180.55642 | 151.50483 | 50 |
| Slice 5 | 458.0304 | 3,270.4873 | 0 | 264.2175 | 221.7048 | 50 |
| Slice 6 | 460.56139 | 3,270.3435 | 0 | 342.23512 | 287.16936 | 50 |
| Slice 7 | 463.05474 | 3,270.2685 | 0 | 414.1135 | 347.48249 | 50 |
| Slice 8 | 465.54809 | 3,270.2589 | 0 | 478.06811 | 401.14677 | 50 |
| Slice 9 | 468.04145 | 3,270.3147 | 0 | 533.6749 | 447.80641 | 50 |
| Slice 10 | 470.5348 | 3,270.436 | 0 | 580.69297 | 487.25925 | 50 |
| Slice 11 | 473.02815 | 3,270.6231 | 0 | 619.06764 | 519.45943 | 50 |
| Slice 12 | 475.5215 | 3,270.8764 | 0 | 648.91988 | 544.50843 | 50 |
| Slice 13 | 478.01486 | 3,271.1963 | 0 | 670.52394 | 562.63639 | 50 |
| Slice 14 | 480.50821 | 3,271.5837 | 0 | 684.27628 | 574.17598 | 50 |
| Slice 15 | 483.00156 | 3,272.0392 | 0 | 690.65879 | 579.53154 | 50 |
| Slice 16 | 485.49492 | 3,272.564 | 0 | 690.19991 | 579.14649 | 50 |
| Slice 17 | 487.98827 | 3,273.1591 | 0 | 683.43653 | 573.47134 | 50 |
| Slice 18 | 490.48162 | 3,273.8261 | 0 | 670.87934 | 562.93461 | 50 |
| Slice 19 | 492.97498 | 3,274.5664 | 0 | 652.98308 | 547.91786 | 50 |
| Slice 20 | 495.46833 | 3,275.3819 | 0 | 630.12247 | 528.73553 | 50 |
| Slice 21 | 497.96168 | 3,276.2746 | 0 | 602.57358 | 505.61927 | 50 |
| Slice 22 | 500.45503 | 3,277.247 | 0 | 570.49951 | 478.70593 | 50 |
| Slice 23 | 502.94839 | 3,278.3016 | 0 | 533.93865 | 448.02772 | 50 |
| Slice 24 | 505.44174 | 3,279.4415 | 0 | 492.79352 | 413.50286 | 50 |
| Slice 25 | 507.93509 | 3,280.6701 | 0 | 446.81828 | 374.92505 | 50 |
| Slice 26 | 510.56825 | 3,282.0712 | 0 | 392.34679 | 329.21805 | 50 |
| Slice 27 | 513.34121 | 3,283.6615 | 0 | 328.09551 | 275.30482 | 50 |
| Slice 28 | 516.11417 | 3,285.3794 | 0 | 255.43767 | 214.33766 | 50 |
| Slice 29 | 518.88713 | 3,287.2336 | 0 | 172.87744 | 145.06139 | 50 |
| Slice 30 | 522.12225 | 3,289.598 | 0 | 60.140672 | 50.464015 | 50 |

# Static Safety Factor: Maximum Surcharge Pool – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 658
Date: 10/14/2016
Time: 1:56:28 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:56:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B2 Static Safety Factor: Maximum Surcharge Pool - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (395.99955, 3,270.5476) ft
Left-Zone Right Coordinate: (489.0001, 3,281.5415) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (523.97089, 3,291) ft
Right-Zone Right Coordinate: (600.00005, 3,283.5087) ft

Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 576.29685 | 3,290 |
| | 817.63967 | 3,290 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |

| | | |
|---|---|---|
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 293.98092 | 3,200 |
| Point 22 | 294 | 3,176 |
| Point 23 | 817.63967 | 3,176 |
| Point 24 | 509.18177 | 3,287 |
| Point 25 | 294 | 3,287 |
| Point 26 | 520.27361 | 3,290 |
| Point 27 | 294 | 3,290 |
| Point 28 | 587.08687 | 3,287.0451 |
| Point 29 | 576.29685 | 3,290 |
| Point 30 | 817.63967 | 3,287 |
| Point 31 | 817.63967 | 3,290 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,28,29,6,7,26,24,8,17,9,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill | 2,1,10,11,12,3 | 17,127 |
| Region 3 | Fly Ash Slurry | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry | 10,9,20,21,11 | 10,389 |
| Region 6 | Foundation Soil | 21,22,23,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1,056
F of S: 3.79
Volume: 399.85574 ft³
Weight: 35,994.29 lbs
Resisting Moment: 3,204,262.1 lbs-ft
Activating Moment: 845,655.44 lbs-ft
Resisting Force: 32,085.175 lbs
Activating Force: 8,458.5982 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (449.04181, 3,271.539) ft
Entry: (523.97089, 3,291) ft
Radius: 95.107676 ft
Center: (464.66739, 3,365.3543) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP | Base Normal | Frictional | Cohesive |
|---|---|---|---|---|---|---|

| | | | (psf) | Stress (psf) | Strength (psf) | Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 449.76821 | 3,271.4238 | 0 | 15.026702 | 10.52181 | 0 |
| Slice 2 | 451.05172 | 3,271.228 | 0 | 38.512647 | 32.315948 | 50 |
| Slice 3 | 452.89316 | 3,270.9872 | 0 | 90.690661 | 76.098501 | 50 |
| Slice 4 | 455.46178 | 3,270.702 | 0 | 180.5593 | 151.50725 | 50 |
| Slice 5 | 458.0304 | 3,270.4872 | 0 | 264.2201 | 221.70699 | 50 |
| Slice 6 | 460.56139 | 3,270.3435 | 0 | 342.23743 | 287.1713 | 50 |
| Slice 7 | 463.05474 | 3,270.2685 | 0 | 414.1155 | 347.48417 | 50 |
| Slice 8 | 465.54809 | 3,270.2589 | 0 | 478.0698 | 401.14819 | 50 |
| Slice 9 | 468.04145 | 3,270.3147 | 0 | 533.67628 | 447.80757 | 50 |
| Slice 10 | 470.5348 | 3,270.436 | 0 | 580.69406 | 487.26017 | 50 |
| Slice 11 | 473.02815 | 3,270.6231 | 0 | 619.06848 | 519.46013 | 50 |
| Slice 12 | 475.5215 | 3,270.8764 | 0 | 648.92048 | 544.50893 | 50 |
| Slice 13 | 478.01486 | 3,271.1963 | 0 | 670.52434 | 562.63673 | 50 |
| Slice 14 | 480.50821 | 3,271.5836 | 0 | 684.27652 | 574.17618 | 50 |
| Slice 15 | 483.00156 | 3,272.0392 | 0 | 690.6589 | 579.53163 | 50 |
| Slice 16 | 485.49492 | 3,272.564 | 0 | 690.19992 | 579.1465 | 50 |
| Slice 17 | 487.98827 | 3,273.1591 | 0 | 683.43647 | 573.47129 | 50 |
| Slice 18 | 490.48162 | 3,273.8261 | 0 | 670.87924 | 562.93452 | 50 |
| Slice 19 | 492.97498 | 3,274.5664 | 0 | 652.98294 | 547.91775 | 50 |
| Slice 20 | 495.46833 | 3,275.3819 | 0 | 630.12231 | 528.7354 | 50 |
| Slice 21 | 497.96168 | 3,276.2746 | 0 | 602.57341 | 505.61913 | 50 |
| Slice 22 | 500.45503 | 3,277.247 | 0 | 570.49934 | 478.70579 | 50 |
| Slice 23 | 502.94839 | 3,278.3016 | 0 | 533.93848 | 448.02758 | 50 |
| Slice 24 | 505.44174 | 3,279.4415 | 0 | 492.79335 | 413.50272 | 50 |
| Slice 25 | 507.93509 | 3,280.6701 | 0 | 446.81811 | 374.92491 | 50 |
| Slice 26 | 510.56825 | 3,282.0712 | 0 | 392.34663 | 329.21791 | 50 |
| Slice 27 | 513.34121 | 3,283.6615 | 0 | 328.09535 | 275.30469 | 50 |
| Slice 28 | 516.11417 | 3,285.3794 | 0 | 255.43752 | 214.33753 | 50 |
| Slice 29 | 518.88713 | 3,287.2336 | 0 | 172.87732 | 145.06129 | 50 |
| Slice 30 | 522.12225 | 3,289.598 | 0 | 60.140624 | 50.463975 | 50 |

# Seismic Safety Factor – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 658
Date: 10/14/2016
Time: 1:56:28 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:56:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: B1 Static Safety Factor: Maximum Storage Pool - B-Cell [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Fly Ash Slurry
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °

### Paste - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 587.08687 | 3,287.0451 |
| | 817.63967 | 3,287 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 293.98092 | 3,200 |

| | | |
|---|---|---|
| Point 22 | 294 | 3,176 |
| Point 23 | 817.63967 | 3,176 |
| Point 24 | 509.18177 | 3,287 |
| Point 25 | 294 | 3,287 |
| Point 26 | 520.27361 | 3,290 |
| Point 27 | 294 | 3,290 |
| Point 28 | 587.08687 | 3,287.0451 |
| Point 29 | 576.29685 | 3,290 |
| Point 30 | 817.63967 | 3,287 |
| Point 31 | 817.63967 | 3,290 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill - Seismic | 1,2,3,4,5,28,29,6,7,26,24,8,17,9,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill - Seismic | 2,1,10,11,12,3 | 17,127 |
| Region 3 | Fly Ash Slurry | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. - Seismic | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry | 10,9,20,21,11 | 10,389 |
| Region 6 | Foundation Soil | 21,22,23,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.54
Volume: 399.85513 ft³
Weight: 35,994.234 lbs
Resisting Moment: 2,391,883.3 lbs-ft
Activating Moment: 939,908.18 lbs-ft
Resisting Force: 23,958.195 lbs
Activating Force: 9,416.2334 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (449.04201, 3,271.539) ft
Entry: (523.97089, 3,291) ft
Radius: 95.107494 ft
Center: (464.66748, 3,365.3542) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 449.76835 | 3,271.4238 | 0 | 15.124474 | 8.0418253 | 0 |
| Slice 2 | 451.05177 | 3,271.228 | 0 | 39.29091 | 24.551685 | 40 |
| Slice 3 | 452.89316 | 3,270.9872 | 0 | 91.940809 | 57.450994 | 40 |
| Slice 4 | 455.46178 | 3,270.702 | 0 | 182.52326 | 114.05319 | 40 |
| Slice 5 | 458.0304 | 3,270.4873 | 0 | 266.8023 | 166.71658 | 40 |
| Slice 6 | 460.56139 | 3,270.3435 | 0 | 345.27566 | 215.75218 | 40 |
| Slice 7 | 463.05474 | 3,270.2685 | 0 | 417.39642 | 260.81823 | 40 |
| Slice 8 | 465.54809 | 3,270.2589 | 0 | 481.33951 | 300.77431 | 40 |
| Slice 9 | 468.04145 | 3,270.3147 | 0 | 536.6599 | 335.34233 | 40 |
| Slice 10 | 470.5348 | 3,270.436 | 0 | 583.11671 | 364.37176 | 40 |
| Slice 11 | 473.02815 | 3,270.6231 | 0 | 620.675 | 387.84079 | 40 |
| Slice 12 | 475.5215 | 3,270.8764 | 0 | 649.49415 | 405.84899 | 40 |
| Slice 13 | 478.01486 | 3,271.1963 | 0 | 669.90028 | 418.60015 | 40 |
| Slice 14 | 480.50821 | 3,271.5837 | 0 | 682.3524 | 426.3811 | 40 |
| Slice 15 | 483.00156 | 3,272.0392 | 0 | 687.39839 | 429.53419 | 40 |
| Slice 16 | 485.49492 | 3,272.564 | 0 | 685.63266 | 428.43084 | 40 |
| Slice 17 | 487.98827 | 3,273.1591 | 0 | 677.65305 | 423.44462 | 40 |
| Slice 18 | 490.48162 | 3,273.8261 | 0 | 664.02262 | 414.92738 | 40 |
| Slice 19 | 492.97498 | 3,274.5664 | 0 | 645.23819 | 403.18957 | 40 |
| Slice 20 | 495.46833 | 3,275.3819 | 0 | 621.70429 | 388.48396 | 40 |
| Slice 21 | 497.96168 | 3,276.2746 | 0 | 593.71498 | 370.9943 | 40 |
| Slice 22 | 500.45503 | 3,277.247 | 0 | 561.44136 | 350.8275 | 40 |
| Slice 23 | 502.94839 | 3,278.3016 | 0 | 524.91991 | 328.00637 | 40 |
| Slice 24 | 505.44174 | 3,279.4415 | 0 | 484.0442 | 302.46438 | 40 |
| Slice 25 | 507.93509 | 3,280.6701 | 0 | 438.55397 | 274.03894 | 40 |
| Slice 26 | 510.56825 | 3,282.0712 | 0 | 384.81148 | 240.4569 | 40 |
| Slice 27 | 513.34121 | 3,283.6615 | 0 | 321.53319 | 200.91624 | 40 |
| Slice 28 | 516.11417 | 3,285.3794 | 0 | 250.02836 | 156.23506 | 40 |
| Slice 29 | 518.88713 | 3,287.2336 | 0 | 168.76162 | 105.45396 | 40 |
| Slice 30 | 522.12225 | 3,289.598 | 0 | 57.660487 | 36.030271 | 40 |

# Static Safety Factor: Maximum Storage Pool – F Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 654
Date: 10/14/2016
Time: 1:48:10 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:48:12 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - F-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (489.99998, 3,281.8119) ft
Left-Zone Right Coordinate: (572.52361, 3,291) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (600.00005, 3,283.5087) ft
Right-Zone Right Coordinate: (690, 3,271.587) ft

Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 294 | 3,287 |
| | 509.18177 | 3,287 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |

| | | |
|---|---|---|
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 507.99036 | 3,261.587 |
| Point 22 | 293.98092 | 3,200 |
| Point 23 | 294 | 3,176 |
| Point 24 | 817.63967 | 3,176 |
| Point 25 | 509.18177 | 3,287 |
| Point 26 | 294 | 3,287 |
| Point 27 | 520.27361 | 3,290 |
| Point 28 | 294 | 3,290 |
| Point 29 | 587.08687 | 3,287.0451 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,29,6,7,27,25,8,17,9,21,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill | 2,1,21,11,12 | 17,127 |
| Region 3 | Fly Ash Slurry | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry | 10,21,9,20,22,11 | 10,389 |
| Region 6 | Foundation Soil | 22,23,24,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1,425
F of S: 3.99
Volume: 138.25259 ft³
Weight: 12,442.733 lbs
Resisting Moment: 683,473.7 lbs-ft
Activating Moment: 171,463.39 lbs-ft
Resisting Force: 11,896.605 lbs
Activating Force: 2,981.3612 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (614.63859, 3,279.2998) ft
Entry: (572.52361, 3,291) ft
Radius: 54.564724 ft
Center: (606.96407, 3,333.3221) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 572.58444 | 3,290.9506 | 0 | -4.8608248 | -4.0787163 | 50 |
| Slice 2 | 573.36736 | 3,290.3369 | 0 | 27.465509 | 23.046299 | 50 |
| Slice 3 | 574.81152 | 3,289.2458 | 0 | 80.772557 | 67.776223 | 50 |
| Slice 4 | 576.25568 | 3,288.2273 | 0 | 127.75756 | 107.20132 | 50 |
| Slice 5 | 577.69984 | 3,287.2767 | 0 | 169.4168 | 142.15757 | 50 |
| Slice 6 | 579.144 | 3,286.3898 | 0 | 206.56184 | 173.32596 | 50 |
| Slice 7 | 580.58815 | 3,285.563 | 0 | 239.836 | 201.2463 | 50 |
| Slice 8 | 582.03231 | 3,284.7932 | 0 | 269.73253 | 226.33247 | 50 |
| Slice 9 | 583.47647 | 3,284.0778 | 0 | 296.61246 | 248.88741 | 50 |
| Slice 10 | 584.92063 | 3,283.4145 | 0 | 320.72033 | 269.11631 | 50 |
| Slice 11 | 586.36479 | 3,282.8011 | 0 | 342.19717 | 287.13752 | 50 |
| Slice 12 | 587.79867 | 3,282.2397 | 0 | 360.97758 | 302.89616 | 50 |
| Slice 13 | 589.22227 | 3,281.7278 | 0 | 377.05558 | 316.3872 | 50 |
| Slice 14 | 590.64587 | 3,281.26 | 0 | 390.47784 | 327.64981 | 50 |
| Slice 15 | 592.06947 | 3,280.8349 | 0 | 401.06798 | 336.53599 | 50 |
| Slice 16 | 593.49306 | 3,280.4515 | 0 | 408.59187 | 342.84929 | 50 |
| Slice 17 | 594.91666 | 3,280.109 | 0 | 412.76941 | 346.35466 | 50 |
| Slice 18 | 596.34026 | 3,279.8066 | 0 | 413.28959 | 346.79114 | 50 |
| Slice 19 | 597.76386 | 3,279.5435 | 0 | 409.82912 | 343.88746 | 50 |
| Slice 20 | 599.18746 | 3,279.3192 | 0 | 402.074 | 337.38015 | 50 |
| Slice 21 | 600.61106 | 3,279.1333 | 0 | 389.74287 | 327.0331 | 50 |
| Slice 22 | 602.03466 | 3,278.9852 | 0 | 372.61044 | 312.65728 | 50 |
| Slice 23 | 603.45825 | 3,278.8748 | 0 | 350.5292 | 294.12892 | 50 |
| Slice 24 | 604.88185 | 3,278.8018 | 0 | 323.44717 | 271.4044 | 50 |
| Slice 25 | 606.30545 | 3,278.766 | 0 | 291.41972 | 244.53018 | 50 |
| Slice 26 | 607.77938 | 3,278.7688 | 0 | 251.3007 | 210.86633 | 50 |
| Slice 27 | 609.30365 | 3,278.8129 | 0 | 203.02784 | 170.36058 | 50 |
| Slice 28 | 610.82792 | 3,278.8998 | 0 | 150.10981 | 125.95709 | 50 |
| Slice 29 | 612.35219 | 3,279.0295 | 0 | 93.130834 | 78.146049 | 50 |
| Slice 30 | 613.87645 | 3,279.2025 | 0 | 32.720675 | 27.455906 | 50 |

# Static Safety Factor: Maximum Surcharge Pool – F Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 654
Date: 10/14/2016
Time: 1:48:10 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:48:12 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - F-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (496.01062, 3,283.4376) ft
Left-Zone Right Coordinate: (572.64528, 3,291) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (600.00005, 3,283.5087) ft
Right-Zone Right Coordinate: (690, 3,271.587) ft

Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 294 | 3,290 |
| | 520.27361 | 3,290 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |

| | | |
|---|---|---|
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 507.99036 | 3,261.587 |
| Point 22 | 293.98092 | 3,200 |
| Point 23 | 294 | 3,176 |
| Point 24 | 817.63967 | 3,176 |
| Point 25 | 509.18177 | 3,287 |
| Point 26 | 294 | 3,287 |
| Point 27 | 520.27361 | 3,290 |
| Point 28 | 294 | 3,290 |
| Point 29 | 587.08687 | 3,287.0451 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,29,6,7,27,25,8,17,9,21,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill | 2,1,21,11,12 | 17,127 |
| Region 3 | Fly Ash Slurry | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry | 10,21,9,20,22,11 | 10,389 |
| Region 6 | Foundation Soil | 22,23,24,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1,425
F of S: 3.99
Volume: 136.71558 ft³
Weight: 12,304.402 lbs
Resisting Moment: 675,485.06 lbs-ft
Activating Moment: 169,282.29 lbs-ft
Resisting Force: 11,780.792 lbs
Activating Force: 2,949.2877 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (614.63859, 3,279.2998) ft
Entry: (572.64528, 3,291) ft
Radius: 54.457081 ft
Center: (607.03624, 3,333.2236) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 573.36736 | 3,290.4319 | 0 | 20.153363 | 16.910679 | 50 |
| Slice 2 | 574.81152 | 3,289.3336 | 0 | 74.155171 | 62.223577 | 50 |
| Slice 3 | 576.25568 | 3,288.3086 | 0 | 121.71205 | 102.12853 | 50 |
| Slice 4 | 577.69984 | 3,287.3519 | 0 | 163.8419 | 137.47968 | 50 |
| Slice 5 | 579.144 | 3,286.4594 | 0 | 201.37562 | 168.97421 | 50 |
| Slice 6 | 580.58815 | 3,285.6275 | 0 | 234.97331 | 197.16601 | 50 |
| Slice 7 | 582.03231 | 3,284.853 | 0 | 265.14252 | 222.48099 | 50 |
| Slice 8 | 583.47647 | 3,284.1332 | 0 | 292.25637 | 245.23221 | 50 |
| Slice 9 | 584.92063 | 3,283.4657 | 0 | 316.56953 | 265.63338 | 50 |
| Slice 10 | 586.36479 | 3,282.8485 | 0 | 338.23163 | 283.81004 | 50 |
| Slice 11 | 587.79867 | 3,282.2834 | 0 | 357.18346 | 299.71251 | 50 |
| Slice 12 | 589.22227 | 3,281.7681 | 0 | 373.4253 | 313.34103 | 50 |
| Slice 13 | 590.64587 | 3,281.297 | 0 | 387.01035 | 324.74024 | 50 |
| Slice 14 | 592.06947 | 3,280.8689 | 0 | 397.76656 | 333.76578 | 50 |
| Slice 15 | 593.49306 | 3,280.4826 | 0 | 405.46332 | 340.22413 | 50 |
| Slice 16 | 594.91666 | 3,280.1373 | 0 | 409.82305 | 343.88237 | 50 |
| Slice 17 | 596.34026 | 3,279.8322 | 0 | 410.53627 | 344.48083 | 50 |
| Slice 18 | 597.76386 | 3,279.5666 | 0 | 407.28015 | 341.74862 | 50 |
| Slice 19 | 599.18746 | 3,279.3399 | 0 | 399.74007 | 335.42174 | 50 |
| Slice 20 | 600.61106 | 3,279.1517 | 0 | 387.63304 | 325.26274 | 50 |
| Slice 21 | 602.03466 | 3,279.0014 | 0 | 370.73137 | 311.08056 | 50 |
| Slice 22 | 603.45825 | 3,278.8889 | 0 | 348.88451 | 292.74886 | 50 |
| Slice 23 | 604.88185 | 3,278.8139 | 0 | 322.03708 | 270.2212 | 50 |
| Slice 24 | 606.30545 | 3,278.7761 | 0 | 290.24105 | 243.54116 | 50 |
| Slice 25 | 607.77938 | 3,278.777 | 0 | 250.35561 | 210.0733 | 50 |
| Slice 26 | 609.30365 | 3,278.8191 | 0 | 202.31445 | 169.76198 | 50 |
| Slice 27 | 610.82792 | 3,278.9041 | 0 | 149.61453 | 125.5415 | 50 |
| Slice 28 | 612.35219 | 3,279.0321 | 0 | 92.838531 | 77.900777 | 50 |
| Slice 29 | 613.87645 | 3,279.2033 | 0 | 32.61554 | 27.367688 | 50 |

# Seismic Safety Factor – F Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 654
Date: 10/14/2016
Time: 1:48:10 PM
Tool Version: 8.15.1.11236
File Name: II_F-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 1:48:12 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - F-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - F-Cell [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °

### Fly Ash Slurry - Seismic
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Paste - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (293.98092, 3,270.0255) ft
Right Coordinate: (817.63967, 3,271.587) ft

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 294 | 3,287 |
| | 509.18177 | 3,287 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 535.72283 | 3,281.587 |
| Point 2 | 578.84892 | 3,281.587 |
| Point 3 | 589.57071 | 3,277.6191 |
| Point 4 | 620.25841 | 3,277.6133 |
| Point 5 | 607.01725 | 3,281.587 |
| Point 6 | 572.64528 | 3,291 |
| Point 7 | 523.97089 | 3,291 |
| Point 8 | 459.31471 | 3,273.5125 |
| Point 9 | 408.79403 | 3,260.8887 |
| Point 10 | 507.99038 | 3,261.587 |
| Point 11 | 422.59238 | 3,200 |
| Point 12 | 799.30621 | 3,200 |
| Point 13 | 817.63967 | 3,271.587 |
| Point 14 | 658.00707 | 3,271.587 |
| Point 15 | 627.01002 | 3,275.587 |
| Point 16 | 817.63967 | 3,200 |
| Point 17 | 451.60885 | 3,271.587 |
| Point 18 | 394.2834 | 3,270.5155 |
| Point 19 | 293.98092 | 3,270.0255 |
| Point 20 | 293.98092 | 3,260.0804 |
| Point 21 | 507.99036 | 3,261.587 |

| | | |
|---|---|---|
| Point 22 | 293.98092 | 3,200 |
| Point 23 | 294 | 3,176 |
| Point 24 | 817.63967 | 3,176 |
| Point 25 | 509.18177 | 3,287 |
| Point 26 | 294 | 3,287 |
| Point 27 | 520.27361 | 3,290 |
| Point 28 | 294 | 3,290 |
| Point 29 | 587.08687 | 3,287.0451 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill - Seismic | 1,2,3,4,5,29,6,7,27,25,8,17,9,21,10 | 2,349.1 |
| Region 2 | Bottom Ash Fill - Seismic | 2,1,21,11,12 | 17,127 |
| Region 3 | Fly Ash Slurry - Seismic | 13,14,15,4,3,12,16 | 8,467.9 |
| Region 4 | Paste - Sat. - Seismic | 17,18,19,20,9 | 1,341 |
| Region 5 | Fly Ash Slurry - Seismic | 10,21,9,20,22,11 | 10,389 |
| Region 6 | Foundation Soil - Seismic | 22,23,24,16,12,11 | 12,568 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.70
Volume: 138.25259 ft³
Weight: 12,442.733 lbs
Resisting Moment: 512,697.54 lbs-ft
Activating Moment: 190,091.2 lbs-ft
Resisting Force: 8,927.717 lbs
Activating Force: 3,306.394 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (614.63859, 3,279.2998) ft
Entry: (572.52361, 3,291) ft
Radius: 54.564724 ft
Center: (606.96407, 3,333.3221) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 572.58444 | 3,290.9506 | 0 | -6.3403075 | -3.9618638 | 40 |
| Slice 2 | 573.36736 | 3,290.3369 | 0 | 25.651242 | 16.028675 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 3 | 574.81152 | 3,289.2458 | 0 | 78.277488 | 48.913203 | 40 |
| Slice 4 | 576.25568 | 3,288.2273 | 0 | 124.51039 | 77.802729 | 40 |
| Slice 5 | 577.69984 | 3,287.2767 | 0 | 165.41242 | 103.36115 | 40 |
| Slice 6 | 579.144 | 3,286.3898 | 0 | 201.84863 | 126.12902 | 40 |
| Slice 7 | 580.58815 | 3,285.563 | 0 | 234.50482 | 146.53487 | 40 |
| Slice 8 | 582.03231 | 3,284.7932 | 0 | 263.90731 | 164.90759 | 40 |
| Slice 9 | 583.47647 | 3,284.0778 | 0 | 290.44316 | 181.48903 | 40 |
| Slice 10 | 584.92063 | 3,283.4145 | 0 | 314.37712 | 196.44463 | 40 |
| Slice 11 | 586.36479 | 3,282.8011 | 0 | 335.86425 | 209.87128 | 40 |
| Slice 12 | 587.79867 | 3,282.2397 | 0 | 354.84491 | 221.73171 | 40 |
| Slice 13 | 589.22227 | 3,281.7278 | 0 | 371.31086 | 232.02078 | 40 |
| Slice 14 | 590.64587 | 3,281.26 | 0 | 385.30197 | 240.76339 | 40 |
| Slice 15 | 592.06947 | 3,280.8349 | 0 | 396.62517 | 247.83891 | 40 |
| Slice 16 | 593.49306 | 3,280.4515 | 0 | 405.02026 | 253.08475 | 40 |
| Slice 17 | 594.91666 | 3,280.109 | 0 | 410.17007 | 256.3027 | 40 |
| Slice 18 | 596.34026 | 3,279.8066 | 0 | 411.71874 | 257.27042 | 40 |
| Slice 19 | 597.76386 | 3,279.5435 | 0 | 409.2906 | 255.75315 | 40 |
| Slice 20 | 599.18746 | 3,279.3192 | 0 | 402.51635 | 251.52013 | 40 |
| Slice 21 | 600.61106 | 3,279.1333 | 0 | 391.06024 | 244.36156 | 40 |
| Slice 22 | 602.03466 | 3,278.9852 | 0 | 374.64714 | 234.10551 | 40 |
| Slice 23 | 603.45825 | 3,278.8748 | 0 | 353.09029 | 220.6353 | 40 |
| Slice 24 | 604.88185 | 3,278.8018 | 0 | 326.31247 | 203.90266 | 40 |
| Slice 25 | 606.30545 | 3,278.766 | 0 | 294.35993 | 183.9365 | 40 |
| Slice 26 | 607.77938 | 3,278.7688 | 0 | 254.08259 | 158.76842 | 40 |
| Slice 27 | 609.30365 | 3,278.8129 | 0 | 205.42833 | 128.36587 | 40 |
| Slice 28 | 610.82792 | 3,278.8998 | 0 | 151.97173 | 94.962476 | 40 |
| Slice 29 | 612.35219 | 3,279.0295 | 0 | 94.373826 | 58.971312 | 40 |
| Slice 30 | 613.87645 | 3,279.2025 | 0 | 33.349141 | 20.838856 | 40 |

# Static Safety Factor: Maximum Storage Pool – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 2:17:58 PM
Tool Version: 8.15.1.11236
File Name: JJ_C-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:18:00 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Paste

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 50 psf
Phi': 35 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (40, 3,267.1226) ft
Left-Zone Right Coordinate: (164.89846, 3,279.8719) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (215.74215, 3,291.6232) ft
Right-Zone Right Coordinate: (292.90659, 3,285) ft

Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (-41.55436, 3,266.2792) ft
Right Coordinate: (599.35253, 3,283) ft

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 285.77859 | 3,289.752 |
| Point 2 | 250.00064 | 3,292 |
| Point 3 | 216.29808 | 3,291.7517 |
| Point 4 | 71.88336 | 3,195.4752 |
| Point 5 | 124.44564 | 3,190 |
| Point 6 | 198.44564 | 3,190 |
| Point 7 | 416.39906 | 3,202.6717 |
| Point 8 | 599.35253 | 3,257.8141 |
| Point 9 | 333.57732 | 3,257.8862 |
| Point 10 | 599.35253 | 3,213.3085 |
| Point 11 | 599.35253 | 3,266.003 |
| Point 12 | 162.68926 | 3,256.0125 |
| Point 13 | -41.55436 | 3,257.6809 |
| Point 14 | -41.55436 | 3,207.2917 |
| Point 15 | 113.00282 | 3,267.8775 |
| Point 16 | -41.55436 | 3,266.2792 |
| Point 17 | -41.55436 | 3,177 |
| Point 18 | 599.35253 | 3,177 |
| Point 19 | 292.90659 | 3,285 |
| Point 20 | 599.35253 | 3,283 |

## Regions

| | Material | Points | Area ($ft^2$) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,6,7,19 | 20,603 |
| Region 2 | Fly Ash Slurry - Sat. | 8,9,7,10 | 11,406 |
| Region 3 | Paste | 9,8,11,20,19 | 7,460.7 |
| Region 4 | Fly Ash Slurry - Sat. | 12,13,14,4 | 9,115.9 |
| Region 5 | Paste | 3,15,16,13,12 | 3,040.6 |

| | | | |
|---|---|---|---|
| Region 6 | Foundation Soil | 14,17,18,10,7,6,5,4 | 14,439 |

## Current Slip Surface

Slip Surface: 1,082
F of S: 3.57
Volume: 573.27709 ft³
Weight: 58,278.974 lbs
Resisting Moment: 9,700,080.8 lbs-ft
Activating Moment: 2,717,285.3 lbs-ft
Resisting Force: 43,998.288 lbs
Activating Force: 12,323.53 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (113.63713, 3,268.0241) ft
Entry: (220.64546, 3,291.7837) ft
Radius: 213.76056 ft
Center: (122.35615, 3,481.6068) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 115.41367 | 3,267.9664 | 0 | 49.300809 | 34.520798 | 50 |
| Slice 2 | 118.96676 | 3,267.8805 | 0 | 144.27096 | 101.01962 | 50 |
| Slice 3 | 122.51985 | 3,267.8537 | 0 | 233.71364 | 163.64806 | 50 |
| Slice 4 | 126.07294 | 3,267.8859 | 0 | 317.13829 | 222.06262 | 50 |
| Slice 5 | 129.62603 | 3,267.9773 | 0 | 394.0816 | 275.93891 | 50 |
| Slice 6 | 133.17912 | 3,268.1278 | 0 | 464.13393 | 324.99008 | 50 |
| Slice 7 | 136.7322 | 3,268.3376 | 0 | 526.96068 | 368.98184 | 50 |
| Slice 8 | 140.28529 | 3,268.6069 | 0 | 582.31778 | 407.7433 | 50 |
| Slice 9 | 143.83838 | 3,268.9359 | 0 | 630.06055 | 441.17315 | 50 |
| Slice 10 | 147.39147 | 3,269.3249 | 0 | 670.14572 | 469.24109 | 50 |
| Slice 11 | 150.94456 | 3,269.7741 | 0 | 702.62717 | 491.98484 | 50 |
| Slice 12 | 154.49765 | 3,270.2841 | 0 | 727.64589 | 509.50313 | 50 |
| Slice 13 | 158.05073 | 3,270.8552 | 0 | 745.41549 | 521.94554 | 50 |
| Slice 14 | 161.60382 | 3,271.4879 | 0 | 756.20445 | 529.50006 | 50 |
| Slice 15 | 165.15691 | 3,272.1828 | 0 | 760.31644 | 532.3793 | 50 |
| Slice 16 | 168.71 | 3,272.9406 | 0 | 758.07007 | 530.80638 | 50 |
| Slice 17 | 172.26309 | 3,273.7618 | 0 | 749.77923 | 525.00107 | 50 |
| Slice 18 | 175.81618 | 3,274.6473 | 0 | 735.7348 | 515.16705 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 19 | 179.36927 | 3,275.5978 | 0 | 716.18848 | 501.48057 | 50 |
| Slice 20 | 182.92235 | 3,276.6144 | 0 | 691.33886 | 484.08068 | 50 |
| Slice 21 | 186.47544 | 3,277.6979 | 0 | 661.31982 | 463.06113 | 50 |
| Slice 22 | 190.02853 | 3,278.8495 | 0 | 626.19114 | 438.46376 | 50 |
| Slice 23 | 193.58162 | 3,280.0703 | 0 | 585.93076 | 410.27313 | 50 |
| Slice 24 | 197.13471 | 3,281.3616 | 0 | 540.42866 | 378.41222 | 50 |
| Slice 25 | 200.6878 | 3,282.7247 | 0 | 489.48189 | 342.73891 | 50 |
| Slice 26 | 204.24089 | 3,284.1612 | 0 | 432.7907 | 303.04331 | 50 |
| Slice 27 | 207.73088 | 3,285.6444 | 0 | 366.82505 | 307.80276 | 0 |
| Slice 28 | 211.15776 | 3,287.1735 | 0 | 292.8393 | 245.72135 | 0 |
| Slice 29 | 214.58464 | 3,288.7756 | 0 | 213.2741 | 178.95822 | 0 |
| Slice 30 | 218.47177 | 3,290.6894 | 0 | 86.076291 | 72.226584 | 0 |

# Seismic Safety Factor – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 2:17:58 PM
Tool Version: 8.15.1.11236
File Name: JJ_C-B_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:18:02 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - B-Cell [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Paste - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 40 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (-41.55436, 3,266.2792) ft
Right Coordinate: (599.35253, 3,283) ft

## Seismic Coefficients
Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 285.77859 | 3,289.752 |
| Point 2 | 250.00064 | 3,292 |
| Point 3 | 216.29808 | 3,291.7517 |
| Point 4 | 71.88336 | 3,195.4752 |
| Point 5 | 124.44564 | 3,190 |
| Point 6 | 198.44564 | 3,190 |
| Point 7 | 416.39906 | 3,202.6717 |
| Point 8 | 599.35253 | 3,257.8141 |
| Point 9 | 333.57732 | 3,257.8862 |
| Point 10 | 599.35253 | 3,213.3085 |
| Point 11 | 599.35253 | 3,266.003 |
| Point 12 | 162.68926 | 3,256.0125 |
| Point 13 | -41.55436 | 3,257.6809 |
| Point 14 | -41.55436 | 3,207.2917 |
| Point 15 | 113.00282 | 3,267.8775 |
| Point 16 | -41.55436 | 3,266.2792 |
| Point 17 | -41.55436 | 3,177 |
| Point 18 | 599.35253 | 3,177 |
| Point 19 | 292.90659 | 3,285 |
| Point 20 | 599.35253 | 3,283 |

## Regions

| | Material | Points | Area ($ft^2$) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 1,2,3,4,5,6,7,19 | 20,603 |
| Region 2 | Fly Ash Slurry - Sat. - Seismic | 8,9,7,10 | 11,406 |
| Region 3 | Paste - Sat. - Seismic | 9,8,11,20,19 | 7,460.7 |
| Region 4 | Fly Ash Slurry - Sat. - Seismic | 12,13,14,4 | 9,115.9 |
| Region 5 | Paste - Sat. - Seismic | 3,15,16,13,12 | 3,040.6 |
| Region 6 | Foundation Soil - Seismic | 14,17,18,10,7,6,5,4 | 14,439 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.42
Volume: 573.27709 $ft^3$

Weight: 63,849.004 lbs
Resisting Moment: 8,141,504.2 lbs-ft
Activating Moment: 3,361,190.4 lbs-ft
Resisting Force: 36,899.43 lbs
Activating Force: 15,231.248 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (113.63713, 3,268.0241) ft
Entry: (220.64546, 3,291.7837) ft
Radius: 213.76056 ft
Center: (122.35615, 3,481.6068) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 115.41367 | 3,267.9664 | 0 | 54.367223 | 28.907565 | 40 |
| Slice 2 | 118.96676 | 3,267.8805 | 0 | 159.03457 | 84.560179 | 40 |
| Slice 3 | 122.51985 | 3,267.8537 | 0 | 257.62183 | 136.97995 | 40 |
| Slice 4 | 126.07294 | 3,267.8859 | 0 | 349.53462 | 185.85086 | 40 |
| Slice 5 | 129.62603 | 3,267.9773 | 0 | 434.21401 | 230.87568 | 40 |
| Slice 6 | 133.17912 | 3,268.1278 | 0 | 511.16868 | 271.79321 | 40 |
| Slice 7 | 136.7322 | 3,268.3376 | 0 | 580.00246 | 308.39278 | 40 |
| Slice 8 | 140.28529 | 3,268.6069 | 0 | 640.43308 | 340.52431 | 40 |
| Slice 9 | 143.83838 | 3,268.9359 | 0 | 692.30267 | 368.10386 | 40 |
| Slice 10 | 147.39147 | 3,269.3249 | 0 | 735.57972 | 391.11467 | 40 |
| Slice 11 | 150.94456 | 3,269.7741 | 0 | 770.35352 | 409.60423 | 40 |
| Slice 12 | 154.49765 | 3,270.2841 | 0 | 796.8196 | 423.6765 | 40 |
| Slice 13 | 158.05073 | 3,270.8552 | 0 | 815.26135 | 433.48215 | 40 |
| Slice 14 | 161.60382 | 3,271.4879 | 0 | 826.02723 | 439.20647 | 40 |
| Slice 15 | 165.15691 | 3,272.1828 | 0 | 829.50489 | 441.05558 | 40 |
| Slice 16 | 168.71 | 3,272.9406 | 0 | 826.09608 | 439.24308 | 40 |
| Slice 17 | 172.26309 | 3,273.7618 | 0 | 816.19224 | 433.97711 | 40 |
| Slice 18 | 175.81618 | 3,274.6473 | 0 | 800.15172 | 425.44822 | 40 |
| Slice 19 | 179.36927 | 3,275.5978 | 0 | 778.28092 | 413.81931 | 40 |
| Slice 20 | 182.92235 | 3,276.6144 | 0 | 750.81815 | 399.21709 | 40 |
| Slice 21 | 186.47544 | 3,277.6979 | 0 | 717.91989 | 381.72478 | 40 |
| Slice 22 | 190.02853 | 3,278.8495 | 0 | 679.65229 | 361.37753 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 23 | 193.58162 | 3,280.0703 | 0 | 635.98187 | 338.15756 | 40 |
| Slice 24 | 197.13471 | 3,281.3616 | 0 | 586.77012 | 311.99121 | 40 |
| Slice 25 | 200.6878 | 3,282.7247 | 0 | 531.76853 | 282.74634 | 40 |
| Slice 26 | 204.24089 | 3,284.1612 | 0 | 470.61532 | 250.2306 | 40 |
| Slice 27 | 207.73088 | 3,285.6444 | 0 | 386.47432 | 324.29046 | 0 |
| Slice 28 | 211.15776 | 3,287.1735 | 0 | 300.93956 | 252.51828 | 0 |
| Slice 29 | 214.58464 | 3,288.7756 | 0 | 210.74216 | 176.83367 | 0 |
| Slice 30 | 218.47177 | 3,290.6894 | 0 | 82.126815 | 68.91258 | 0 |

# Static Safety Factor: Maximum Storage Pool – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 643
Date: 10/14/2016
Time: 2:28:32 PM
Tool Version: 8.15.1.11236
File Name: KK_C-B_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:28:34 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °

### Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (65.24226, 3,262) ft
Left-Zone Right Coordinate: (124.9999, 3,271.4472) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (197.0001, 3,289.586) ft
Right-Zone Right Coordinate: (259.99988, 3,281.989) ft

Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (65, 3,262) ft
Right Coordinate: (440.1, 3,280) ft

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440 | 3,160 |
| Point 2 | 396.95813 | 3,166.4242 |
| Point 3 | 242.50004 | 3,287.1 |
| Point 4 | 180.49925 | 3,273.8176 |
| Point 5 | 91.00522 | 3,203.8972 |
| Point 6 | 167 | 3,200 |
| Point 7 | 253 | 3,190 |
| Point 8 | 338 | 3,180 |
| Point 9 | 373 | 3,170 |
| Point 10 | 87.5 | 3,262 |
| Point 11 | 440 | 3,140.7831 |
| Point 12 | 201 | 3,290 |
| Point 13 | 239 | 3,290 |
| Point 14 | 197.04186 | 3,289.5965 |
| Point 15 | 259 | 3,282 |
| Point 16 | 65 | 3,262 |
| Point 17 | 65 | 3,205.2309 |
| Point 18 | 65 | 3,140.7831 |
| Point 19 | 65 | 3,252 |
| Point 20 | 88 | 3,252 |
| Point 21 | 180 | 3,275 |
| Point 22 | 184.57256 | 3,277 |
| Point 23 | 440.1 | 3,280 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill | 22,4,5,6,7,8,9,2,3,13,12 | 16,213 |
| Region 2 | Foundation Soil | 18,11,1,2,9,8,7,6,5,17 | 17,548 |

| | | | |
|---|---|---|---|
| Region 3 | Paste - Sat. | 3,2,1,23,15 | 13,512 |
| Region 4 | Fly Ash Slurry - Sat. | 17,5,4,22,21,20,19 | 3,482.2 |
| Region 5 | Paste - Sat. | 10,16,19,20,21,22,12,14 | 1,296.3 |

## Current Slip Surface

Slip Surface: 713
F of S: 3.22
Volume: 641.8974 ft³
Weight: 71,859.332 lbs
Resisting Moment: 12,879,508 lbs-ft
Activating Moment: 4,002,155.4 lbs-ft
Resisting Force: 53,087.036 lbs
Activating Force: 16,493.707 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (88.072861, 3,262.1443) ft
Entry: (202.38138, 3,290) ft
Radius: 234.16631 ft
Center: (91.563866, 3,496.2846) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 89.951636 | 3,262.1314 | 0 | 55.582707 | 38.91943 | 50 |
| Slice 2 | 93.709188 | 3,262.1357 | 0 | 163.56695 | 114.53081 | 50 |
| Slice 3 | 97.46674 | 3,262.2003 | 0 | 265.43566 | 185.86005 | 50 |
| Slice 4 | 101.22429 | 3,262.3252 | 0 | 360.59562 | 252.49177 | 50 |
| Slice 5 | 104.98184 | 3,262.5106 | 0 | 448.48468 | 314.03235 | 50 |
| Slice 6 | 108.73939 | 3,262.7566 | 0 | 528.60334 | 370.13204 | 50 |
| Slice 7 | 112.49695 | 3,263.0634 | 0 | 600.54075 | 420.50316 | 50 |
| Slice 8 | 116.2545 | 3,263.4313 | 0 | 663.99354 | 464.93328 | 50 |
| Slice 9 | 120.01205 | 3,263.8605 | 0 | 718.77685 | 503.29297 | 50 |
| Slice 10 | 123.7696 | 3,264.3513 | 0 | 764.82731 | 535.53784 | 50 |
| Slice 11 | 127.52715 | 3,264.9042 | 0 | 802.19827 | 561.70528 | 50 |
| Slice 12 | 131.28471 | 3,265.5196 | 0 | 831.04843 | 581.90637 | 50 |
| Slice 13 | 135.04226 | 3,266.198 | 0 | 851.6248 | 596.31411 | 50 |
| Slice 14 | 138.79981 | 3,266.94 | 0 | 864.24188 | 605.14868 | 50 |
| Slice 15 | 142.55736 | 3,267.7462 | 0 | 869.25841 | 608.66129 | 50 |
| Slice 16 | 146.31491 | 3,268.6172 | 0 | 867.05353 | 607.11742 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 17 | 150.07246 | 3,269.5538 | 0 | 858.00342 | 600.78046 | 50 |
| Slice 18 | 153.83002 | 3,270.5569 | 0 | 842.45978 | 589.89669 | 50 |
| Slice 19 | 157.58757 | 3,271.6273 | 0 | 820.7307 | 574.68182 | 50 |
| Slice 20 | 161.34512 | 3,272.766 | 0 | 793.06433 | 555.30963 | 50 |
| Slice 21 | 165.10267 | 3,273.974 | 0 | 759.6353 | 531.90236 | 50 |
| Slice 22 | 168.86022 | 3,275.2525 | 0 | 720.53367 | 504.52311 | 50 |
| Slice 23 | 172.61777 | 3,276.6028 | 0 | 675.75598 | 473.16943 | 50 |
| Slice 24 | 176.37533 | 3,278.026 | 0 | 625.19798 | 437.76834 | 50 |
| Slice 25 | 180.13288 | 3,279.5237 | 0 | 568.64854 | 398.172 | 50 |
| Slice 26 | 183.89043 | 3,281.0975 | 0 | 505.78487 | 354.15438 | 50 |
| Slice 27 | 187.64798 | 3,282.749 | 0 | 436.16896 | 305.4088 | 50 |
| Slice 28 | 191.40553 | 3,284.48 | 0 | 359.24612 | 251.54684 | 50 |
| Slice 29 | 195.16308 | 3,286.2925 | 0 | 274.34623 | 192.0993 | 50 |
| Slice 30 | 197.66307 | 3,287.5352 | 0 | 204.75884 | 143.37368 | 50 |
| Slice 31 | 199.64214 | 3,288.5574 | 0 | 120.50933 | 101.11933 | 0 |
| Slice 32 | 201.69069 | 3,289.6319 | 0 | 29.009024 | 24.341461 | 0 |

# Seismic Safety Factor – B Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 643
Date: 10/14/2016
Time: 2:28:32 PM
Tool Version: 8.15.1.11236
File Name: KK_C-B_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:28:36 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - B-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - B-Cell [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Paste - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 40 psf
Phi': 28 °
Phi-B: 0 °

### Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °

## Slip Surface Limits
Left Coordinate: (65, 3,262) ft
Right Coordinate: (440.1, 3,280) ft

## Seismic Coefficients
Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 440 | 3,160 |
| Point 2 | 396.95813 | 3,166.4242 |
| Point 3 | 242.50004 | 3,287.1 |
| Point 4 | 180.49925 | 3,273.8176 |
| Point 5 | 91.00522 | 3,203.8972 |
| Point 6 | 167 | 3,200 |
| Point 7 | 253 | 3,190 |
| Point 8 | 338 | 3,180 |
| Point 9 | 373 | 3,170 |
| Point 10 | 87.5 | 3,262 |
| Point 11 | 440 | 3,140.7831 |
| Point 12 | 201 | 3,290 |
| Point 13 | 239 | 3,290 |
| Point 14 | 197.04186 | 3,289.5965 |
| Point 15 | 259 | 3,282 |
| Point 16 | 65 | 3,262 |
| Point 17 | 65 | 3,205.2309 |
| Point 18 | 65 | 3,140.7831 |
| Point 19 | 65 | 3,252 |
| Point 20 | 88 | 3,252 |
| Point 21 | 180 | 3,275 |
| Point 22 | 184.57256 | 3,277 |
| Point 23 | 440.1 | 3,280 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bottom Ash Fill - Seismic | 22,4,5,6,7,8,9,2,3,13,12 | 16,213 |
| Region 2 | Foundation Soil - Seismic | 18,11,1,2,9,8,7,6,5,17 | 17,548 |
| Region 3 | Paste - Sat. - Seismic | 3,2,1,23,15 | 13,512 |
| Region 4 | Fly Ash Slurry - Sat. - Seismic | 17,5,4,22,21,20,19 | 3,482.2 |
| Region 5 | Paste - Sat. - Seismic | 10,16,19,20,21,22,12,14 | 1,296.3 |

## Current Slip Surface

Slip Surface: 1

F of S: 2.18
Volume: 641.8974 ft³
Weight: 71,859.331 lbs
Resisting Moment: 9,771,774.1 lbs-ft
Activating Moment: 4,481,897.2 lbs-ft
Resisting Force: 40,289.001 lbs
Activating Force: 18,475.914 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (88.072861, 3,262.1443) ft
Entry: (202.38138, 3,290) ft
Radius: 234.16631 ft
Center: (91.563866, 3,496.2846) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 89.951636 | 3,262.1314 | 0 | 55.865803 | 29.704374 | 40 |
| Slice 2 | 93.709188 | 3,262.1357 | 0 | 164.38234 | 87.403639 | 40 |
| Slice 3 | 97.46674 | 3,262.2003 | 0 | 266.81334 | 141.86717 | 40 |
| Slice 4 | 101.22429 | 3,262.3252 | 0 | 362.48916 | 192.73891 | 40 |
| Slice 5 | 104.98184 | 3,262.5106 | 0 | 450.77574 | 239.68171 | 40 |
| Slice 6 | 108.73939 | 3,262.7566 | 0 | 531.1117 | 282.3971 | 40 |
| Slice 7 | 112.49695 | 3,263.0634 | 0 | 603.039 | 320.64152 | 40 |
| Slice 8 | 116.2545 | 3,263.4313 | 0 | 666.22478 | 354.238 | 40 |
| Slice 9 | 120.01205 | 3,263.8605 | 0 | 720.47398 | 383.08281 | 40 |
| Slice 10 | 123.7696 | 3,264.3513 | 0 | 765.73304 | 407.14748 | 40 |
| Slice 11 | 127.52715 | 3,264.9042 | 0 | 802.08291 | 426.47505 | 40 |
| Slice 12 | 131.28471 | 3,265.5196 | 0 | 829.72588 | 441.17308 | 40 |
| Slice 13 | 135.04226 | 3,266.198 | 0 | 848.96389 | 451.40211 | 40 |
| Slice 14 | 138.79981 | 3,266.94 | 0 | 860.17422 | 457.36275 | 40 |
| Slice 15 | 142.55736 | 3,267.7462 | 0 | 863.78198 | 459.28103 | 40 |
| Slice 16 | 146.31491 | 3,268.6172 | 0 | 860.23048 | 457.39266 | 40 |
| Slice 17 | 150.07246 | 3,269.5538 | 0 | 849.9566 | 451.92994 | 40 |
| Slice 18 | 153.83002 | 3,270.5569 | 0 | 833.36375 | 443.10737 | 40 |
| Slice 19 | 157.58757 | 3,271.6273 | 0 | 810.80243 | 431.1113 | 40 |
| Slice 20 | 161.34512 | 3,272.766 | 0 | 782.55167 | 416.0901 | 40 |
| Slice 21 | 165.10267 | 3,273.974 | 0 | 748.80516 | 398.14677 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 22 | 168.86022 | 3,275.2525 | 0 | 709.6607 | 377.33329 | 40 |
| Slice 23 | 172.61777 | 3,276.6028 | 0 | 665.11196 | 353.6463 | 40 |
| Slice 24 | 176.37533 | 3,278.026 | 0 | 615.04155 | 327.02339 | 40 |
| Slice 25 | 180.13288 | 3,279.5237 | 0 | 559.21593 | 297.34038 | 40 |
| Slice 26 | 183.89043 | 3,281.0975 | 0 | 497.28177 | 264.40941 | 40 |
| Slice 27 | 187.64798 | 3,282.749 | 0 | 428.76225 | 227.97693 | 40 |
| Slice 28 | 191.40553 | 3,284.48 | 0 | 353.05617 | 187.72329 | 40 |
| Slice 29 | 195.16308 | 3,286.2925 | 0 | 269.43909 | 143.2633 | 40 |
| Slice 30 | 197.66307 | 3,287.5352 | 0 | 200.82996 | 106.78318 | 40 |
| Slice 31 | 199.64214 | 3,288.5574 | 0 | 118.95508 | 74.331385 | 0 |
| Slice 32 | 201.69069 | 3,289.6319 | 0 | 28.65132 | 17.903331 | 0 |

# Static Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 653
Date: 10/14/2016
Time: 3:01:32 PM
Tool Version: 8.15.1.11236
File Name: LL_C-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/16/2016
Last Solved Time: 4:40:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bottom Ash Fill - Sat.**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (244.25, 3,289) ft
Left-Zone Right Coordinate: (306, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (400.00002, 3,258.7917) ft
Right-Zone Right Coordinate: (550, 3,240) ft
Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (-4, 3,286) ft
Right Coordinate: (600, 3,240) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -4 | 3,240 |
| Coordinate 2 | 600 | 3,217 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 77 | 3,182 |
| Point 2 | 119.48251 | 3,181.2488 |
| Point 3 | 139.69083 | 3,181.2488 |
| Point 4 | 152.40295 | 3,181.2488 |
| Point 5 | 233.48251 | 3,181.2488 |
| Point 6 | 297.48251 | 3,182.2488 |
| Point 7 | 309.48251 | 3,181.2488 |
| Point 8 | 378.48251 | 3,171.2488 |
| Point 9 | 464.88721 | 3,161.2976 |
| Point 10 | 550 | 3,170 |
| Point 11 | 600 | 3,172.1053 |
| Point 12 | 600 | 3,130 |
| Point 13 | -4 | 3,130 |
| Point 14 | 404.48251 | 3,221.2488 |
| Point 15 | 431.18251 | 3,241.2488 |
| Point 16 | 239 | 3,286 |
| Point 17 | 456.3 | 3,240 |
| Point 18 | 435 | 3,221.25 |
| Point 19 | 424.7 | 3,221.2488 |
| Point 20 | 417.88251 | 3,208.2488 |
| Point 21 | 600 | 3,207 |
| Point 22 | 461.8 | 3,236 |
| Point 23 | 405.08251 | 3,239.2488 |
| Point 24 | 433.08251 | 3,239.2488 |
| Point 25 | 430 | 3,236.5 |

| | | |
|---|---|---|
| Point 26 | 600 | 3,239 |
| Point 27 | 246 | 3,290 |
| Point 28 | 506.3 | 3,240 |
| Point 29 | 511.8 | 3,236 |
| Point 30 | 306.5 | 3,290 |
| Point 31 | -4 | 3,182.7519 |
| Point 32 | 600 | 3,240 |
| Point 33 | 600 | 3,217 |
| Point 34 | -4 | 3,240 |
| Point 35 | 434.32498 | 3,223.3088 |
| Point 36 | 421.94091 | 3,223.7804 |
| Point 37 | 157.92451 | 3,233.834 |
| Point 38 | 244.25 | 3,289 |
| Point 39 | -4 | 3,286 |
| Point 40 | 321.48 | 3,285 |
| Point 41 | 600 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 31,1,2,3,4,5,6,7,8,9,10,11,12,13 | 27,623 |
| Region 2 | Fly Ash Slurry - Sat. | 20,9,10,11,21 | 6,475.4 |
| Region 3 | Clinker Fill | 15,24,23,36,35,25,22,29,28,17 | 605.6 |
| Region 4 | Paste - Sat. | 31,1,37,34 | 6,764.6 |
| Region 5 | Paste | 29,22,25,35,33,26,32,28 | 3,023.3 |
| Region 6 | Bottom Ash Fill | 37,36,23,24,15,17,40,30,27,38,16 | 11,539 |
| Region 7 | Paste - Sat. | 18,19,14,20,21,33,35 | 2,386.3 |
| Region 8 | Clinker Fill | 19,18,35,36 | 25.628 |
| Region 9 | Bottom Ash Fill - Sat. | 1,2,3,4,5,6,7,8,9,20,14,19,36,37 | 16,219 |
| Region 10 | Paste - Sat. | 34,37,16,38,39 | 10,427 |
| Region 11 | | 40,17,28,32,41 | 9,500 |

## Current Slip Surface

Slip Surface: 1,739
F of S: 2.85
Volume: 1,169.6012 ft³
Weight: 105,264.11 lbs
Resisting Moment: 32,015,178 lbs-ft

Activating Moment: 11,223,383 lbs-ft
Resisting Force: 87,694.846 lbs
Activating Force: 30,743.564 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (454.44242, 3,240.62) ft
Entry: (300.83204, 3,290) ft
Radius: 345.32103 ft
Center: (480.39416, 3,584.9645) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 303.66602 | 3,288.3117 | -3,740.2887 | 119.72217 | 100.45882 | 50 |
| Slice 2 | 308.99667 | 3,285.1959 | -3,558.7907 | 292.14021 | 245.13475 | 50 |
| Slice 3 | 313.99 | 3,282.3953 | -3,396.134 | 376.21433 | 315.6813 | 50 |
| Slice 4 | 318.98333 | 3,279.702 | -3,240.1674 | 452.27645 | 379.50501 | 50 |
| Slice 5 | 324.03697 | 3,277.0833 | -3,088.9883 | 521.85569 | 437.88892 | 50 |
| Slice 6 | 329.15091 | 3,274.539 | -2,942.5851 | 585.47498 | 491.27184 | 50 |
| Slice 7 | 334.26485 | 3,272.0989 | -2,802.6795 | 642.77463 | 539.35195 | 50 |
| Slice 8 | 339.37879 | 3,269.7607 | -2,669.1204 | 694.17648 | 582.48322 | 50 |
| Slice 9 | 344.49273 | 3,267.5221 | -2,541.7675 | 739.96281 | 620.90252 | 50 |
| Slice 10 | 349.60667 | 3,265.381 | -2,420.4904 | 780.27996 | 654.73263 | 50 |
| Slice 11 | 354.72061 | 3,263.3355 | -2,305.1677 | 815.14361 | 683.9867 | 50 |
| Slice 12 | 359.83454 | 3,261.3837 | -2,195.6865 | 844.44626 | 708.57454 | 50 |
| Slice 13 | 364.94848 | 3,259.524 | -2,091.9416 | 867.96738 | 728.31111 | 50 |
| Slice 14 | 370.06242 | 3,257.7547 | -1,993.8352 | 885.3867 | 742.92765 | 50 |
| Slice 15 | 375.17636 | 3,256.0745 | -1,901.2762 | 896.30114 | 752.08596 | 50 |
| Slice 16 | 380.2903 | 3,254.482 | -1,814.18 | 900.24579 | 755.39591 | 50 |
| Slice 17 | 385.40424 | 3,252.9759 | -1,732.468 | 896.71892 | 752.43651 | 50 |
| Slice 18 | 390.51818 | 3,251.555 | -1,656.0672 | 885.21096 | 742.78019 | 50 |
| Slice 19 | 395.63212 | 3,250.2182 | -1,584.91 | 865.23648 | 726.01962 | 50 |
| Slice 20 | 400.74606 | 3,248.9647 | -1,518.9336 | 836.36794 | 701.79603 | 50 |
| Slice 21 | 405.86 | 3,247.7933 | -1,458.0804 | 798.26913 | 669.82734 | 50 |
| Slice 22 | 410.97394 | 3,246.7033 | -1,402.2971 | 750.72608 | 629.93398 | 50 |
| Slice 23 | 416.08788 | 3,245.6939 | -1,351.5349 | 693.67235 | 582.06022 | 50 |
| Slice 24 | 421.20182 | 3,244.7643 | -1,305.7489 | 627.20626 | 526.28854 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 25 | 426.31576 | 3,243.914 | -1,264.8986 | 551.59749 | 462.84525 | 50 |
| Slice 26 | 431.4297 | 3,243.1423 | -1,228.9471 | 467.2816 | 392.09581 | 50 |
| Slice 27 | 436.54363 | 3,242.4487 | -1,197.8612 | 374.84165 | 314.52949 | 50 |
| Slice 28 | 441.65757 | 3,241.8326 | -1,171.6114 | 274.97787 | 230.73383 | 50 |
| Slice 29 | 446.77151 | 3,241.2938 | -1,150.1718 | 168.46708 | 141.36067 | 50 |
| Slice 30 | 451.88545 | 3,240.8318 | -1,133.5197 | 56.114883 | 47.085978 | 50 |

# Seismic Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 654
Date: 10/16/2016
Time: 4:40:51 PM
Tool Version: 8.15.1.11236
File Name: LL_C-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/16/2016
Last Solved Time: 4:40:52 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditons

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions [(last)]

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Sat. - Seismic

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat. - Seismic

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits
Left Coordinate: (-4, 3,286) ft
Right Coordinate: (600, 3,240) ft

## Piezometric Lines
### Piezometric Line 1
#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -4 | 3,240 |
| Coordinate 2 | 600 | 3,217 |

## Seismic Coefficients
Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 77 | 3,182 |
| Point 2 | 119.48251 | 3,181.2488 |
| Point 3 | 139.69083 | 3,181.2488 |
| Point 4 | 152.40295 | 3,181.2488 |
| Point 5 | 233.48251 | 3,181.2488 |
| Point 6 | 297.48251 | 3,182.2488 |
| Point 7 | 309.48251 | 3,181.2488 |
| Point 8 | 378.48251 | 3,171.2488 |
| Point 9 | 464.88721 | 3,161.2976 |
| Point 10 | 550 | 3,170 |
| Point 11 | 600 | 3,172.1053 |
| Point 12 | 600 | 3,130 |
| Point 13 | -4 | 3,130 |
| Point 14 | 404.48251 | 3,221.2488 |
| Point 15 | 431.18251 | 3,241.2488 |
| Point 16 | 239 | 3,286 |
| Point 17 | 456.3 | 3,240 |
| Point 18 | 435 | 3,221.25 |
| Point 19 | 424.7 | 3,221.2488 |
| Point 20 | 417.88251 | 3,208.2488 |
| Point 21 | 600 | 3,207 |
| Point 22 | 461.8 | 3,236 |
| Point 23 | 405.08251 | 3,239.2488 |
| Point 24 | 433.08251 | 3,239.2488 |
| Point 25 | 430 | 3,236.5 |
| Point 26 | 600 | 3,239 |
| Point 27 | 246 | 3,290 |
| Point 28 | 506.3 | 3,240 |
| Point 29 | 511.8 | 3,236 |
| Point 30 | 306.5 | 3,290 |
| Point 31 | -4 | 3,182.7519 |
| Point 32 | 600 | 3,240 |
| Point 33 | 600 | 3,217 |

| | | |
|---|---|---|
| Point 34 | -4 | 3,240 |
| Point 35 | 434.32498 | 3,223.3088 |
| Point 36 | 421.94091 | 3,223.7804 |
| Point 37 | 157.92451 | 3,233.834 |
| Point 38 | 244.25 | 3,289 |
| Point 39 | -4 | 3,286 |
| Point 40 | 321.48 | 3,285 |
| Point 41 | 600 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil - Seismic | 31,1,2,3,4,5,6,7,8,9,10,11,12,13 | 27,623 |
| Region 2 | Fly Ash Slurry - Sat. - Seismic | 20,9,10,11,21 | 6,475.4 |
| Region 3 | Clinker Fill - Seismic | 15,24,23,36,35,25,22,29,28,17 | 605.6 |
| Region 4 | Paste - Sat. - Seismic | 31,1,37,34 | 6,764.6 |
| Region 5 | Paste - Seismic | 29,22,25,35,33,26,32,28 | 3,023.3 |
| Region 6 | Bottom Ash Fill - Seismic | 37,36,23,24,15,17,40,30,27,38,16 | 11,539 |
| Region 7 | Paste - Sat. - Seismic | 18,19,14,20,21,33,35 | 2,386.3 |
| Region 8 | Clinker Fill - Seismic | 19,18,35,36 | 25.628 |
| Region 9 | Bottom Ash Fill - Sat. - Seismic | 1,2,3,4,5,6,7,8,9,20,14,19,36,37 | 16,219 |
| Region 10 | Paste - Sat. - Seismic | 34,37,16,38,39 | 10,427 |
| Region 11 | | 40,17,28,32,41 | 9,500 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.94
Volume: 1,169.6012 ft³
Weight: 105,264.11 lbs
Resisting Moment: 23,792,834 lbs-ft
Activating Moment: 12,239,835 lbs-ft
Resisting Force: 65,184.047 lbs
Activating Force: 33,539.834 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (454.44242, 3,240.62) ft
Entry: (300.83204, 3,290) ft
Radius: 345.32103 ft
Center: (480.39416, 3,584.9645) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 303.66602 | 3,288.3117 | -3,740.2887 | 116.61517 | 72.869246 | 40 |
| Slice 2 | 308.99667 | 3,285.1959 | -3,558.7908 | 286.61141 | 179.09468 | 40 |
| Slice 3 | 313.99 | 3,282.3953 | -3,396.134 | 369.34617 | 230.7931 | 40 |
| Slice 4 | 318.98333 | 3,279.702 | -3,240.1674 | 444.12186 | 277.51814 | 40 |
| Slice 5 | 324.03697 | 3,277.0833 | -3,088.9883 | 512.50035 | 320.24576 | 40 |
| Slice 6 | 329.15091 | 3,274.539 | -2,942.5852 | 575.05165 | 359.33215 | 40 |
| Slice 7 | 334.26485 | 3,272.0989 | -2,802.6795 | 631.47248 | 394.5878 | 40 |
| Slice 8 | 339.37879 | 3,269.7607 | -2,669.1203 | 682.21991 | 426.29831 | 40 |
| Slice 9 | 344.49273 | 3,267.5221 | -2,541.7675 | 727.604 | 454.65744 | 40 |
| Slice 10 | 349.60667 | 3,265.381 | -2,420.4904 | 767.79048 | 479.76874 | 40 |
| Slice 11 | 354.72061 | 3,263.3355 | -2,305.1677 | 802.80466 | 501.64803 | 40 |
| Slice 12 | 359.83454 | 3,261.3837 | -2,195.6865 | 832.53764 | 520.22725 | 40 |
| Slice 13 | 364.94848 | 3,259.524 | -2,091.9416 | 856.75491 | 535.35988 | 40 |
| Slice 14 | 370.06242 | 3,257.7547 | -1,993.8352 | 875.11054 | 546.82976 | 40 |
| Slice 15 | 375.17636 | 3,256.0745 | -1,901.2762 | 887.16263 | 554.36074 | 40 |
| Slice 16 | 380.2903 | 3,254.482 | -1,814.18 | 892.39657 | 557.63127 | 40 |
| Slice 17 | 385.40424 | 3,252.9759 | -1,732.468 | 890.25115 | 556.29066 | 40 |
| Slice 18 | 390.51818 | 3,251.555 | -1,656.0672 | 880.15119 | 549.9795 | 40 |
| Slice 19 | 395.63212 | 3,250.2182 | -1,584.9099 | 861.54315 | 538.35191 | 40 |
| Slice 20 | 400.74606 | 3,248.9647 | -1,518.9336 | 833.93397 | 521.09978 | 40 |
| Slice 21 | 405.86 | 3,247.7933 | -1,458.0804 | 796.92966 | 497.97692 | 40 |
| Slice 22 | 410.97394 | 3,246.7033 | -1,402.2972 | 750.27156 | 468.8217 | 40 |
| Slice 23 | 416.08788 | 3,245.6939 | -1,351.5349 | 693.86556 | 433.57532 | 40 |
| Slice 24 | 421.20182 | 3,244.7643 | -1,305.749 | 627.8025 | 392.29454 | 40 |
| Slice 25 | 426.31576 | 3,243.914 | -1,264.8986 | 552.36604 | 345.15661 | 40 |
| Slice 26 | 431.4297 | 3,243.1423 | -1,228.9471 | 468.02595 | 292.45507 | 40 |
| Slice 27 | 436.54363 | 3,242.4487 | -1,197.8612 | 375.41662 | 234.58634 | 40 |
| Slice 28 | 441.65757 | 3,241.8326 | -1,171.6114 | 275.30163 | 172.02755 | 40 |
| Slice 29 | 446.77151 | 3,241.2938 | -1,150.1718 | 168.52722 | 105.30749 | 40 |
| Slice 30 | 451.88545 | 3,240.8318 | -1,133.5197 | 55.967551 | 34.972407 | 40 |

# Static Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 2:57:51 PM
Tool Version: 8.15.1.11236
File Name: MM_C-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:58:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - J-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill - Sat.**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (157.30011, 3,288.9983) ft
Left-Zone Right Coordinate: (235, 3,290) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (322.73212, 3,262.441) ft
Right-Zone Right Coordinate: (480, 3,244.0239) ft
Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (-79, 3,286) ft
Right Coordinate: (612, 3,244) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -79 | 3,230 |

| | | |
|---|---|---|
| Coordinate 2 | 612 | 3,230 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 433 | 3,185 |
| Point 2 | 433 | 3,139.6236 |
| Point 3 | -79 | 3,139.5886 |
| Point 4 | 23.41086 | 3,184.7977 |
| Point 5 | 90 | 3,190 |
| Point 6 | 137 | 3,200 |
| Point 7 | 167 | 3,210 |
| Point 8 | 194 | 3,220 |
| Point 9 | 200 | 3,222 |
| Point 10 | 216 | 3,230 |
| Point 11 | 234.8 | 3,233.6154 |
| Point 12 | 249.37512 | 3,236.4183 |
| Point 13 | 283.21357 | 3,235.9964 |
| Point 14 | 306 | 3,230 |
| Point 15 | 330 | 3,220 |
| Point 16 | 348 | 3,212 |
| Point 17 | 359.82271 | 3,208.7817 |
| Point 18 | 367 | 3,205 |
| Point 19 | 389 | 3,200 |
| Point 20 | 314.98048 | 3,235.5573 |
| Point 21 | 268 | 3,240 |
| Point 22 | 337.50192 | 3,219.6248 |
| Point 23 | 348.644 | 3,235.6 |
| Point 24 | 301.96542 | 3,244.867 |
| Point 25 | 370.01173 | 3,235.6 |
| Point 26 | 378.4 | 3,210 |
| Point 27 | 339.8 | 3,240 |
| Point 28 | 612 | 3,210 |
| Point 29 | 612 | 3,178.1168 |
| Point 30 | 612 | 3,138.9442 |
| Point 31 | 368 | 3,242 |

| | | |
|---|---|---|
| Point 32 | 393.8 | 3,240 |
| Point 33 | 401 | 3,235 |
| Point 34 | -8.04657 | 3,183.8266 |
| Point 35 | 159 | 3,290 |
| Point 36 | 451 | 3,235 |
| Point 37 | 443.8 | 3,240 |
| Point 38 | 235 | 3,290 |
| Point 39 | 254 | 3,284 |
| Point 40 | 296.92176 | 3,270.5911 |
| Point 41 | -79 | 3,181.6362 |
| Point 42 | -79 | 3,272 |
| Point 43 | 612 | 3,244 |
| Point 44 | 381.00001 | 3,244.0418 |
| Point 45 | -79 | 3,230 |
| Point 46 | 64.6643 | 3,230 |
| Point 47 | 322.83602 | 3,230 |
| Point 48 | 612 | 3,230 |
| Point 49 | 157.43454 | 3,289 |
| Point 50 | -79 | 3,286 |
| Point 51 | 250.83333 | 3,285 |
| Point 52 | 612 | 3,285 |
| Point 53 | 241.33333 | 3,288 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bedrock | 9,8,7,6,5,4,34,41,3,2,30,29,1,19,18,17,16,15,14,13,21,12,11,10 | 40,728 |
| Region 2 | Fly Ash Slurry - Sat. | 26,28,29,1,19,18,17 | 6,037 |
| Region 3 | Paste | 36,33,25,23,24,20,47,48,43,44,32,37 | 3,387.8 |
| Region 4 | Bottom Ash Fill | 39,51,53,38,35,49,46,10,11,12,21,13,14,47,20,24,23,27,31,32,44,40 | 11,655 |
| Region 5 | Clinker Fill | 31,27,23,25,33,36,37,32 | 545.12 |
| Region 6 | Paste - Sat. | 41,34,46,45 | 5,032.5 |
| Region 7 | Paste - Sat. | 45,46,49,50,42 | 10,858 |

| | | | |
|---|---|---|---|
| Region 8 | Bottom Ash Fill - Sat. | 34,4,5,6,7,8,9,10,46 | 5,513.3 |
| Region 9 | Bottom Ash Fill | 15,16,17,22,47,14 | 175.16 |
| Region 10 | Paste - Sat. | 22,17,26,28,48,47 | 5,483.5 |
| Region 11 | | 51,39,40,44,43,52 | 12,126 |

## Current Slip Surface

Slip Surface: 1,433
F of S: 3.04
Volume: 1,210.3422 ft³
Weight: 108,930.8 lbs
Resisting Moment: 32,112,862 lbs-ft
Activating Moment: 10,578,748 lbs-ft
Resisting Force: 91,427.807 lbs
Activating Force: 30,119.503 lbs
F of S Rank (Analysis): 1 of 1,683 slip surfaces
F of S Rank (Query): 1 of 1,683 slip surfaces
Exit: (379.98454, 3,244.3625) ft
Entry: (227.2008, 3,290) ft
Radius: 334.12731 ft
Center: (396.46123, 3,578.0833) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 229.1506 | 3,288.872 | -3,673.6145 | 79.13427 | 66.401537 | 50 |
| Slice 2 | 233.0502 | 3,286.6508 | -3,535.008 | 250.10924 | 209.86657 | 50 |
| Slice 3 | 238.16666 | 3,283.8538 | -3,360.4788 | 386.41033 | 324.23677 | 50 |
| Slice 4 | 243.70833 | 3,280.9293 | -3,177.988 | 474.49285 | 398.14678 | 50 |
| Slice 5 | 248.45833 | 3,278.535 | -3,028.5816 | 541.93779 | 454.7398 | 50 |
| Slice 6 | 252.41666 | 3,276.605 | -2,908.1518 | 593.86353 | 498.31067 | 50 |
| Slice 7 | 256.68261 | 3,274.6129 | -2,783.8436 | 644.78992 | 541.04298 | 50 |
| Slice 8 | 262.04783 | 3,272.1985 | -2,633.1839 | 704.06699 | 590.78235 | 50 |
| Slice 9 | 267.41305 | 3,269.8964 | -2,489.5326 | 756.82018 | 635.04753 | 50 |
| Slice 10 | 272.77827 | 3,267.7041 | -2,352.7336 | 803.30426 | 674.05231 | 50 |
| Slice 11 | 278.14349 | 3,265.6193 | -2,222.6427 | 843.61069 | 707.87342 | 50 |
| Slice 12 | 283.50871 | 3,263.6398 | -2,099.1263 | 877.6756 | 736.45727 | 50 |
| Slice 13 | 288.87393 | 3,261.7638 | -1,982.061 | 905.29118 | 759.62949 | 50 |
| Slice 14 | 294.23915 | 3,259.9893 | -1,871.3325 | 926.12113 | 777.1079 | 50 |
| Slice 15 | 299.51747 | 3,258.3402 | -1,768.43 | 938.90585 | 787.83555 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 16 | 304.7089 | 3,256.8119 | -1,673.0632 | 943.35202 | 791.56633 | 50 |
| Slice 17 | 309.90032 | 3,255.3743 | -1,583.3591 | 939.98924 | 788.74462 | 50 |
| Slice 18 | 315.09174 | 3,254.0263 | -1,499.2422 | 928.27875 | 778.91836 | 50 |
| Slice 19 | 320.28317 | 3,252.7667 | -1,420.6431 | 907.70216 | 761.65255 | 50 |
| Slice 20 | 325.47459 | 3,251.5945 | -1,347.4979 | 877.79764 | 736.55967 | 50 |
| Slice 21 | 330.66601 | 3,250.5088 | -1,279.7481 | 838.19617 | 703.33009 | 50 |
| Slice 22 | 335.85744 | 3,249.5087 | -1,217.34 | 788.65514 | 661.76024 | 50 |
| Slice 23 | 341.04886 | 3,248.5934 | -1,160.2252 | 729.08637 | 611.7761 | 50 |
| Slice 24 | 346.24029 | 3,247.7622 | -1,108.3595 | 659.5754 | 553.44947 | 50 |
| Slice 25 | 351.43171 | 3,247.0145 | -1,061.7035 | 580.38963 | 487.00472 | 50 |
| Slice 26 | 356.62313 | 3,246.3497 | -1,020.2218 | 491.97324 | 412.81456 | 50 |
| Slice 27 | 361.81456 | 3,245.7674 | -983.88351 | 394.92828 | 331.38417 | 50 |
| Slice 28 | 367.00598 | 3,245.267 | -952.6615 | 289.98258 | 243.32428 | 50 |
| Slice 29 | 372.1974 | 3,244.8483 | -926.53276 | 177.94642 | 149.31478 | 50 |
| Slice 30 | 377.38883 | 3,244.5109 | -905.47811 | 59.661258 | 50.06174 | 50 |

# Seismic Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 2:57:51 PM
Tool Version: 8.15.1.11236
File Name: MM_C-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 2:58:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - J-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - J-Cell [(last)]

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Sat.
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (-79, 3,286) ft
Right Coordinate: (612, 3,244) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -79 | 3,230 |
| Coordinate 2 | 612 | 3,230 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|

| | | |
|---|---|---|
| Point 1 | 433 | 3,185 |
| Point 2 | 433 | 3,139.6236 |
| Point 3 | -79 | 3,139.5886 |
| Point 4 | 23.41086 | 3,184.7977 |
| Point 5 | 90 | 3,190 |
| Point 6 | 137 | 3,200 |
| Point 7 | 167 | 3,210 |
| Point 8 | 194 | 3,220 |
| Point 9 | 200 | 3,222 |
| Point 10 | 216 | 3,230 |
| Point 11 | 234.8 | 3,233.6154 |
| Point 12 | 249.37512 | 3,236.4183 |
| Point 13 | 283.21357 | 3,235.9964 |
| Point 14 | 306 | 3,230 |
| Point 15 | 330 | 3,220 |
| Point 16 | 348 | 3,212 |
| Point 17 | 359.82271 | 3,208.7817 |
| Point 18 | 367 | 3,205 |
| Point 19 | 389 | 3,200 |
| Point 20 | 314.98048 | 3,235.5573 |
| Point 21 | 268 | 3,240 |
| Point 22 | 337.50192 | 3,219.6248 |
| Point 23 | 348.644 | 3,235.6 |
| Point 24 | 301.96542 | 3,244.867 |
| Point 25 | 370.01173 | 3,235.6 |
| Point 26 | 378.4 | 3,210 |
| Point 27 | 339.8 | 3,240 |
| Point 28 | 612 | 3,210 |
| Point 29 | 612 | 3,178.1168 |
| Point 30 | 612 | 3,138.9442 |
| Point 31 | 368 | 3,242 |
| Point 32 | 393.8 | 3,240 |
| Point 33 | 401 | 3,235 |
| Point 34 | -8.04657 | 3,183.8266 |
| Point 35 | 159 | 3,290 |

| | | |
|---|---|---|
| Point 36 | 451 | 3,235 |
| Point 37 | 443.8 | 3,240 |
| Point 38 | 235 | 3,290 |
| Point 39 | 254 | 3,284 |
| Point 40 | 296.92176 | 3,270.5911 |
| Point 41 | -79 | 3,181.6362 |
| Point 42 | -79 | 3,272 |
| Point 43 | 612 | 3,244 |
| Point 44 | 381.00001 | 3,244.0418 |
| Point 45 | -79 | 3,230 |
| Point 46 | 64.6643 | 3,230 |
| Point 47 | 322.83602 | 3,230 |
| Point 48 | 612 | 3,230 |
| Point 49 | 157.43454 | 3,289 |
| Point 50 | -79 | 3,286 |
| Point 51 | 250.83333 | 3,285 |
| Point 52 | 612 | 3,285 |
| Point 53 | 241.33333 | 3,288 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Bedrock | 9,8,7,6,5,4,34,41,3,2,30,29,1,19,18,17,16,15,14,13,21,12,11,10 | 40,728 |
| Region 2 | Fly Ash Slurry - Sat. - Seismic | 26,28,29,1,19,18,17 | 6,037 |
| Region 3 | Paste - Seismic | 36,33,25,23,24,20,47,48,43,44,32,37 | 3,387.8 |
| Region 4 | Bottom Ash Fill - Sat. | 39,51,53,38,35,49,46,10,11,12,21,13,14,47,20,24,23,27,31,32,44,40 | 11,655 |
| Region 5 | Clinker Fill - Seismic | 31,27,23,25,33,36,37,32 | 545.12 |
| Region 6 | Paste - Sat. - Seismic | 41,34,46,45 | 5,032.5 |
| Region 7 | Paste - Sat. - Seismic | 45,46,49,50,42 | 10,858 |
| Region 8 | Bottom Ash Fill - Sat. - Seismic | 34,4,5,6,7,8,9,10,46 | 5,513.3 |
| Region 9 | Bottom Ash Fill - Sat. | 15,16,17,22,47,14 | 175.16 |
| Region 10 | Paste - Sat. - Seismic | 22,17,26,28,48,47 | 5,483.5 |
| Region 11 | | 51,39,40,44,43,52 | 12,126 |

Jorgensen Geotechnical, LLC
Appendix B – Geostudio Reports
Units 3&4 EHP C/J Divider Dike: Cross-Section M-M'

## Current Slip Surface

Slip Surface: 1
F of S: 2.72
Volume: 1,210.3422 ft³
Weight: 121,034.22 lbs
Resisting Moment: 35,095,408 lbs-ft
Activating Moment: 12,890,444 lbs-ft
Resisting Force: 99,941.523 lbs
Activating Force: 36,714.686 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (379.98454, 3,244.3625) ft
Entry: (227.2008, 3,290) ft
Radius: 334.12731 ft
Center: (396.46123, 3,578.0833) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 229.1506 | 3,288.872 | -3,673.6145 | 86.502561 | 72.584267 | 50 |
| Slice 2 | 233.0502 | 3,286.6508 | -3,535.008 | 273.32145 | 229.34393 | 50 |
| Slice 3 | 238.16666 | 3,283.8538 | -3,360.4788 | 421.98769 | 354.08971 | 50 |
| Slice 4 | 243.70833 | 3,280.9293 | -3,177.9879 | 517.88522 | 434.55729 | 50 |
| Slice 5 | 248.45833 | 3,278.535 | -3,028.5816 | 591.31962 | 496.17607 | 50 |
| Slice 6 | 252.41666 | 3,276.605 | -2,908.1518 | 647.90632 | 543.65796 | 50 |
| Slice 7 | 256.68261 | 3,274.6129 | -2,783.8436 | 703.49123 | 590.29923 | 50 |
| Slice 8 | 262.04783 | 3,272.1985 | -2,633.1839 | 768.37066 | 644.73953 | 50 |
| Slice 9 | 267.41305 | 3,269.8964 | -2,489.5326 | 826.36931 | 693.40619 | 50 |
| Slice 10 | 272.77827 | 3,267.7041 | -2,352.7337 | 877.79355 | 736.55625 | 50 |
| Slice 11 | 278.14349 | 3,265.6193 | -2,222.6427 | 922.75432 | 774.28281 | 50 |
| Slice 12 | 283.50871 | 3,263.6398 | -2,099.1263 | 961.17363 | 806.52044 | 50 |
| Slice 13 | 288.87393 | 3,261.7638 | -1,982.061 | 992.79655 | 833.05522 | 50 |
| Slice 14 | 294.23915 | 3,259.9893 | -1,871.3325 | 1,017.2068 | 853.53787 | 50 |
| Slice 15 | 299.51747 | 3,258.3402 | -1,768.43 | 1,032.9249 | 866.7269 | 50 |
| Slice 16 | 304.7089 | 3,256.8119 | -1,673.0632 | 1,039.5402 | 872.27783 | 50 |
| Slice 17 | 309.90032 | 3,255.3743 | -1,583.3591 | 1,037.5726 | 870.62676 | 50 |
| Slice 18 | 315.09174 | 3,254.0263 | -1,499.2422 | 1,026.3341 | 861.1966 | 50 |
| Slice 19 | 320.28317 | 3,252.7667 | -1,420.6431 | 1,005.159 | 843.4285 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 20 | 325.47459 | 3,251.5945 | -1,347.4979 | 973.44884 | 816.82056 | 50 |
| Slice 21 | 330.66601 | 3,250.5088 | -1,279.748 | 930.72146 | 780.96803 | 50 |
| Slice 22 | 335.85744 | 3,249.5087 | -1,217.34 | 876.65425 | 735.60026 | 50 |
| Slice 23 | 341.04886 | 3,248.5934 | -1,160.2252 | 811.12182 | 680.61202 | 50 |
| Slice 24 | 346.24029 | 3,247.7622 | -1,108.3596 | 734.22121 | 616.08475 | 50 |
| Slice 25 | 351.43171 | 3,247.0145 | -1,061.7035 | 646.28136 | 542.29445 | 50 |
| Slice 26 | 356.62313 | 3,246.3497 | -1,020.2218 | 547.8559 | 459.70569 | 50 |
| Slice 27 | 361.81456 | 3,245.7674 | -983.88351 | 439.69682 | 368.94944 | 50 |
| Slice 28 | 367.00598 | 3,245.267 | -952.66152 | 322.71078 | 270.7865 | 50 |
| Slice 29 | 372.1974 | 3,244.8483 | -926.53277 | 197.90215 | 166.05962 | 50 |
| Slice 30 | 377.38883 | 3,244.5109 | -905.4781 | 66.305378 | 55.636818 | 50 |

# Static Safety Factor: Maximum Storage Pool – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/14/2016
Time: 3:22:21 PM
Tool Version: 8.15.1.11236
File Name: NN_G-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 3:22:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose**

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Sat**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (550, 3,285) ft
Left-Zone Right Coordinate: (621, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (694.00003, 3,265.3894) ft
Right-Zone Right Coordinate: (768, 3,250.0647) ft
Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (394, 3,285) ft
Right Coordinate: (836.15953, 3,249.0623) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 394 | 3,235 |

| | | |
|---|---|---|
| Coordinate 2 | 598 | 3,236 |
| Coordinate 3 | 836.5 | 3,237.5 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 836.15953 | 3,249.0623 |
| Point 2 | 820.55228 | 3,249.4407 |
| Point 3 | 818.77202 | 3,250.0592 |
| Point 4 | 410.79256 | 3,250.0592 |
| Point 5 | 401.78975 | 3,248.9526 |
| Point 6 | 400.96204 | 3,248.4152 |
| Point 7 | 394 | 3,248.396 |
| Point 8 | 394 | 3,234.4667 |
| Point 9 | 836.15953 | 3,234.4667 |
| Point 10 | 394 | 3,225.0592 |
| Point 11 | 836.15953 | 3,225.0592 |
| Point 12 | 394 | 3,200.0592 |
| Point 13 | 836.15953 | 3,200.0592 |
| Point 14 | 694.59396 | 3,265.1864 |
| Point 15 | 570.41346 | 3,288.2238 |
| Point 16 | 472.03587 | 3,258.2238 |
| Point 17 | 462.16728 | 3,256.3741 |
| Point 18 | 768.17471 | 3,250.0592 |
| Point 19 | 760.54809 | 3,250.3004 |
| Point 20 | 755.18493 | 3,250.3503 |
| Point 21 | 751.70406 | 3,250.7386 |
| Point 22 | 738.63233 | 3,251.7075 |
| Point 23 | 734.4372 | 3,251.9545 |
| Point 24 | 734.18448 | 3,251.9304 |
| Point 25 | 708.35483 | 3,260.7984 |
| Point 26 | 394 | 3,191.5 |
| Point 27 | 836.15953 | 3,192 |
| Point 28 | 574.00002 | 3,290 |
| Point 29 | 621.99999 | 3,290 |
| Point 30 | 394 | 3,238 |

| | | |
|---|---|---|
| Point 31 | 836.15953 | 3,238 |
| Point 32 | 394 | 3,235 |
| Point 33 | 598 | 3,236 |
| Point 34 | 836.15953 | 3,237.4979 |
| Point 35 | 559.8418 | 3,285 |
| Point 36 | 394 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. | 9,8,10,11 | 4,159.6 |
| Region 2 | Native Clinker | 11,10,12,13 | 11,054 |
| Region 3 | Bottom Ash Fill | 14,29,28,15,35,16,17,4,18,19,20,21,22,23,24,25 | 6,936.6 |
| Region 4 | Bedrock | 12,26,27,13 | 3,674 |
| Region 5 | Bottom Ash Fill- Loose-Sat | 8,9,34,33,32 | 754.33 |
| Region 6 | Bottom Ash Fill- Loose | 31,1,2,3,18,4,5,6,7,30,32,33,34 | 6,109.3 |
| Region 7 | Paste - Sat. | 35,16,17,4,5,6,7,36 | 3,686.2 |

## Current Slip Surface

Slip Surface: 1,939
F of S: 2.83
Volume: 1,463.4231 ft³
Weight: 131,708.08 lbs
Resisting Moment: 13,310,131 lbs-ft
Activating Moment: 4,703,869.5 lbs-ft
Resisting Force: 100,515.42 lbs
Activating Force: 35,480.394 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (744.21294, 3,251.2939) ft
Entry: (621, 3,290) ft
Radius: 122.69556 ft
Center: (713.87356, 3,370.1792) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 621.5 | 3,289.428 | -3,324.5556 | 23.339897 | 19.584499 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 2 | 624.08955 | 3,286.6111 | -3,147.7693 | 163.97484 | 137.59123 | 50 |
| Slice 3 | 628.26866 | 3,282.3299 | -2,878.9959 | 353.63359 | 296.73382 | 50 |
| Slice 4 | 632.44777 | 3,278.4391 | -2,634.5794 | 517.1604 | 433.9491 | 50 |
| Slice 5 | 636.62688 | 3,274.8906 | -2,411.5186 | 660.0598 | 553.85593 | 50 |
| Slice 6 | 640.806 | 3,271.6471 | -2,207.495 | 786.45725 | 659.91599 | 50 |
| Slice 7 | 644.98511 | 3,268.6794 | -2,020.6761 | 899.45105 | 754.72905 | 50 |
| Slice 8 | 649.16422 | 3,265.9638 | -1,849.5869 | 1,001.3327 | 840.21791 | 50 |
| Slice 9 | 653.34333 | 3,263.4809 | -1,693.0228 | 1,093.723 | 917.7426 | 50 |
| Slice 10 | 657.52245 | 3,261.2149 | -1,549.9881 | 1,177.6568 | 988.17137 | 50 |
| Slice 11 | 661.70156 | 3,259.1524 | -1,419.6525 | 1,253.6369 | 1,051.9262 | 50 |
| Slice 12 | 665.88067 | 3,257.2822 | -1,301.3185 | 1,321.6724 | 1,109.0149 | 50 |
| Slice 13 | 670.05978 | 3,255.5949 | -1,194.3973 | 1,381.3088 | 1,159.0557 | 50 |
| Slice 14 | 674.2389 | 3,254.0826 | -1,098.3905 | 1,431.6567 | 1,201.3026 | 50 |
| Slice 15 | 678.41801 | 3,252.7384 | -1,012.8755 | 1,471.428 | 1,234.6747 | 50 |
| Slice 16 | 682.59712 | 3,251.5566 | -937.49535 | 1,498.9841 | 1,257.797 | 50 |
| Slice 17 | 686.77623 | 3,250.5324 | -871.94916 | 1,512.4078 | 1,269.0608 | 50 |
| Slice 18 | 691.72987 | 3,249.5335 | -807.67495 | 1,494.293 | 1,126.0306 | 0 |
| Slice 19 | 696.88744 | 3,248.6872 | -752.84137 | 1,466.1905 | 1,104.8538 | 0 |
| Slice 20 | 701.47439 | 3,248.1335 | -716.49413 | 1,419.9925 | 1,070.0411 | 0 |
| Slice 21 | 706.06135 | 3,247.7542 | -691.02312 | 1,347.8001 | 1,015.6402 | 0 |
| Slice 22 | 710.5073 | 3,247.5487 | -676.45954 | 1,246.9799 | 939.66673 | 0 |
| Slice 23 | 714.81224 | 3,247.5061 | -672.111 | 1,118.9329 | 843.17642 | 0 |
| Slice 24 | 719.11718 | 3,247.6147 | -677.19537 | 967.00128 | 728.68773 | 0 |
| Slice 25 | 723.42213 | 3,247.8748 | -691.7378 | 792.85369 | 597.45811 | 0 |
| Slice 26 | 727.72707 | 3,248.2875 | -715.79893 | 599.0226 | 451.3959 | 0 |
| Slice 27 | 732.03201 | 3,248.8543 | -749.47601 | 388.72216 | 292.92316 | 0 |
| Slice 28 | 734.31084 | 3,249.1978 | -770.01537 | 278.89134 | 210.1597 | 0 |
| Slice 29 | 736.53476 | 3,249.6134 | -795.07492 | 223.95488 | 168.76211 | 0 |
| Slice 30 | 741.42263 | 3,250.6507 | -857.88577 | 90.290388 | 75.762631 | 50 |

# Static Safety Factor: Maximum Surcharge Pool – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/14/2016
Time: 3:22:21 PM
Tool Version: 8.15.1.11236
File Name: NN_G-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 3:22:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A2 Static Safety Factor: Maximum Surcharge Pool - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bedrock**

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose**

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Sat**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (550, 3,285) ft
Left-Zone Right Coordinate: (621, 3,290) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (694.06974, 3,265.3656) ft
Right-Zone Right Coordinate: (768, 3,250.0647) ft
Right-Zone Increment: 16
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (394, 3,285) ft
Right Coordinate: (836.15953, 3,249.0623) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 394 | 3,235 |

| | | |
|---|---|---|
| Coordinate 2 | 598 | 3,236 |
| Coordinate 3 | 836.15953 | 3,237.4979 |

## Surcharge Loads

### Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| | 394 | 3,288 |
| | 569.67956 | 3,288 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 836.15953 | 3,249.0623 |
| Point 2 | 820.55228 | 3,249.4407 |
| Point 3 | 818.77202 | 3,250.0592 |
| Point 4 | 410.79256 | 3,250.0592 |
| Point 5 | 401.78975 | 3,248.9526 |
| Point 6 | 400.96204 | 3,248.4152 |
| Point 7 | 394 | 3,248.396 |
| Point 8 | 394 | 3,234.4667 |
| Point 9 | 836.15953 | 3,234.4667 |
| Point 10 | 394 | 3,225.0592 |
| Point 11 | 836.15953 | 3,225.0592 |
| Point 12 | 394 | 3,200.0592 |
| Point 13 | 836.15953 | 3,200.0592 |
| Point 14 | 694.59396 | 3,265.1864 |
| Point 15 | 570.41346 | 3,288.2238 |
| Point 16 | 472.03587 | 3,258.2238 |
| Point 17 | 462.16728 | 3,256.3741 |
| Point 18 | 768.17471 | 3,250.0592 |
| Point 19 | 760.54809 | 3,250.3004 |
| Point 20 | 755.18493 | 3,250.3503 |
| Point 21 | 751.70406 | 3,250.7386 |

| | | |
|---|---|---|
| Point 22 | 738.63233 | 3,251.7075 |
| Point 23 | 734.4372 | 3,251.9545 |
| Point 24 | 734.18448 | 3,251.9304 |
| Point 25 | 708.35483 | 3,260.7984 |
| Point 26 | 394 | 3,191.5 |
| Point 27 | 836.15953 | 3,192 |
| Point 28 | 574.00002 | 3,290 |
| Point 29 | 621.99999 | 3,290 |
| Point 30 | 394 | 3,238 |
| Point 31 | 836.15953 | 3,238 |
| Point 32 | 394 | 3,235 |
| Point 33 | 598 | 3,236 |
| Point 34 | 836.15953 | 3,237.4979 |
| Point 35 | 559.8418 | 3,285 |
| Point 36 | 394 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. | 9,8,10,11 | 4,159.6 |
| Region 2 | Native Clinker | 11,10,12,13 | 11,054 |
| Region 3 | Bottom Ash Fill | 14,29,28,15,35,16,17,4,18,19,20,21,22,23,24,25 | 6,936.6 |
| Region 4 | Bedrock | 12,26,27,13 | 3,674 |
| Region 5 | Bottom Ash Fill- Loose-Sat | 8,9,34,33,32 | 754.33 |
| Region 6 | Bottom Ash Fill- Loose | 31,1,2,3,18,4,5,6,7,30,32,33,34 | 6,109.3 |
| Region 7 | Paste - Sat. | 35,16,17,4,5,6,7,36 | 3,686.2 |

## Current Slip Surface

Slip Surface: 1,939
F of S: 2.83
Volume: 1,463.729 ft³
Weight: 131,735.61 lbs
Resisting Moment: 13,311,879 lbs-ft
Activating Moment: 4,705,302.2 lbs-ft
Resisting Force: 100,514.18 lbs
Activating Force: 35,486.109 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces

F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (744.2359, 3,251.2922) ft
Entry: (621, 3,290) ft
Radius: 122.71241 ft
Center: (713.88485, 3,370.1919) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 621.5 | 3,289.4281 | -3,324.5566 | 23.335727 | 19.581 | 50 |
| Slice 2 | 624.08922 | 3,286.6115 | -3,147.7958 | 163.94683 | 137.56772 | 50 |
| Slice 3 | 628.26769 | 3,282.3311 | -2,879.0649 | 353.57031 | 296.68072 | 50 |
| Slice 4 | 632.44616 | 3,278.4408 | -2,634.6803 | 517.07374 | 433.87639 | 50 |
| Slice 5 | 636.62462 | 3,274.8926 | -2,411.643 | 659.95786 | 553.7704 | 50 |
| Slice 6 | 640.80309 | 3,271.6494 | -2,207.6357 | 786.34558 | 659.82228 | 50 |
| Slice 7 | 644.98156 | 3,268.6818 | -2,020.8271 | 899.33359 | 754.63048 | 50 |
| Slice 8 | 649.16002 | 3,265.9663 | -1,849.7428 | 1,001.2124 | 840.11699 | 50 |
| Slice 9 | 653.33849 | 3,263.4834 | -1,693.1787 | 1,093.6026 | 917.64157 | 50 |
| Slice 10 | 657.51696 | 3,261.2173 | -1,550.1398 | 1,177.539 | 988.07257 | 50 |
| Slice 11 | 661.69542 | 3,259.1546 | -1,419.7959 | 1,253.5253 | 1,051.8326 | 50 |
| Slice 12 | 665.87389 | 3,257.2843 | -1,301.4498 | 1,321.5715 | 1,108.9301 | 50 |
| Slice 13 | 670.05236 | 3,255.5968 | -1,194.5129 | 1,381.2245 | 1,158.985 | 50 |
| Slice 14 | 674.23082 | 3,254.0841 | -1,098.4868 | 1,431.5969 | 1,201.2525 | 50 |
| Slice 15 | 678.40929 | 3,252.7395 | -1,012.9493 | 1,471.4026 | 1,234.6533 | 50 |
| Slice 16 | 682.58776 | 3,251.5573 | -937.54315 | 1,499.0051 | 1,257.8146 | 50 |
| Slice 17 | 686.76622 | 3,250.5327 | -871.96769 | 1,512.4894 | 1,269.1293 | 50 |
| Slice 18 | 691.72471 | 3,249.5322 | -807.59618 | 1,494.4323 | 1,126.1355 | 0 |
| Slice 19 | 696.88744 | 3,248.6844 | -752.66998 | 1,466.3708 | 1,104.9897 | 0 |
| Slice 20 | 701.47439 | 3,248.1304 | -716.30059 | 1,420.2235 | 1,070.2152 | 0 |
| Slice 21 | 706.06135 | 3,247.7507 | -690.8062 | 1,348.0875 | 1,015.8568 | 0 |
| Slice 22 | 710.5073 | 3,247.5449 | -676.21872 | 1,247.3254 | 939.92714 | 0 |
| Slice 23 | 714.81224 | 3,247.5019 | -671.84577 | 1,119.3358 | 843.48 | 0 |
| Slice 24 | 719.11718 | 3,247.61 | -676.90443 | 967.45962 | 729.03311 | 0 |
| Slice 25 | 723.42213 | 3,247.8697 | -691.41972 | 793.36296 | 597.84187 | 0 |
| Slice 26 | 727.72707 | 3,248.2819 | -715.45217 | 599.57582 | 451.81279 | 0 |
| Slice 27 | 732.03201 | 3,248.8483 | -749.09889 | 389.31059 | 293.36657 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 28 | 734.31084 | 3,249.1915 | -769.62169 | 279.49505 | 210.61463 | 0 |
| Slice 29 | 736.53476 | 3,249.6068 | -794.66409 | 224.57533 | 169.22965 | 0 |
| Slice 30 | 738.77328 | 3,250.03 | -820.19147 | 166.84395 | 125.72593 | 0 |
| Slice 31 | 741.57507 | 3,250.6757 | -859.38024 | 86.56868 | 72.639748 | 50 |

# Seismic Safety Factor – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 639
Date: 10/14/2016
Time: 3:22:21 PM
Tool Version: 8.15.1.11236
File Name: NN_G-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 3:22:24 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - G-Cell [(last)]

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker - Seismic
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Seismic**

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 29.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Seismic-Sat**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 29.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (394, 3,285) ft
Right Coordinate: (836.15953, 3,249.0623) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 394 | 3,235 |
| Coordinate 2 | 598 | 3,236 |
| Coordinate 3 | 836.15953 | 3,237.4979 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 836.15953 | 3,249.0623 |
| Point 2 | 820.55228 | 3,249.4407 |
| Point 3 | 818.77202 | 3,250.0592 |
| Point 4 | 410.79256 | 3,250.0592 |
| Point 5 | 401.78975 | 3,248.9526 |
| Point 6 | 400.96204 | 3,248.4152 |
| Point 7 | 394 | 3,248.396 |
| Point 8 | 394 | 3,234.4667 |
| Point 9 | 836.15953 | 3,234.4667 |
| Point 10 | 394 | 3,225.0592 |
| Point 11 | 836.15953 | 3,225.0592 |
| Point 12 | 394 | 3,200.0592 |
| Point 13 | 836.15953 | 3,200.0592 |
| Point 14 | 694.59396 | 3,265.1864 |
| Point 15 | 570.41346 | 3,288.2238 |
| Point 16 | 472.03587 | 3,258.2238 |
| Point 17 | 462.16728 | 3,256.3741 |
| Point 18 | 768.17471 | 3,250.0592 |
| Point 19 | 760.54809 | 3,250.3004 |
| Point 20 | 755.18493 | 3,250.3503 |
| Point 21 | 751.70406 | 3,250.7386 |
| Point 22 | 738.63233 | 3,251.7075 |
| Point 23 | 734.4372 | 3,251.9545 |
| Point 24 | 734.18448 | 3,251.9304 |
| Point 25 | 708.35483 | 3,260.7984 |
| Point 26 | 394 | 3,191.5 |
| Point 27 | 836.15953 | 3,192 |
| Point 28 | 574.00002 | 3,290 |
| Point 29 | 621.99999 | 3,290 |
| Point 30 | 394 | 3,238 |
| Point 31 | 836.15953 | 3,238 |
| Point 32 | 394 | 3,235 |
| Point 33 | 598 | 3,236 |

| | | |
|---|---|---|
| Point 34 | 836.15953 | 3,237.4979 |
| Point 35 | 559.8418 | 3,285 |
| Point 36 | 394 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. - Seismic | 9,8,10,11 | 4,159.6 |
| Region 2 | Native Clinker - Seismic | 11,10,12,13 | 11,054 |
| Region 3 | Bottom Ash Fill - Seismic | 14,29,28,15,35,16,17,4,18,19,20,21,22,23,24,25 | 6,936.6 |
| Region 4 | Bedrock | 12,26,27,13 | 3,674 |
| Region 5 | Bottom Ash Fill- Loose-Seismic-Sat | 8,9,34,33,32 | 754.33 |
| Region 6 | Bottom Ash Fill- Loose-Seismic | 31,1,2,3,18,4,5,6,7,30,32,33,34 | 6,109.3 |
| Region 7 | Paste - Sat. - Seismic | 35,16,17,4,5,6,7,36 | 3,686.2 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.94
Volume: 1,463.4231 ft³
Weight: 131,708.08 lbs
Resisting Moment: 9,901,363.6 lbs-ft
Activating Moment: 5,124,830.4 lbs-ft
Resisting Force: 74,858.846 lbs
Activating Force: 38,618.62 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (744.21294, 3,251.2939) ft
Entry: (621, 3,290) ft
Radius: 122.69556 ft
Center: (713.87356, 3,370.1792) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 621.5 | 3,289.428 | -3,324.5554 | 20.308273 | 12.690017 | 40 |
| Slice 2 | 624.08955 | 3,286.6111 | -3,147.769 | 157.64881 | 98.509907 | 40 |
| Slice 3 | 628.26866 | 3,282.3299 | -2,878.9955 | 342.10259 | 213.76942 | 40 |
| Slice 4 | 632.44777 | 3,278.4391 | -2,634.579 | 500.46492 | 312.72519 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 5 | 636.62688 | 3,274.8906 | -2,411.5182 | 638.721 | 399.11718 | 40 |
| Slice 6 | 640.806 | 3,271.6471 | -2,207.4946 | 761.34322 | 475.74004 | 40 |
| Slice 7 | 644.98511 | 3,268.6794 | -2,020.6756 | 871.59652 | 544.63395 | 40 |
| Slice 8 | 649.16422 | 3,265.9638 | -1,849.5864 | 971.79879 | 607.24728 | 40 |
| Slice 9 | 653.34333 | 3,263.4809 | -1,693.0222 | 1,063.5266 | 664.5652 | 40 |
| Slice 10 | 657.52245 | 3,261.2149 | -1,549.9875 | 1,147.7579 | 717.19873 | 40 |
| Slice 11 | 661.70156 | 3,259.1524 | -1,419.6518 | 1,224.9587 | 765.43915 | 40 |
| Slice 12 | 665.88067 | 3,257.2822 | -1,301.3178 | 1,295.122 | 809.28205 | 40 |
| Slice 13 | 670.05978 | 3,255.5949 | -1,194.3965 | 1,357.7769 | 848.43316 | 40 |
| Slice 14 | 674.2389 | 3,254.0826 | -1,098.3896 | 1,411.9859 | 882.30671 | 40 |
| Slice 15 | 678.41801 | 3,252.7384 | -1,012.8747 | 1,456.353 | 910.03034 | 40 |
| Slice 16 | 682.59712 | 3,251.5566 | -937.49443 | 1,489.0579 | 930.46667 | 40 |
| Slice 17 | 686.77623 | 3,250.5324 | -871.94819 | 1,507.9283 | 942.25821 | 40 |
| Slice 18 | 691.72987 | 3,249.5335 | -807.67394 | 1,493.5129 | 848.4334 | 0 |
| Slice 19 | 696.88744 | 3,248.6872 | -752.84031 | 1,471.6922 | 836.03752 | 0 |
| Slice 20 | 701.47439 | 3,248.1335 | -716.49302 | 1,430.2993 | 812.52308 | 0 |
| Slice 21 | 706.06135 | 3,247.7542 | -691.02197 | 1,361.8341 | 773.62942 | 0 |
| Slice 22 | 710.5073 | 3,247.5487 | -676.45831 | 1,263.3411 | 717.67764 | 0 |
| Slice 23 | 714.81224 | 3,247.5061 | -672.10971 | 1,136.1938 | 645.44791 | 0 |
| Slice 24 | 719.11718 | 3,247.6147 | -677.19406 | 983.85863 | 558.90949 | 0 |
| Slice 25 | 723.42213 | 3,247.8748 | -691.73647 | 808.10244 | 459.06608 | 0 |
| Slice 26 | 727.72707 | 3,248.2875 | -715.79753 | 611.64913 | 347.46506 | 0 |
| Slice 27 | 732.03201 | 3,248.8543 | -749.47454 | 397.99333 | 226.09168 | 0 |
| Slice 28 | 734.31084 | 3,249.1978 | -770.0139 | 286.24858 | 162.61182 | 0 |
| Slice 29 | 736.53476 | 3,249.6134 | -795.07341 | 229.89062 | 130.59605 | 0 |
| Slice 30 | 741.42263 | 3,250.6507 | -857.88419 | 93.565331 | 58.466108 | 40 |

# Static Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 640
Date: 10/14/2016
Time: 3:26:45 PM
Tool Version: 8.15.1.11236
File Name: NN_G-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 3:26:46 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Existing Conditions - J-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bedrock

Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill- Loose

Model: Mohr-Coulomb
Unit Weight: 90 pcf

Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Sat**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 37 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (394.3946, 3,248.3971) ft
Left-Zone Right Coordinate: (474.00006, 3,258.8228) ft
Left-Zone Increment: 16
Right Projection: Range
Right-Zone Left Coordinate: (573.89076, 3,289.9459) ft
Right-Zone Right Coordinate: (623.99995, 3,289.3164) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (394, 3,248.396) ft
Right Coordinate: (836.15953, 3,249.0623) ft

## Piezometric Lines

### Piezometric Line 1

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 394 | 3,235 |
| Coordinate 2 | 598 | 3,236 |
| Coordinate 3 | 836.15953 | 3,237.4979 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 836.15953 | 3,249.0623 |
| Point 2 | 820.55228 | 3,249.4407 |

| | | |
|---|---|---|
| Point 3 | 818.77202 | 3,250.0592 |
| Point 4 | 410.79256 | 3,250.0592 |
| Point 5 | 401.78975 | 3,248.9526 |
| Point 6 | 400.96204 | 3,248.4152 |
| Point 7 | 394 | 3,248.396 |
| Point 8 | 394 | 3,234.4667 |
| Point 9 | 836.15953 | 3,234.4667 |
| Point 10 | 394 | 3,225.0592 |
| Point 11 | 836.15953 | 3,225.0592 |
| Point 12 | 394 | 3,200.0592 |
| Point 13 | 836.15953 | 3,200.0592 |
| Point 14 | 694.59396 | 3,265.1864 |
| Point 15 | 570.41346 | 3,288.2238 |
| Point 16 | 472.03587 | 3,258.2238 |
| Point 17 | 462.16728 | 3,256.3741 |
| Point 18 | 768.17471 | 3,250.0592 |
| Point 19 | 760.54809 | 3,250.3004 |
| Point 20 | 755.18493 | 3,250.3503 |
| Point 21 | 751.70406 | 3,250.7386 |
| Point 22 | 738.63233 | 3,251.7075 |
| Point 23 | 734.4372 | 3,251.9545 |
| Point 24 | 734.18448 | 3,251.9304 |
| Point 25 | 708.35483 | 3,260.7984 |
| Point 26 | 394 | 3,191.5 |
| Point 27 | 836.15953 | 3,192 |
| Point 28 | 574.00002 | 3,290 |
| Point 29 | 621.99999 | 3,290 |
| Point 30 | 394 | 3,238 |
| Point 31 | 836.15953 | 3,238 |
| Point 32 | 394 | 3,235 |
| Point 33 | 598 | 3,236 |
| Point 34 | 836.15953 | 3,237.4979 |
| Point 35 | 559.8418 | 3,285 |
| Point 36 | 394 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. | 9,8,10,11 | 4,159.6 |
| Region 2 | Native Clinker | 11,10,12,13 | 11,054 |
| Region 3 | Bottom Ash Fill | 14,29,28,15,35,16,17,4,18,19,20,21,22,23,24,25 | 6,936.6 |
| Region 4 | Bedrock | 12,26,27,13 | 3,674 |
| Region 5 | Bottom Ash Fill- Loose-Sat | 8,9,34,33,32 | 754.33 |
| Region 6 | Bottom Ash Fill- Loose | 31,1,2,3,18,4,5,6,7,30,32,33,34 | 6,109.3 |
| Region 7 | | 35,16,17,4,5,6,7,36 | 3,686.2 |

## Current Slip Surface

Slip Surface: 1,767
F of S: 3.22
Volume: 903.64841 ft³
Weight: 81,328.357 lbs
Resisting Moment: 10,467,977 lbs-ft
Activating Moment: 3,257,410.6 lbs-ft
Resisting Force: 68,605.858 lbs
Activating Force: 21,324.145 lbs
F of S Rank (Analysis): 1 of 1,989 slip surfaces
F of S Rank (Query): 1 of 1,989 slip surfaces
Exit: (469.11028, 3,257.6754) ft
Entry: (578.06439, 3,290) ft
Radius: 144.25124 ft
Center: (485.87588, 3,400.9491) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 470.57308 | 3,257.5194 | -1,381.7537 | 42.719181 | 35.845649 | 50 |
| Slice 2 | 473.86516 | 3,257.2105 | -1,361.4704 | 152.09804 | 127.62541 | 50 |
| Slice 3 | 477.52374 | 3,256.9515 | -1,344.1928 | 285.58735 | 239.63624 | 50 |
| Slice 4 | 481.18232 | 3,256.7858 | -1,332.7369 | 411.2512 | 345.08073 | 50 |
| Slice 5 | 484.8409 | 3,256.7132 | -1,327.0825 | 527.66242 | 442.76134 | 50 |
| Slice 6 | 488.49948 | 3,256.7333 | -1,327.2209 | 633.52261 | 531.58859 | 50 |
| Slice 7 | 492.15806 | 3,256.8463 | -1,333.1546 | 727.7478 | 610.65291 | 50 |
| Slice 8 | 495.81664 | 3,257.0525 | -1,344.8971 | 809.53254 | 679.27845 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 9 | 499.47522 | 3,257.3521 | -1,362.4736 | 878.38841 | 737.05539 | 50 |
| Slice 10 | 503.1338 | 3,257.7458 | -1,385.9206 | 934.15558 | 783.8496 | 50 |
| Slice 11 | 506.79238 | 3,258.2343 | -1,415.2868 | 976.98858 | 819.79076 | 50 |
| Slice 12 | 510.45096 | 3,258.8187 | -1,450.6332 | 1,007.3197 | 845.24162 | 50 |
| Slice 13 | 514.10954 | 3,259.5001 | -1,492.0341 | 1,025.8054 | 860.75292 | 50 |
| Slice 14 | 517.76813 | 3,260.28 | -1,539.5775 | 1,033.2612 | 867.00906 | 50 |
| Slice 15 | 521.42671 | 3,261.16 | -1,593.3663 | 1,030.5926 | 864.76989 | 50 |
| Slice 16 | 525.08529 | 3,262.1419 | -1,653.5192 | 1,018.7274 | 854.81378 | 50 |
| Slice 17 | 528.74387 | 3,263.228 | -1,720.1727 | 998.55373 | 837.88607 | 50 |
| Slice 18 | 532.40245 | 3,264.4208 | -1,793.4819 | 970.86865 | 814.65552 | 50 |
| Slice 19 | 536.06103 | 3,265.7231 | -1,873.6231 | 936.33742 | 785.68038 | 50 |
| Slice 20 | 539.71961 | 3,267.1381 | -1,960.7959 | 895.46376 | 751.38331 | 50 |
| Slice 21 | 543.37819 | 3,268.6694 | -2,055.2263 | 848.56878 | 712.03375 | 50 |
| Slice 22 | 547.03677 | 3,270.321 | -2,157.1697 | 795.77526 | 667.73472 | 50 |
| Slice 23 | 550.69535 | 3,272.0978 | -2,266.9154 | 736.99332 | 618.41082 | 50 |
| Slice 24 | 554.35393 | 3,274.0048 | -2,384.7914 | 671.9034 | 563.7939 | 50 |
| Slice 25 | 558.01251 | 3,276.0481 | -2,511.1704 | 599.9333 | 503.40381 | 50 |
| Slice 26 | 561.60374 | 3,278.1915 | -2,643.8189 | 521.8718 | 437.90244 | 50 |
| Slice 27 | 565.12763 | 3,280.4371 | -2,782.8645 | 436.86831 | 366.57603 | 50 |
| Slice 28 | 568.65152 | 3,282.8306 | -2,931.1338 | 342.25631 | 287.18714 | 50 |
| Slice 29 | 572.20674 | 3,285.4052 | -3,090.6992 | 260.52679 | 218.60793 | 50 |
| Slice 30 | 576.0322 | 3,288.3725 | -3,274.6871 | 109.30807 | 91.720359 | 50 |

# Seismic Safety Factor: Existing Conditions – J Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 640
Date: 10/14/2016
Time: 3:26:45 PM
Tool Version: 8.15.1.11236
File Name: NN_G-J_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 3:26:48 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor: Existing Conditions - J-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: B1 Static Safety Factor: Existing Conditions - J-Cell [(last)]

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bedrock
Model: Bedrock (Impenetrable)
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Native Clinker - Seismic
Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Seismic**

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 0 psf
Phi': 29.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill- Loose-Seismic-Sat**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 29.6 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits

Left Coordinate: (394, 3,248.396) ft
Right Coordinate: (836.15953, 3,249.0623) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 394 | 3,235 |
| Coordinate 2 | 598 | 3,236 |
| Coordinate 3 | 836.15953 | 3,237.4979 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 836.15953 | 3,249.0623 |
| Point 2 | 820.55228 | 3,249.4407 |
| Point 3 | 818.77202 | 3,250.0592 |
| Point 4 | 410.79256 | 3,250.0592 |
| Point 5 | 401.78975 | 3,248.9526 |
| Point 6 | 400.96204 | 3,248.4152 |

| | | |
|---|---|---|
| Point 7 | 394 | 3,248.396 |
| Point 8 | 394 | 3,234.4667 |
| Point 9 | 836.15953 | 3,234.4667 |
| Point 10 | 394 | 3,225.0592 |
| Point 11 | 836.15953 | 3,225.0592 |
| Point 12 | 394 | 3,200.0592 |
| Point 13 | 836.15953 | 3,200.0592 |
| Point 14 | 694.59396 | 3,265.1864 |
| Point 15 | 570.41346 | 3,288.2238 |
| Point 16 | 472.03587 | 3,258.2238 |
| Point 17 | 462.16728 | 3,256.3741 |
| Point 18 | 768.17471 | 3,250.0592 |
| Point 19 | 760.54809 | 3,250.3004 |
| Point 20 | 755.18493 | 3,250.3503 |
| Point 21 | 751.70406 | 3,250.7386 |
| Point 22 | 738.63233 | 3,251.7075 |
| Point 23 | 734.4372 | 3,251.9545 |
| Point 24 | 734.18448 | 3,251.9304 |
| Point 25 | 708.35483 | 3,260.7984 |
| Point 26 | 394 | 3,191.5 |
| Point 27 | 836.15953 | 3,192 |
| Point 28 | 574.00002 | 3,290 |
| Point 29 | 621.99999 | 3,290 |
| Point 30 | 394 | 3,238 |
| Point 31 | 836.15953 | 3,238 |
| Point 32 | 394 | 3,235 |
| Point 33 | 598 | 3,236 |
| Point 34 | 836.15953 | 3,237.4979 |
| Point 35 | 559.8418 | 3,285 |
| Point 36 | 394 | 3,285 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. - Seismic | 9,8,10,11 | 4,159.6 |

| | | | |
|---|---|---|---|
| Region 2 | Native Clinker - Seismic | 11,10,12,13 | 11,054 |
| Region 3 | Bottom Ash Fill - Seismic | 14,29,28,15,35,16,17,4,18,19,20,21, 22,23,24,25 | 6,936.6 |
| Region 4 | Bedrock | 12,26,27,13 | 3,674 |
| Region 5 | Bottom Ash Fill- Loose-Seismic-Sat | 8,9,34,33,32 | 754.33 |
| Region 6 | Bottom Ash Fill- Loose-Seismic | 31,1,2,3,18,4,5,6,7,30,32,33,34 | 6,109.3 |
| Region 7 | | 35,16,17,4,5,6,7,36 | 3,686.2 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.18
Volume: 903.64842 ft³
Weight: 81,328.357 lbs
Resisting Moment: 7,785,136.2 lbs-ft
Activating Moment: 3,577,552.1 lbs-ft
Resisting Force: 51,043.283 lbs
Activating Force: 23,464.334 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (469.11028, 3,257.6754) ft
Entry: (578.06439, 3,290) ft
Radius: 144.25124 ft
Center: (485.87588, 3,400.9491) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 470.57308 | 3,257.5194 | -1,381.7537 | 43.397741 | 27.117918 | 40 |
| Slice 2 | 473.86516 | 3,257.2105 | -1,361.4704 | 153.58658 | 95.971547 | 40 |
| Slice 3 | 477.52374 | 3,256.9515 | -1,344.1928 | 287.99162 | 179.95713 | 40 |
| Slice 4 | 481.18232 | 3,256.7858 | -1,332.7369 | 414.44726 | 258.97539 | 40 |
| Slice 5 | 484.8409 | 3,256.7132 | -1,327.0825 | 531.43498 | 332.07743 | 40 |
| Slice 6 | 488.49948 | 3,256.7333 | -1,327.2209 | 637.57668 | 398.40213 | 40 |
| Slice 7 | 492.15806 | 3,256.8463 | -1,333.1546 | 731.72958 | 457.23539 | 40 |
| Slice 8 | 495.81664 | 3,257.0525 | -1,344.8971 | 813.05538 | 508.05339 | 40 |
| Slice 9 | 499.47522 | 3,257.3521 | -1,362.4735 | 881.0623 | 550.54883 | 40 |
| Slice 10 | 503.1338 | 3,257.7458 | -1,385.9206 | 935.6173 | 584.63857 | 40 |
| Slice 11 | 506.79238 | 3,258.2343 | -1,415.2868 | 976.92799 | 610.45236 | 40 |
| Slice 12 | 510.45096 | 3,258.8187 | -1,450.6332 | 1,005.5015 | 628.30707 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 13 | 514.10954 | 3,259.5002 | -1,492.0341 | 1,022.0844 | 638.66922 | 40 |
| Slice 14 | 517.76813 | 3,260.28 | -1,539.5775 | 1,027.59 | 642.1095 | 40 |
| Slice 15 | 521.42671 | 3,261.16 | -1,593.3663 | 1,023.0199 | 639.25377 | 40 |
| Slice 16 | 525.08529 | 3,262.1419 | -1,653.5192 | 1,009.3926 | 630.73851 | 40 |
| Slice 17 | 528.74387 | 3,263.228 | -1,720.1727 | 987.67252 | 617.16629 | 40 |
| Slice 18 | 532.40245 | 3,264.4208 | -1,793.4819 | 958.71791 | 599.07344 | 40 |
| Slice 19 | 536.06103 | 3,265.7231 | -1,873.623 | 923.2357 | 576.90169 | 40 |
| Slice 20 | 539.71961 | 3,267.1381 | -1,960.7959 | 881.75422 | 550.98119 | 40 |
| Slice 21 | 543.37819 | 3,268.6694 | -2,055.2263 | 834.60209 | 521.51727 | 40 |
| Slice 22 | 547.03677 | 3,270.321 | -2,157.1697 | 781.89598 | 488.58283 | 40 |
| Slice 23 | 550.69535 | 3,272.0978 | -2,266.9154 | 723.53011 | 452.11179 | 40 |
| Slice 24 | 554.35393 | 3,274.0048 | -2,384.7913 | 659.16214 | 411.89022 | 40 |
| Slice 25 | 558.01251 | 3,276.0481 | -2,511.1704 | 588.19358 | 367.54414 | 40 |
| Slice 26 | 561.60374 | 3,278.1915 | -2,643.8189 | 511.35946 | 319.53285 | 40 |
| Slice 27 | 565.12763 | 3,280.4371 | -2,782.8645 | 427.77358 | 267.3026 | 40 |
| Slice 28 | 568.65152 | 3,282.8306 | -2,931.1338 | 334.76641 | 209.18527 | 40 |
| Slice 29 | 572.20674 | 3,285.4052 | -3,090.6992 | 254.39477 | 158.9635 | 40 |
| Slice 30 | 576.0322 | 3,288.3725 | -3,274.6871 | 105.64398 | 66.013686 | 40 |

# Static Safety Factor: Existing Conditions – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 653
Date: 10/14/2016
Time: 4:08:57 PM
Tool Version: 8.15.1.11236
File Name: OO_C-G_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:08:58 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bottom Ash Fill - Sat.**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (247.45755, 3,284.9997) ft
Left-Zone Right Coordinate: (309, 3,286) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (335.4, 3,268) ft
Right-Zone Right Coordinate: (409.57143, 3,246) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (0, 3,283) ft
Right Coordinate: (700, 3,244) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237.5 |
| Coordinate 2 | 700 | 3,237.5 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 0 | 3,190.579 |
| Point 2 | 0 | 3,153.1 |
| Point 3 | 700 | 3,153.1 |
| Point 4 | 700 | 3,208 |
| Point 5 | 586.10047 | 3,208 |
| Point 6 | 190.81409 | 3,195.9064 |
| Point 7 | 215.41547 | 3,208.2984 |
| Point 8 | 420.3232 | 3,216 |
| Point 9 | 546.5 | 3,223.6 |
| Point 10 | 528 | 3,236 |
| Point 11 | 700 | 3,232 |
| Point 12 | 458 | 3,236 |
| Point 13 | 393 | 3,254 |
| Point 14 | 353 | 3,256 |
| Point 15 | 190.5 | 3,256 |
| Point 16 | 129.25 | 3,220 |
| Point 17 | 83 | 3,193 |
| Point 18 | 0 | 3,220 |
| Point 19 | 427.07472 | 3,208 |
| Point 20 | 309 | 3,286 |
| Point 21 | 384.9 | 3,236 |
| Point 22 | 207 | 3,264 |
| Point 23 | 228 | 3,272 |
| Point 24 | 245 | 3,284 |
| Point 25 | 250 | 3,286 |

| | | |
|---|---|---|
| Point 26 | 422 | 3,240 |
| Point 27 | 447 | 3,240 |
| Point 28 | 409.57143 | 3,246 |
| Point 29 | 700 | 3,244 |
| Point 30 | 0 | 3,268 |
| Point 31 | 700 | 3,237.5 |
| Point 32 | 0 | 3,237.5 |
| Point 33 | 453.875 | 3,237.5 |
| Point 34 | 382.5075 | 3,237.5 |
| Point 35 | 159.02431 | 3,237.5 |
| Point 36 | 247.5 | 3,285 |
| Point 37 | 0 | 3,283 |

## Regions

| | Material | Points | Area ($ft^2$) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,2,3,4,5,19,6 | 34,185 |
| Region 2 | Fly Ash Slurry - Sat. | 6,7,8,9,11,4,5,19 | 6,661.9 |
| Region 3 | Clinker Fill | 9,8,21,12,10 | 2,283.6 |
| Region 4 | Bottom Ash Fill - Sat. | 12,33,34,21 | 108.35 |
| Region 5 | Bottom Ash Fill - Sat. | 8,21,34,35,16,17,6,7 | 8,603 |
| Region 6 | Paste - Sat. | 18,16,35,32 | 2,522.4 |
| Region 7 | Fly Ash Slurry - Sat. | 16,17,1,18 | 2,965.8 |
| Region 8 | Paste | 28,26,27,33,31,29 | 2,038.8 |
| Region 9 | Paste - Sat. | 12,10,9,11,31,33 | 1,739.5 |
| Region 10 | Bottom Ash Fill | 27,26,28,13,14,34,33 | 773.65 |
| Region 11 | Bottom Ash Fill | 14,20,25,36,24,23,22,15,35,34 | 6,837.3 |
| Region 12 | Paste | 32,35,15,22,23,24,36,37,30 | 9,399.8 |

## Current Slip Surface

Slip Surface: 1,345
F of S: 1.64
Volume: 281.4465 $ft^3$
Weight: 25,330.185 lbs
Resisting Moment: 1,704,636.2 lbs-ft
Activating Moment: 1,041,252.3 lbs-ft
Resisting Force: 18,196.327 lbs
Activating Force: 11,088.596 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces

F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (352.70878, 3,256.1986) ft
Entry: (303.85541, 3,286) ft
Radius: 79.360724 ft
Center: (366.83118, 3,334.2926) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 304.71284 | 3,284.9212 | -2,959.0825 | 35.867222 | 30.096172 | 50 |
| Slice 2 | 306.42771 | 3,282.8359 | -2,828.9587 | 148.30746 | 124.44473 | 50 |
| Slice 3 | 308.14257 | 3,280.8871 | -2,707.3559 | 250.39418 | 210.10567 | 50 |
| Slice 4 | 309.80942 | 3,279.1085 | -2,596.3695 | 314.05778 | 263.52576 | 50 |
| Slice 5 | 311.42827 | 3,277.4827 | -2,494.9227 | 342.07482 | 287.03486 | 50 |
| Slice 6 | 313.04711 | 3,275.9472 | -2,399.1064 | 368.02431 | 308.80907 | 50 |
| Slice 7 | 314.66595 | 3,274.495 | -2,308.4858 | 392.43316 | 329.29052 | 50 |
| Slice 8 | 316.2848 | 3,273.12 | -2,222.6904 | 415.60499 | 348.73399 | 50 |
| Slice 9 | 317.90364 | 3,271.8173 | -2,141.4008 | 437.68329 | 367.25989 | 50 |
| Slice 10 | 319.52248 | 3,270.5824 | -2,064.3404 | 458.69201 | 384.8883 | 50 |
| Slice 11 | 321.14133 | 3,269.4113 | -1,991.2672 | 478.55431 | 401.55474 | 50 |
| Slice 12 | 322.76017 | 3,268.3008 | -1,921.9687 | 497.09359 | 417.11105 | 50 |
| Slice 13 | 324.37901 | 3,267.2477 | -1,856.2571 | 514.02341 | 431.31685 | 50 |
| Slice 14 | 325.99786 | 3,266.2495 | -1,793.9658 | 528.93379 | 443.82814 | 50 |
| Slice 15 | 327.6167 | 3,265.3036 | -1,734.946 | 541.28213 | 454.18964 | 50 |
| Slice 16 | 329.23554 | 3,264.4081 | -1,679.0648 | 550.39536 | 461.83654 | 50 |
| Slice 17 | 330.85439 | 3,263.5609 | -1,626.2029 | 555.48827 | 466.11001 | 50 |
| Slice 18 | 332.47323 | 3,262.7605 | -1,576.253 | 555.70049 | 466.28807 | 50 |
| Slice 19 | 334.09207 | 3,262.0051 | -1,529.1182 | 550.15117 | 461.63164 | 50 |
| Slice 20 | 335.71092 | 3,261.2934 | -1,484.7111 | 538.00803 | 451.44234 | 50 |
| Slice 21 | 337.32976 | 3,260.6242 | -1,442.9526 | 518.5643 | 435.12711 | 50 |
| Slice 22 | 338.94861 | 3,259.9963 | -1,403.771 | 491.3157 | 412.26282 | 50 |
| Slice 23 | 340.56745 | 3,259.4087 | -1,367.1015 | 456.02827 | 382.65316 | 50 |
| Slice 24 | 342.18629 | 3,258.8603 | -1,332.8853 | 412.78833 | 346.37053 | 50 |
| Slice 25 | 343.80514 | 3,258.3505 | -1,301.0694 | 362.02669 | 303.77646 | 50 |
| Slice 26 | 345.42398 | 3,257.8783 | -1,271.6055 | 304.51199 | 255.5159 | 50 |
| Slice 27 | 347.04282 | 3,257.4431 | -1,244.4504 | 241.3107 | 202.48372 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 28 | 348.66167 | 3,257.0443 | -1,219.5649 | 173.71499 | 145.76419 | 50 |
| Slice 29 | 350.28051 | 3,256.6813 | -1,196.9141 | 103.14376 | 86.547892 | 50 |
| Slice 30 | 351.89935 | 3,256.3536 | -1,176.4668 | 31.024954 | 26.033028 | 50 |

# Seismic Safety Factor: Existing Conditions – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 653
Date: 10/14/2016
Time: 4:08:57 PM
Tool Version: 8.15.1.11236
File Name: OO_C-G_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:08:58 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Apply Phreatic Correction: Yes
- Use Staged Rapid Drawdown: No
- Initial Slip Surface Source: Other GeoStudio Analysis
- Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - G-Cell [(last)]

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Critical Slip Surfaces from Other
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Sat.

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Sat. - Seismic

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits
Left Coordinate: (0, 3,283) ft
Right Coordinate: (700, 3,244) ft

## Piezometric Lines
### Piezometric Line 1
**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 0 | 3,237.5 |
| Coordinate 2 | 700 | 3,237.5 |

## Seismic Coefficients
Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 0 | 3,190.579 |
| Point 2 | 0 | 3,153.1 |
| Point 3 | 700 | 3,153.1 |
| Point 4 | 700 | 3,208 |
| Point 5 | 586.10047 | 3,208 |
| Point 6 | 190.81409 | 3,195.9064 |
| Point 7 | 215.41547 | 3,208.2984 |
| Point 8 | 420.3232 | 3,216 |
| Point 9 | 546.5 | 3,223.6 |
| Point 10 | 528 | 3,236 |
| Point 11 | 700 | 3,232 |
| Point 12 | 458 | 3,236 |
| Point 13 | 393 | 3,254 |
| Point 14 | 353 | 3,256 |
| Point 15 | 190.5 | 3,256 |
| Point 16 | 129.25 | 3,220 |
| Point 17 | 83 | 3,193 |
| Point 18 | 0 | 3,220 |
| Point 19 | 427.07472 | 3,208 |
| Point 20 | 309 | 3,286 |
| Point 21 | 384.9 | 3,236 |
| Point 22 | 207 | 3,264 |
| Point 23 | 228 | 3,272 |
| Point 24 | 245 | 3,284 |
| Point 25 | 250 | 3,286 |
| Point 26 | 422 | 3,240 |
| Point 27 | 447 | 3,240 |
| Point 28 | 409.57143 | 3,246 |
| Point 29 | 700 | 3,244 |
| Point 30 | 0 | 3,268 |
| Point 31 | 700 | 3,237.5 |
| Point 32 | 0 | 3,237.5 |
| Point 33 | 453.875 | 3,237.5 |

| | | |
|---|---|---|
| Point 34 | 382.5075 | 3,237.5 |
| Point 35 | 159.02431 | 3,237.5 |
| Point 36 | 247.5 | 3,285 |
| Point 37 | 0 | 3,283 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil - Seismic | 1,2,3,4,5,19,6 | 34,185 |
| Region 2 | Fly Ash Slurry - Sat. - Seismic | 6,7,8,9,11,4,5,19 | 6,661.9 |
| Region 3 | Clinker Fill | 9,8,21,12,10 | 2,283.6 |
| Region 4 | Bottom Ash Fill - Sat. | 12,33,34,21 | 108.35 |
| Region 5 | Bottom Ash Fill - Sat. | 8,21,34,35,16,17,6,7 | 8,603 |
| Region 6 | Paste - Sat. - Seismic | 18,16,35,32 | 2,522.4 |
| Region 7 | Fly Ash Slurry - Sat. - Seismic | 16,17,1,18 | 2,965.8 |
| Region 8 | Paste - Seismic | 28,26,27,33,31,29 | 2,038.8 |
| Region 9 | Paste - Sat. - Seismic | 12,10,9,11,31,33 | 1,739.5 |
| Region 10 | Bottom Ash Fill | 27,26,28,13,14,34,33 | 773.65 |
| Region 11 | Bottom Ash Fill | 14,20,25,36,24,23,22,15,35,34 | 6,837.3 |
| Region 12 | Paste - Seismic | 32,35,15,22,23,24,36,37,30 | 9,399.8 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.54
Volume: 281.4465 ft³
Weight: 25,330.185 lbs
Resisting Moment: 1,680,898.1 lbs-ft
Activating Moment: 1,089,255.9 lbs-ft
Resisting Force: 17,960.334 lbs
Activating Force: 11,634.863 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (352.70878, 3,256.1986) ft
Entry: (303.85541, 3,286) ft
Radius: 79.360724 ft
Center: (366.83118, 3,334.2926) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 304.71284 | 3,284.9212 | -2,959.0825 | 33.742425 | 28.313256 | 50 |
| Slice 2 | 306.42771 | 3,282.8359 | -2,828.9587 | 143.7093 | 120.58642 | 50 |
| Slice 3 | 308.14257 | 3,280.8871 | -2,707.3559 | 243.40579 | 204.24171 | 50 |
| Slice 4 | 309.80942 | 3,279.1085 | -2,596.3695 | 305.46863 | 256.31861 | 50 |
| Slice 5 | 311.42827 | 3,277.4827 | -2,494.9227 | 332.68435 | 279.15531 | 50 |
| Slice 6 | 313.04711 | 3,275.9472 | -2,399.1064 | 357.87725 | 300.29467 | 50 |
| Slice 7 | 314.66595 | 3,274.495 | -2,308.4858 | 381.5975 | 320.19832 | 50 |
| Slice 8 | 316.2848 | 3,273.12 | -2,222.6904 | 404.18203 | 339.14899 | 50 |
| Slice 9 | 317.90364 | 3,271.8173 | -2,141.4008 | 425.81136 | 357.29816 | 50 |
| Slice 10 | 319.52248 | 3,270.5824 | -2,064.3404 | 446.54911 | 374.69919 | 50 |
| Slice 11 | 321.14133 | 3,269.4113 | -1,991.2671 | 466.35363 | 391.31716 | 50 |
| Slice 12 | 322.76017 | 3,268.3008 | -1,921.9687 | 485.07631 | 407.02736 | 50 |
| Slice 13 | 324.37901 | 3,267.2477 | -1,856.2571 | 502.44628 | 421.60249 | 50 |
| Slice 14 | 325.99786 | 3,266.2495 | -1,793.9658 | 518.05417 | 434.69906 | 50 |
| Slice 15 | 327.6167 | 3,265.3036 | -1,734.946 | 531.34205 | 445.84892 | 50 |
| Slice 16 | 329.23554 | 3,264.4081 | -1,679.0648 | 541.60269 | 454.45862 | 50 |
| Slice 17 | 330.85439 | 3,263.5609 | -1,626.2029 | 548.00197 | 459.82825 | 50 |
| Slice 18 | 332.47323 | 3,262.7605 | -1,576.253 | 549.61749 | 461.18383 | 50 |
| Slice 19 | 334.09207 | 3,262.0051 | -1,529.1182 | 545.49739 | 457.72666 | 50 |
| Slice 20 | 335.71092 | 3,261.2934 | -1,484.7111 | 534.73654 | 448.69723 | 50 |
| Slice 21 | 337.32976 | 3,260.6242 | -1,442.9526 | 516.55873 | 433.44424 | 50 |
| Slice 22 | 338.94861 | 3,259.9963 | -1,403.771 | 490.39931 | 411.49388 | 50 |
| Slice 23 | 340.56745 | 3,259.4087 | -1,367.1015 | 455.97898 | 382.61179 | 50 |
| Slice 24 | 342.18629 | 3,258.8603 | -1,332.8853 | 413.35827 | 346.84877 | 50 |
| Slice 25 | 343.80514 | 3,258.3505 | -1,301.0694 | 362.96142 | 304.5608 | 50 |
| Slice 26 | 345.42398 | 3,257.8783 | -1,271.6055 | 305.5716 | 256.40502 | 50 |
| Slice 27 | 347.04282 | 3,257.4431 | -1,244.4504 | 242.28752 | 203.30337 | 50 |
| Slice 28 | 348.66167 | 3,257.0443 | -1,219.5649 | 174.44592 | 146.37751 | 50 |
| Slice 29 | 350.28051 | 3,256.6813 | -1,196.9141 | 103.51604 | 86.860275 | 50 |
| Slice 30 | 351.89935 | 3,256.3536 | -1,176.4668 | 30.974334 | 25.990553 | 50 |

# Static Safety Factor: Existing Conditons – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 646
Date: 10/14/2016
Time: 4:18:25 PM
Tool Version: 8.15.1.11236
File Name: PP_C-G_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:18:26 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Maximum Storage Pool - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

**Paste - Sat.**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat.**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Bottom Ash Fill**
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Clinker Fill**
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

**Bottom Ash Fill - Sat.**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste**

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry**

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (295.12651, 3,285) ft
Left-Zone Right Coordinate: (348, 3,286) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (378.47681, 3,266.5085) ft
Right-Zone Right Coordinate: (446.9625, 3,242) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (170, 3,283) ft
Right Coordinate: (615, 3,242) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 170 | 3,237.5 |
| Coordinate 2 | 615 | 3,237.5 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 200.57104 | 3,214.0088 |
| Point 2 | 244.57219 | 3,249.7303 |
| Point 3 | 170 | 3,215.3828 |
| Point 4 | 294.98539 | 3,224.4936 |
| Point 5 | 265.39117 | 3,215.0964 |
| Point 6 | 405.10151 | 3,211.2347 |
| Point 7 | 431.27343 | 3,210.6368 |
| Point 8 | 615 | 3,210.5411 |
| Point 9 | 615 | 3,220.0788 |
| Point 10 | 413.23139 | 3,220.1062 |
| Point 11 | 479 | 3,236 |
| Point 12 | 470.5 | 3,240 |
| Point 13 | 394.8 | 3,256 |
| Point 14 | 423.6 | 3,256 |
| Point 15 | 450.3 | 3,240 |
| Point 16 | 615 | 3,200 |
| Point 17 | 275.72342 | 3,273.4056 |
| Point 18 | 296.8 | 3,286 |
| Point 19 | 348.2 | 3,286 |
| Point 20 | 304.9 | 3,286 |
| Point 21 | 326.4 | 3,286 |
| Point 22 | 433.6987 | 3,234.5 |

| | | |
|---|---|---|
| Point 23 | 556.11746 | 3,232.1013 |
| Point 24 | 550 | 3,236 |
| Point 25 | 496.94054 | 3,232.9999 |
| Point 26 | 422.87313 | 3,240 |
| Point 27 | 226.50215 | 3,249.3913 |
| Point 28 | 170 | 3,200 |
| Point 29 | 170 | 3,248.3313 |
| Point 30 | 295.12651 | 3,285 |
| Point 31 | 170 | 3,283 |
| Point 32 | 446.9625 | 3,242 |
| Point 33 | 615 | 3,242 |
| Point 34 | 170 | 3,237.5 |
| Point 35 | 615 | 3,237.5 |
| Point 36 | 229.50711 | 3,237.5 |
| Point 37 | 427.79384 | 3,237.5 |
| Point 38 | 475.8125 | 3,237.5 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. | 1,36,34,3 | 1,037 |
| Region 2 | Fly Ash Slurry - Sat. | 4,5,6,7,8,9,10 | 3,205.7 |
| Region 3 | Foundation Soil | 8,16,28,3,1,5,6,7 | 5,463.6 |
| Region 4 | Bottom Ash Fill | 2,17,30,18,19,13,14,32,15,26,37,36 | 6,536.1 |
| Region 5 | Paste - Sat. | 11,24,23,25,22,10,9,35,38 | 2,903.5 |
| Region 6 | Clinker Fill | 26,15,12,38,37 | 119.56 |
| Region 7 | Paste | 29,27,2,17,30,31 | 3,399.6 |
| Region 8 | Fly Ash Slurry | 2,27,29,34,36 | 767.75 |
| Region 9 | Bottom Ash Fill - Sat. | 22,10,4,5,1,36,37 | 3,668.7 |
| Region 10 | Clinker Fill | 11,24,23,25,22,37,38 | 408.92 |
| Region 11 | Paste | 33,32,15,12,38,35 | 687.35 |

## Current Slip Surface

Slip Surface: 1,317
F of S: 1.71
Volume: 251.30023 ft³
Weight: 22,617.02 lbs
Resisting Moment: 1,872,326.9 lbs-ft

Activating Moment: 1,096,502.2 lbs-ft
Resisting Force: 16,771.446 lbs
Activating Force: 9,807.81 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (394.33677, 3,256.2982) ft
Entry: (343.57087, 3,286) ft
Radius: 95.55138 ft
Center: (414.86423, 3,349.6186) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 344.3424 | 3,285.156 | -2,973.7319 | 29.128378 | 24.441611 | 50 |
| Slice 2 | 345.88544 | 3,283.5069 | -2,870.8329 | 124.85976 | 104.76978 | 50 |
| Slice 3 | 347.42848 | 3,281.9333 | -2,772.6367 | 213.42754 | 179.08697 | 50 |
| Slice 4 | 349.05438 | 3,280.3528 | -2,674.0177 | 270.02941 | 226.58158 | 50 |
| Slice 5 | 350.76315 | 3,278.7681 | -2,575.1293 | 296.48455 | 248.78008 | 50 |
| Slice 6 | 352.47192 | 3,277.2584 | -2,480.925 | 320.57366 | 268.99324 | 50 |
| Slice 7 | 354.18069 | 3,275.8192 | -2,391.117 | 342.81012 | 287.65184 | 50 |
| Slice 8 | 355.88946 | 3,274.4464 | -2,305.4524 | 363.51434 | 305.02475 | 50 |
| Slice 9 | 357.59823 | 3,273.1363 | -2,223.7078 | 382.85901 | 321.25686 | 50 |
| Slice 10 | 359.307 | 3,271.886 | -2,145.6849 | 400.90227 | 336.39694 | 50 |
| Slice 11 | 361.01577 | 3,270.6924 | -2,071.2065 | 417.60765 | 350.41442 | 50 |
| Slice 12 | 362.72454 | 3,269.5531 | -2,000.114 | 432.85207 | 363.20602 | 50 |
| Slice 13 | 364.43331 | 3,268.4658 | -1,932.2648 | 446.42509 | 374.59512 | 50 |
| Slice 14 | 366.14208 | 3,267.4284 | -1,867.5298 | 458.02405 | 384.32782 | 50 |
| Slice 15 | 367.85085 | 3,266.439 | -1,805.7926 | 467.25049 | 392.06972 | 50 |
| Slice 16 | 369.55962 | 3,265.496 | -1,746.9473 | 473.61236 | 397.40795 | 50 |
| Slice 17 | 371.26838 | 3,264.5977 | -1,690.8976 | 476.53617 | 399.86132 | 50 |
| Slice 18 | 372.97715 | 3,263.7429 | -1,637.5557 | 475.3912 | 398.90058 | 50 |
| Slice 19 | 374.68592 | 3,262.9302 | -1,586.8415 | 469.526 | 393.9791 | 50 |
| Slice 20 | 376.39469 | 3,262.1584 | -1,538.6817 | 458.31543 | 384.57231 | 50 |
| Slice 21 | 378.10346 | 3,261.4264 | -1,493.0091 | 441.21446 | 370.22289 | 50 |
| Slice 22 | 379.81223 | 3,260.7334 | -1,449.7623 | 417.81356 | 350.5872 | 50 |
| Slice 23 | 381.521 | 3,260.0783 | -1,408.885 | 387.88945 | 325.4779 | 50 |
| Slice 24 | 383.22977 | 3,259.4603 | -1,370.3254 | 351.44498 | 294.89735 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 25 | 384.93854 | 3,258.8788 | -1,334.0362 | 308.73226 | 259.05712 | 50 |
| Slice 26 | 386.64731 | 3,258.3329 | -1,299.974 | 260.25495 | 218.37983 | 50 |
| Slice 27 | 388.35608 | 3,257.8221 | -1,268.099 | 206.74709 | 173.48141 | 50 |
| Slice 28 | 390.06485 | 3,257.3458 | -1,238.375 | 149.12883 | 125.13394 | 50 |
| Slice 29 | 391.77362 | 3,256.9033 | -1,210.7686 | 88.441494 | 74.211225 | 50 |
| Slice 30 | 393.48238 | 3,256.4944 | -1,185.2499 | 25.767485 | 21.621487 | 50 |

# Seismic Safety Factor: Existing Conditions – G Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 646
Date: 10/14/2016
Time: 4:18:25 PM
Tool Version: 8.15.1.11236
File Name: PP_C-G_2016-10-13.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:19:08 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - G-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: Yes
Use Staged Rapid Drawdown: No
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Maximum Storage Pool - G-Cell [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Bottom Ash Fill - Sat. - Seismic

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Clinker Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Fly Ash Slurry - Seismic

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 560 psf
Phi': 22.4 °

Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Fly Ash Slurry - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Seismic**
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Paste - Sat. - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

**Foundation Soil - Seismic**
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 22.4 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Limits
Left Coordinate: (170, 3,283) ft
Right Coordinate: (615, 3,242) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | 170 | 3,237.5 |
| Coordinate 2 | 615 | 3,237.5 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 200.57104 | 3,214.0088 |
| Point 2 | 244.57219 | 3,249.7303 |
| Point 3 | 170 | 3,215.3828 |
| Point 4 | 294.98539 | 3,224.4936 |
| Point 5 | 265.39117 | 3,215.0964 |
| Point 6 | 405.10151 | 3,211.2347 |
| Point 7 | 431.27343 | 3,210.6368 |
| Point 8 | 615 | 3,210.5411 |
| Point 9 | 615 | 3,220.0788 |
| Point 10 | 413.23139 | 3,220.1062 |
| Point 11 | 479 | 3,236 |
| Point 12 | 470.5 | 3,240 |
| Point 13 | 394.8 | 3,256 |
| Point 14 | 423.6 | 3,256 |
| Point 15 | 450.3 | 3,240 |
| Point 16 | 615 | 3,200 |
| Point 17 | 275.72342 | 3,273.4056 |
| Point 18 | 296.8 | 3,286 |
| Point 19 | 348.2 | 3,286 |
| Point 20 | 304.9 | 3,286 |
| Point 21 | 326.4 | 3,286 |
| Point 22 | 433.6987 | 3,234.5 |
| Point 23 | 556.11746 | 3,232.1013 |

| | | |
|---|---|---|
| Point 24 | 550 | 3,236 |
| Point 25 | 496.94054 | 3,232.9999 |
| Point 26 | 422.87313 | 3,240 |
| Point 27 | 226.50215 | 3,249.3913 |
| Point 28 | 170 | 3,200 |
| Point 29 | 170 | 3,248.3313 |
| Point 30 | 295.12651 | 3,285 |
| Point 31 | 170 | 3,283 |
| Point 32 | 446.9625 | 3,242 |
| Point 33 | 615 | 3,242 |
| Point 34 | 170 | 3,237.5 |
| Point 35 | 615 | 3,237.5 |
| Point 36 | 229.50711 | 3,237.5 |
| Point 37 | 427.79384 | 3,237.5 |
| Point 38 | 475.8125 | 3,237.5 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Fly Ash Slurry - Sat. - Seismic | 1,36,34,3 | 1,037 |
| Region 2 | Fly Ash Slurry - Sat. - Seismic | 4,5,6,7,8,9,10 | 3,205.7 |
| Region 3 | Foundation Soil - Seismic | 8,16,28,3,1,5,6,7 | 5,463.6 |
| Region 4 | Bottom Ash Fill - Seismic | 2,17,30,18,19,13,14,32,15,26,37,36 | 6,536.1 |
| Region 5 | Paste - Sat. - Seismic | 11,24,23,25,22,10,9,35,38 | 2,903.5 |
| Region 6 | Clinker Fill - Seismic | 26,15,12,38,37 | 119.56 |
| Region 7 | Paste - Seismic | 29,27,2,17,30,31 | 3,399.6 |
| Region 8 | Fly Ash Slurry - Seismic | 2,27,29,34,36 | 767.75 |
| Region 9 | Bottom Ash Fill - Sat. - Seismic | 22,10,4,5,1,36,37 | 3,668.7 |
| Region 10 | Clinker Fill - Seismic | 11,24,23,25,22,37,38 | 408.92 |
| Region 11 | Paste - Seismic | 33,32,15,12,38,35 | 687.35 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.21
Volume: 251.30023 ft³
Weight: 22,617.02 lbs
Resisting Moment: 1,390,834.3 lbs-ft
Activating Moment: 1,149,617 lbs-ft

Resisting Force: 12,479.168 lbs
Activating Force: 10,266.251 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (394.33677, 3,256.2982) ft
Entry: (343.57087, 3,286) ft
Radius: 95.55138 ft
Center: (414.86423, 3,349.6186) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 344.3424 | 3,285.156 | -2,973.7319 | 26.395726 | 16.49388 | 40 |
| Slice 2 | 345.88544 | 3,283.5069 | -2,870.833 | 120.32451 | 75.1871 | 40 |
| Slice 3 | 347.42848 | 3,281.9333 | -2,772.6368 | 206.08352 | 128.77528 | 40 |
| Slice 4 | 349.05438 | 3,280.3528 | -2,674.0177 | 260.04346 | 162.49319 | 40 |
| Slice 5 | 350.76315 | 3,278.7681 | -2,575.1293 | 284.5091 | 177.78102 | 40 |
| Slice 6 | 352.47192 | 3,277.2584 | -2,480.925 | 306.64587 | 191.6136 | 40 |
| Slice 7 | 354.18069 | 3,275.8192 | -2,391.117 | 327.08386 | 204.38468 | 40 |
| Slice 8 | 355.88946 | 3,274.4464 | -2,305.4524 | 346.29722 | 216.39052 | 40 |
| Slice 9 | 357.59823 | 3,273.1363 | -2,223.7078 | 364.61706 | 227.83803 | 40 |
| Slice 10 | 359.307 | 3,271.886 | -2,145.6849 | 382.23596 | 238.84754 | 40 |
| Slice 11 | 361.01577 | 3,270.6924 | -2,071.2065 | 399.2046 | 249.45072 | 40 |
| Slice 12 | 362.72454 | 3,269.5531 | -2,000.114 | 415.43512 | 259.59268 | 40 |
| Slice 13 | 364.43331 | 3,268.4658 | -1,932.2648 | 430.69831 | 269.13017 | 40 |
| Slice 14 | 366.14208 | 3,267.4284 | -1,867.5298 | 444.62732 | 277.83398 | 40 |
| Slice 15 | 367.85085 | 3,266.439 | -1,805.7926 | 456.72138 | 285.39119 | 40 |
| Slice 16 | 369.55962 | 3,265.496 | -1,746.9473 | 466.34927 | 291.40737 | 40 |
| Slice 17 | 371.26838 | 3,264.5977 | -1,690.8976 | 472.76571 | 295.4168 | 40 |
| Slice 18 | 372.97715 | 3,263.7429 | -1,637.5557 | 475.13772 | 296.899 | 40 |
| Slice 19 | 374.68592 | 3,262.9302 | -1,586.8415 | 472.58521 | 295.30401 | 40 |
| Slice 20 | 376.39469 | 3,262.1584 | -1,538.6817 | 464.2436 | 290.09159 | 40 |
| Slice 21 | 378.10346 | 3,261.4264 | -1,493.0091 | 449.34241 | 280.7803 | 40 |
| Slice 22 | 379.81223 | 3,260.7334 | -1,449.7623 | 427.28771 | 266.999 | 40 |
| Slice 23 | 381.521 | 3,260.0783 | -1,408.885 | 397.75169 | 248.54284 | 40 |
| Slice 24 | 383.22977 | 3,259.4603 | -1,370.3254 | 360.73712 | 225.41357 | 40 |
| Slice 25 | 384.93854 | 3,258.8788 | -1,334.0362 | 316.62107 | 197.8468 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | 386.64731 | 3,258.3329 | -1,299.974 | 266.15211 | 166.3103 | 40 |
| Slice 27 | 388.35608 | 3,257.8221 | -1,268.0991 | 210.40452 | 131.47533 | 40 |
| Slice 28 | 390.06485 | 3,257.3458 | -1,238.375 | 150.69092 | 94.162134 | 40 |
| Slice 29 | 391.77362 | 3,256.9033 | -1,210.7686 | 88.440057 | 55.263481 | 40 |
| Slice 30 | 393.48238 | 3,256.4944 | -1,185.2498 | 25.060832 | 15.659746 | 40 |

# Static Safety Factor: Maximum Storage Pool – C Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 648
Date: 10/14/2016
Time: 4:35:12 PM
Tool Version: 8.15.1.11236
File Name: QQ_C-H_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:35:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B1 Static Safety Factor: Maximum Storage Pool - C-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: (none)

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Resisting Side Maximum Convex Angle: 1 °
- Driving Side Maximum Convex Angle: 5 °
- Optimize Critical Slip Surface Location: No
- Tension Crack
  - Tension Crack Option: (none)

F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °

### Paste

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb

Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (215, 3,285.7585) ft
Left-Zone Right Coordinate: (320, 3,291.0763) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (330, 3,285.2322) ft
Right-Zone Right Coordinate: (465, 3,275.4037) ft
Right-Zone Increment: 20
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (80.09388, 3,269.615) ft
Right Coordinate: (503.65457, 3,276) ft

## Surcharge Loads

**Surcharge Load 1**

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| | 80 | 3,289 |
| | 226.0246 | 3,289 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 503.65457 | 3,220 |
| Point 2 | 80.09388 | 3,220 |
| Point 3 | 80.09388 | 3,205 |
| Point 4 | 503.65457 | 3,205 |

| | | |
|---|---|---|
| Point 5 | 360.71496 | 3,236 |
| Point 6 | 80.09388 | 3,236 |
| Point 7 | 328.71496 | 3,220 |
| Point 8 | 190.26764 | 3,278.4866 |
| Point 9 | 161.10229 | 3,269.9113 |
| Point 10 | 80.09388 | 3,269.615 |
| Point 11 | 126.53777 | 3,236 |
| Point 12 | 320.47589 | 3,291.0763 |
| Point 13 | 266.71491 | 3,291.0763 |
| Point 14 | 253.33343 | 3,292.922 |
| Point 15 | 240.39384 | 3,293.2249 |
| Point 16 | 368.71496 | 3,240 |
| Point 17 | 403.71496 | 3,240 |
| Point 18 | 503.65457 | 3,265.0868 |
| Point 19 | 375.51773 | 3,257.3021 |
| Point 20 | 503.65457 | 3,257.3021 |
| Point 21 | 443.71496 | 3,220 |
| Point 22 | 348.30513 | 3,274 |
| Point 23 | 374 | 3,274 |
| Point 24 | 503.65457 | 3,276 |
| Point 25 | 232.82677 | 3,291 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,21,7,2,3,4 | 6,353.4 |
| Region 2 | Fly Ash Slurry | 5,11,6,2,7 | 4,233.9 |
| Region 3 | Paste | 8,9,10,6,11 | 2,495.4 |
| Region 4 | Bottom Ash Fill | 12,13,25,8,11,5,16,17,19,22 | 10,557 |
| Region 5 | Paste - Sat. | 19,20,18,24,23,22 | 2,496.5 |
| Region 6 | Fly Ash Slurry - Sat. | 20,19,17,21,1 | 3,571.9 |
| Region 7 | Embankment Fill | 17,16,5,7,21 | 1,500 |
| Region 8 | Bottom Ash Fill | 14,15,25,13 | 47.325 |

## Current Slip Surface

Slip Surface: 3,811
F of S: 1.98

Volume: 80.735789 ft³
Weight: 7,266.221 lbs
Resisting Moment: 273,911.08 lbs-ft
Activating Moment: 138,501.54 lbs-ft
Resisting Force: 6,042.9552 lbs
Activating Force: 3,045.1609 lbs
F of S Rank (Analysis): 1 of 3,969 slip surfaces
F of S Rank (Query): 1 of 3,969 slip surfaces
Exit: (347.66659, 3,274.3918) ft
Entry: (320, 3,291.0763) ft
Radius: 38.678302 ft
Center: (351.98198, 3,312.8286) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 320.23795 | 3,290.7344 | 0 | -2.8012687 | -2.3505436 | 50 |
| Slice 2 | 320.9447 | 3,289.7618 | 0 | 37.067584 | 31.103396 | 50 |
| Slice 3 | 321.88231 | 3,288.5498 | 0 | 73.275506 | 61.48545 | 50 |
| Slice 4 | 322.81992 | 3,287.4303 | 0 | 103.53511 | 86.876271 | 50 |
| Slice 5 | 323.75753 | 3,286.3915 | 0 | 129.49269 | 108.65727 | 50 |
| Slice 6 | 324.69514 | 3,285.4242 | 0 | 152.33737 | 127.82623 | 50 |
| Slice 7 | 325.63275 | 3,284.5211 | 0 | 172.89144 | 145.07314 | 50 |
| Slice 8 | 326.57036 | 3,283.676 | 0 | 191.69786 | 160.85361 | 50 |
| Slice 9 | 327.50797 | 3,282.8842 | 0 | 209.0962 | 175.45254 | 50 |
| Slice 10 | 328.44558 | 3,282.1415 | 0 | 225.28173 | 189.03382 | 50 |
| Slice 11 | 329.38319 | 3,281.4444 | 0 | 240.34563 | 201.67393 | 50 |
| Slice 12 | 330.3208 | 3,280.7898 | 0 | 254.29695 | 213.38047 | 50 |
| Slice 13 | 331.25841 | 3,280.1754 | 0 | 267.06991 | 224.09827 | 50 |
| Slice 14 | 332.19602 | 3,279.5987 | 0 | 278.52137 | 233.70718 | 50 |
| Slice 15 | 333.13363 | 3,279.0579 | 0 | 288.42445 | 242.01685 | 50 |
| Slice 16 | 334.07124 | 3,278.5513 | 0 | 296.46431 | 248.7631 | 50 |
| Slice 17 | 335.00885 | 3,278.0773 | 0 | 302.24112 | 253.61042 | 50 |
| Slice 18 | 335.94646 | 3,277.6348 | 0 | 305.28374 | 256.16347 | 50 |
| Slice 19 | 336.88407 | 3,277.2224 | 0 | 305.0757 | 255.98891 | 50 |
| Slice 20 | 337.82168 | 3,276.8391 | 0 | 301.0929 | 252.64694 | 50 |
| Slice 21 | 338.75929 | 3,276.4841 | 0 | 292.85006 | 245.73037 | 50 |
| Slice 22 | 339.6969 | 3,276.1565 | 0 | 279.95153 | 234.90722 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 23 | 340.63451 | 3,275.8556 | 0 | 262.14058 | 219.96206 | 50 |
| Slice 24 | 341.57212 | 3,275.5807 | 0 | 239.34087 | 200.83084 | 50 |
| Slice 25 | 342.50973 | 3,275.3312 | 0 | 211.68422 | 177.62415 | 50 |
| Slice 26 | 343.44734 | 3,275.1068 | 0 | 179.51972 | 150.63493 | 50 |
| Slice 27 | 344.38495 | 3,274.9068 | 0 | 143.40142 | 120.32808 | 50 |
| Slice 28 | 345.32256 | 3,274.7309 | 0 | 104.05369 | 87.311417 | 50 |
| Slice 29 | 346.26017 | 3,274.5788 | 0 | 62.316431 | 52.289694 | 50 |
| Slice 30 | 347.19778 | 3,274.4503 | 0 | 19.074602 | 16.005491 | 50 |

# Static Safety Factor: Maximum Surcharge Pool – C Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 648
Date: 10/14/2016
Time: 4:35:12 PM
Tool Version: 8.15.1.11236
File Name: QQ_C-H_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:35:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B2 Static Safety Factor: Maximum Surcharge Pool - C-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Left to Right
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °

### Paste

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb

Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (215.35002, 3,285.8614) ft
Left-Zone Right Coordinate: (320, 3,291.0763) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (334.99995, 3,282.1642) ft
Right-Zone Right Coordinate: (465, 3,275.4037) ft
Right-Zone Increment: 20
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (80.09388, 3,269.615) ft
Right Coordinate: (503.65457, 3,276) ft

## Surcharge Loads

**Surcharge Load 1**

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| | 80 | 3,292 |
| | 236.22785 | 3,292 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 503.65457 | 3,220 |
| Point 2 | 80.09388 | 3,220 |
| Point 3 | 80.09388 | 3,205 |
| Point 4 | 503.65457 | 3,205 |

| | | |
|---|---|---|
| Point 5 | 360.71496 | 3,236 |
| Point 6 | 80.09388 | 3,236 |
| Point 7 | 328.71496 | 3,220 |
| Point 8 | 190.26764 | 3,278.4866 |
| Point 9 | 161.10229 | 3,269.9113 |
| Point 10 | 80.09388 | 3,269.615 |
| Point 11 | 126.53777 | 3,236 |
| Point 12 | 320.47589 | 3,291.0763 |
| Point 13 | 266.71491 | 3,291.0763 |
| Point 14 | 253.33343 | 3,292.922 |
| Point 15 | 240.39384 | 3,293.2249 |
| Point 16 | 368.71496 | 3,240 |
| Point 17 | 403.71496 | 3,240 |
| Point 18 | 503.65457 | 3,265.0868 |
| Point 19 | 375.51773 | 3,257.3021 |
| Point 20 | 503.65457 | 3,257.3021 |
| Point 21 | 443.71496 | 3,220 |
| Point 22 | 348.30513 | 3,274 |
| Point 23 | 374 | 3,274 |
| Point 24 | 503.65457 | 3,276 |
| Point 25 | 232.82677 | 3,291 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,21,7,2,3,4 | 6,353.4 |
| Region 2 | Fly Ash Slurry | 5,11,6,2,7 | 4,233.9 |
| Region 3 | Paste | 8,9,10,6,11 | 2,495.4 |
| Region 4 | Bottom Ash Fill | 12,13,25,8,11,5,16,17,19,22 | 10,557 |
| Region 5 | Paste - Sat. | 19,20,18,24,23,22 | 2,496.5 |
| Region 6 | Fly Ash Slurry - Sat. | 20,19,17,21,1 | 3,571.9 |
| Region 7 | Embankment Fill | 17,16,5,7,21 | 1,500 |
| Region 8 | Bottom Ash Fill | 14,15,25,13 | 47.325 |

## Current Slip Surface

Slip Surface: 3,812
F of S: 1.98

Volume: 106.2582 ft³
Weight: 9,574.5952 lbs
Resisting Moment: 299,597.69 lbs-ft
Activating Moment: 151,088.88 lbs-ft
Resisting Force: 7,713.0598 lbs
Activating Force: 3,881.7383 lbs
F of S Rank (Analysis): 1 of 3,969 slip surfaces
F of S Rank (Query): 1 of 3,969 slip surfaces
Exit: (352.54222, 3,274) ft
Entry: (320, 3,291.0763) ft
Radius: 33.171007 ft
Center: (349.10323, 3,306.9923) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 320.23795 | 3,290.6559 | 0 | -3.2916861 | -2.7620526 | 50 |
| Slice 2 | 321.01107 | 3,289.3817 | 0 | 48.219355 | 40.460843 | 50 |
| Slice 3 | 322.08142 | 3,287.7755 | 0 | 100.43967 | 84.27889 | 50 |
| Slice 4 | 323.15178 | 3,286.3501 | 0 | 143.13895 | 120.10784 | 50 |
| Slice 5 | 324.22213 | 3,285.0699 | 0 | 179.00326 | 150.20157 | 50 |
| Slice 6 | 325.29249 | 3,283.9104 | 0 | 209.87306 | 176.10441 | 50 |
| Slice 7 | 326.36284 | 3,282.8541 | 0 | 237.03143 | 198.89299 | 50 |
| Slice 8 | 327.4332 | 3,281.888 | 0 | 261.36826 | 219.31401 | 50 |
| Slice 9 | 328.50356 | 3,281.0018 | 0 | 283.48079 | 237.86863 | 50 |
| Slice 10 | 329.57391 | 3,280.1877 | 0 | 303.73666 | 254.86532 | 50 |
| Slice 11 | 330.64427 | 3,279.4393 | 0 | 322.31153 | 270.45149 | 50 |
| Slice 12 | 331.71462 | 3,278.7512 | 0 | 339.20926 | 284.63037 | 50 |
| Slice 13 | 332.78498 | 3,278.1192 | 0 | 354.27095 | 297.26862 | 50 |
| Slice 14 | 333.85533 | 3,277.5397 | 0 | 367.17866 | 308.09948 | 50 |
| Slice 15 | 334.92569 | 3,277.0096 | 0 | 377.45899 | 316.7257 | 50 |
| Slice 16 | 335.99604 | 3,276.5262 | 0 | 384.49134 | 322.62654 | 50 |
| Slice 17 | 337.0664 | 3,276.0876 | 0 | 387.52578 | 325.17274 | 50 |
| Slice 18 | 338.13675 | 3,275.6916 | 0 | 385.71554 | 323.65377 | 50 |
| Slice 19 | 339.20711 | 3,275.3368 | 0 | 378.16876 | 317.32127 | 50 |
| Slice 20 | 340.27746 | 3,275.0218 | 0 | 364.02211 | 305.45082 | 50 |
| Slice 21 | 341.34782 | 3,274.7453 | 0 | 342.53476 | 287.42079 | 50 |
| Slice 22 | 342.41818 | 3,274.5065 | 0 | 313.19489 | 262.80171 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 23 | 343.48853 | 3,274.3044 | 0 | 275.8243 | 231.44406 | 50 |
| Slice 24 | 344.55889 | 3,274.1384 | 0 | 230.66169 | 193.54814 | 50 |
| Slice 25 | 345.62924 | 3,274.0081 | 0 | 178.40351 | 149.69832 | 50 |
| Slice 26 | 346.6996 | 3,273.9128 | 0 | 120.18596 | 100.84799 | 50 |
| Slice 27 | 347.76995 | 3,273.8524 | 0 | 57.501386 | 48.249391 | 50 |
| Slice 28 | 348.44755 | 3,273.828 | 0 | 27.211144 | 22.832861 | 50 |
| Slice 29 | 349.084 | 3,273.8249 | 0 | 22.412032 | 15.693074 | 0 |
| Slice 30 | 350.07206 | 3,273.8391 | 0 | 20.107121 | 14.079157 | 0 |
| Slice 31 | 351.06012 | 3,273.8827 | 0 | 14.286301 | 10.003376 | 0 |
| Slice 32 | 352.04818 | 3,273.956 | 0 | 5.2376432 | 3.6674372 | 0 |

# Seismic Safety Factor – C Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 648
Date: 10/14/2016
Time: 4:35:12 PM
Tool Version: 8.15.1.11236
File Name: QQ_C-H_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:35:16 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### B3 Seismic Safety Factor - C-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: B1 Static Safety Factor: Maximum Storage Pool - C-Cell [(last)]
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °

### Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °

### Fly Ash Slurry - Seismic
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Paste - Seismic
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Limits

Left Coordinate: (80.09388, 3,269.615) ft
Right Coordinate: (503.65457, 3,276) ft

## Surcharge Loads

**Surcharge Load 1**

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

**Coordinates**

| | X (ft) | Y (ft) |
|---|---|---|
| | 80 | 3,289 |
| | 226.0246 | 3,289 |

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 503.65457 | 3,220 |
| Point 2 | 80.09388 | 3,220 |
| Point 3 | 80.09388 | 3,205 |
| Point 4 | 503.65457 | 3,205 |
| Point 5 | 360.71496 | 3,236 |
| Point 6 | 80.09388 | 3,236 |
| Point 7 | 328.71496 | 3,220 |
| Point 8 | 190.26764 | 3,278.4866 |

| | | |
|---|---|---|
| Point 9 | 161.10229 | 3,269.9113 |
| Point 10 | 80.09388 | 3,269.615 |
| Point 11 | 126.53777 | 3,236 |
| Point 12 | 320.47589 | 3,291.0763 |
| Point 13 | 266.71491 | 3,291.0763 |
| Point 14 | 253.33343 | 3,292.922 |
| Point 15 | 240.39384 | 3,293.2249 |
| Point 16 | 368.71496 | 3,240 |
| Point 17 | 403.71496 | 3,240 |
| Point 18 | 503.65457 | 3,265.0868 |
| Point 19 | 375.51773 | 3,257.3021 |
| Point 20 | 503.65457 | 3,257.3021 |
| Point 21 | 443.71496 | 3,220 |
| Point 22 | 348.30513 | 3,274 |
| Point 23 | 374 | 3,274 |
| Point 24 | 503.65457 | 3,276 |
| Point 25 | 232.82677 | 3,291 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,21,7,2,3,4 | 6,353.4 |
| Region 2 | Fly Ash Slurry - Seismic | 5,11,6,2,7 | 4,233.9 |
| Region 3 | Paste - Seismic | 8,9,10,6,11 | 2,495.4 |
| Region 4 | Bottom Ash Fill - Seismic | 12,13,25,8,11,5,16,17,19,22 | 10,557 |
| Region 5 | Paste - Sat. - Seismic | 19,20,18,24,23,22 | 2,496.5 |
| Region 6 | Fly Ash Slurry - Sat. - Seismic | 20,19,17,21,1 | 3,571.9 |
| Region 7 | Embankment Fill - Seismic | 17,16,5,7,21 | 1,500 |
| Region 8 | Bottom Ash Fill - Seismic | 14,15,25,13 | 47.325 |

## Current Slip Surface

Slip Surface: 1
F of S: 1.41
Volume: 80.735788 ft³
Weight: 7,266.2209 lbs
Resisting Moment: 205,086.07 lbs-ft
Activating Moment: 145,283.73 lbs-ft
Resisting Force: 4,530.8953 lbs

Activating Force: 3,199.1275 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (347.66659, 3,274.3918) ft
Entry: (320, 3,291.0763) ft
Radius: 38.678302 ft
Center: (351.98198, 3,312.8286) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 320.23795 | 3,290.7344 | 0 | -5.2854407 | -3.3027099 | 40 |
| Slice 2 | 320.9447 | 3,289.7618 | 0 | 34.26694 | 21.41236 | 40 |
| Slice 3 | 321.88231 | 3,288.5498 | 0 | 70.037318 | 43.764173 | 40 |
| Slice 4 | 322.81992 | 3,287.4303 | 0 | 99.726456 | 62.316006 | 40 |
| Slice 5 | 323.75753 | 3,286.3915 | 0 | 125.05996 | 78.146133 | 40 |
| Slice 6 | 324.69514 | 3,285.4242 | 0 | 147.28295 | 92.032602 | 40 |
| Slice 7 | 325.63275 | 3,284.5211 | 0 | 167.25667 | 104.51357 | 40 |
| Slice 8 | 326.57036 | 3,283.676 | 0 | 185.55118 | 115.94525 | 40 |
| Slice 9 | 327.50797 | 3,282.8842 | 0 | 202.52765 | 126.55332 | 40 |
| Slice 10 | 328.44558 | 3,282.1415 | 0 | 218.40306 | 136.47338 | 40 |
| Slice 11 | 329.38319 | 3,281.4444 | 0 | 233.28986 | 145.77568 | 40 |
| Slice 12 | 330.3208 | 3,280.7898 | 0 | 247.22006 | 154.48024 | 40 |
| Slice 13 | 331.25841 | 3,280.1754 | 0 | 260.14851 | 162.55883 | 40 |
| Slice 14 | 332.19602 | 3,279.5987 | 0 | 271.94863 | 169.93236 | 40 |
| Slice 15 | 333.13363 | 3,279.0579 | 0 | 282.39908 | 176.46253 | 40 |
| Slice 16 | 334.07124 | 3,278.5513 | 0 | 291.17921 | 181.94896 | 40 |
| Slice 17 | 335.00885 | 3,278.0773 | 0 | 297.8661 | 186.1274 | 40 |
| Slice 18 | 335.94646 | 3,277.6348 | 0 | 301.94961 | 188.67905 | 40 |
| Slice 19 | 336.88407 | 3,277.2224 | 0 | 302.85875 | 189.24715 | 40 |
| Slice 20 | 337.82168 | 3,276.8391 | 0 | 300.00402 | 187.46331 | 40 |
| Slice 21 | 338.75929 | 3,276.4841 | 0 | 292.8274 | 182.97887 | 40 |
| Slice 22 | 339.6969 | 3,276.1565 | 0 | 280.86177 | 175.50191 | 40 |
| Slice 23 | 340.63451 | 3,275.8556 | 0 | 263.78758 | 164.83278 | 40 |
| Slice 24 | 341.57212 | 3,275.5807 | 0 | 241.48 | 150.89345 | 40 |
| Slice 25 | 342.50973 | 3,275.3312 | 0 | 214.04308 | 133.74896 | 40 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 26 | 343.44734 | 3,275.1068 | 0 | 181.82331 | 113.61581 | 40 |
| Slice 27 | 344.38495 | 3,274.9068 | 0 | 145.39601 | 90.853509 | 40 |
| Slice 28 | 345.32256 | 3,274.7309 | 0 | 105.52964 | 65.942235 | 40 |
| Slice 29 | 346.26017 | 3,274.5788 | 0 | 63.125249 | 39.445034 | 40 |
| Slice 30 | 347.19778 | 3,274.4503 | 0 | 19.138067 | 11.958792 | 40 |

# Static Safety Factor: Maximum Storage Pool – H Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 4:36:01 PM
Tool Version: 8.15.1.11236
File Name: QQ_C-H_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:36:02 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A1 Static Safety Factor: Existing Conditons - H-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: (none)
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °
    Driving Side Maximum Convex Angle: 5 °
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Paste - Sat.

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry - Sat.

Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

### Bottom Ash Fill

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 50 psf
Phi': 40 °
Phi-B: 0 °

### Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 33 °
Phi-B: 0 °

### Paste

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 35 °
Phi-B: 0 °

### Fly Ash Slurry

Model: Mohr-Coulomb

Unit Weight: 100 pcf
Cohesion': 700 psf
Phi': 28 °
Phi-B: 0 °

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (80.81508, 3,269.6176) ft
Left-Zone Right Coordinate: (198, 3,280.7601) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (233.35257, 3,291.1546) ft
Right-Zone Right Coordinate: (320, 3,291.0763) ft
Right-Zone Increment: 12
Radius Increments: 8

## Slip Surface Limits

Left Coordinate: (80.09388, 3,269.615) ft
Right Coordinate: (503.65457, 3,276) ft

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 503.65457 | 3,220 |
| Point 2 | 80.09388 | 3,220 |
| Point 3 | 80.09388 | 3,205 |
| Point 4 | 503.65457 | 3,205 |
| Point 5 | 360.71496 | 3,236 |
| Point 6 | 80.09388 | 3,236 |
| Point 7 | 328.71496 | 3,220 |
| Point 8 | 190.26764 | 3,278.4866 |
| Point 9 | 161.10229 | 3,269.9113 |
| Point 10 | 80.09388 | 3,269.615 |
| Point 11 | 126.53777 | 3,236 |
| Point 12 | 320.47589 | 3,291.0763 |
| Point 13 | 266.71491 | 3,291.0763 |

| | | |
|---|---|---|
| Point 14 | 253.33343 | 3,292.922 |
| Point 15 | 240.39384 | 3,293.2249 |
| Point 16 | 368.71496 | 3,240 |
| Point 17 | 403.71496 | 3,240 |
| Point 18 | 503.65457 | 3,265.0868 |
| Point 19 | 375.51773 | 3,257.3021 |
| Point 20 | 503.65457 | 3,257.3021 |
| Point 21 | 443.71496 | 3,220 |
| Point 22 | 348.30513 | 3,274 |
| Point 23 | 374 | 3,274 |
| Point 24 | 503.65457 | 3,276 |
| Point 25 | 232.82677 | 3,291 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,21,7,2,3,4 | 6,353.4 |
| Region 2 | Fly Ash Slurry | 5,11,6,2,7 | 4,233.9 |
| Region 3 | Paste | 8,9,10,6,11 | 2,495.4 |
| Region 4 | Bottom Ash Fill | 12,13,25,8,11,5,16,17,19,22 | 10,557 |
| Region 5 | Paste - Sat. | 19,20,18,24,23,22 | 2,496.5 |
| Region 6 | Fly Ash Slurry - Sat. | 20,19,17,21,1 | 3,571.9 |
| Region 7 | Embankment Fill | 17,16,5,7,21 | 1,500 |
| Region 8 | Bottom Ash Fill | 14,15,25,13 | 47.325 |

## Current Slip Surface

Slip Surface: 947
F of S: 3.34
Volume: 272.30013 ft³
Weight: 25,185.093 lbs
Resisting Moment: 4,003,787.2 lbs-ft
Activating Moment: 1,197,354 lbs-ft
Resisting Force: 21,953.077 lbs
Activating Force: 6,567.1682 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (161.27851, 3,269.9631) ft
Entry: (240.3142, 3,293.2015) ft
Radius: 173.84982 ft
Center: (153.15256, 3,443.6229) ft

**Slip Slices**

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | 162.64622 | 3,270.0379 | 0 | 33.240103 | 23.274971 | 0 |
| Slice 2 | 165.38164 | 3,270.2092 | 0 | 97.773522 | 68.461757 | 0 |
| Slice 3 | 168.11707 | 3,270.4238 | 0 | 158.07586 | 110.68591 | 0 |
| Slice 4 | 170.85249 | 3,270.6819 | 0 | 213.795 | 149.70087 | 0 |
| Slice 5 | 173.58792 | 3,270.9838 | 0 | 264.61847 | 185.28785 | 0 |
| Slice 6 | 176.32334 | 3,271.3297 | 0 | 310.29248 | 217.26913 | 0 |
| Slice 7 | 179.05877 | 3,271.7197 | 0 | 350.63555 | 245.51766 | 0 |
| Slice 8 | 181.65662 | 3,272.1303 | 0 | 379.14393 | 318.13953 | 50 |
| Slice 9 | 184.11691 | 3,272.5574 | 0 | 392.77852 | 329.58031 | 50 |
| Slice 10 | 186.5772 | 3,273.0211 | 0 | 402.40382 | 337.6569 | 50 |
| Slice 11 | 189.03749 | 3,273.5216 | 0 | 408.09596 | 342.43317 | 50 |
| Slice 12 | 191.59761 | 3,274.0827 | 0 | 415.5578 | 348.6944 | 50 |
| Slice 13 | 194.25756 | 3,274.708 | 0 | 424.46721 | 356.17028 | 50 |
| Slice 14 | 196.9175 | 3,275.3776 | 0 | 429.069 | 360.03164 | 50 |
| Slice 15 | 199.57745 | 3,276.0921 | 0 | 429.56528 | 360.44807 | 50 |
| Slice 16 | 202.2374 | 3,276.8521 | 0 | 426.16399 | 357.59405 | 50 |
| Slice 17 | 204.89734 | 3,277.6582 | 0 | 419.06542 | 351.63764 | 50 |
| Slice 18 | 207.55729 | 3,278.5111 | 0 | 408.45001 | 342.73025 | 50 |
| Slice 19 | 210.21723 | 3,279.4115 | 0 | 394.46777 | 330.99776 | 50 |
| Slice 20 | 212.87718 | 3,280.3602 | 0 | 377.22942 | 316.53306 | 50 |
| Slice 21 | 215.53712 | 3,281.358 | 0 | 356.79903 | 299.38994 | 50 |
| Slice 22 | 218.19707 | 3,282.4059 | 0 | 333.18814 | 279.57804 | 50 |
| Slice 23 | 220.85701 | 3,283.5049 | 0 | 306.35069 | 257.05875 | 50 |
| Slice 24 | 223.51696 | 3,284.656 | 0 | 276.17896 | 231.74166 | 50 |
| Slice 25 | 226.17691 | 3,285.8603 | 0 | 242.49997 | 203.48163 | 50 |
| Slice 26 | 228.83685 | 3,287.119 | 0 | 205.0728 | 172.07651 | 50 |
| Slice 27 | 231.4968 | 3,288.4336 | 0 | 163.58693 | 137.26574 | 50 |
| Slice 28 | 234.62039 | 3,290.0565 | 0 | 108.666 | 91.181601 | 50 |
| Slice 29 | 238.36411 | 3,292.1048 | 0 | 34.080912 | 28.597281 | 50 |

# Seismic Safety Factor – H Direction

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## File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 649
Date: 10/14/2016
Time: 4:36:01 PM
Tool Version: 8.15.1.11236
File Name: QQ_C-H_2016-10-14.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\34 EHP\Divider Dikes\
Last Solved Date: 10/14/2016
Last Solved Time: 4:36:30 PM

## Project Settings

Length(L) Units: Feet
Time(t) Units: Days
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

## Analysis Settings

### A3 Seismic Safety Factor - H-Cell

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: (none)
Initial Slip Surface Source: Other GeoStudio Analysis
Slip Surface Other Analysis: A1 Static Safety Factor: Existing Conditons - H-Cell [(last)]
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Critical Slip Surfaces from Other
Critical slip surfaces saved: 1
Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack

Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

## Materials

### Bottom Ash Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion': 40 psf
Phi': 32 °
Phi-B: 0 °

### Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 26.4 °
Phi-B: 0 °

### Fly Ash Slurry - Seismic
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Fly Ash Slurry - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 103.4 pcf
Cohesion': 560 psf
Phi': 22.4 °
Phi-B: 0 °

### Paste - Seismic
Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

**Paste - Sat. - Seismic**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

**Foundation Soil**

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

## Slip Surface Limits

Left Coordinate: (80.09388, 3,269.615) ft
Right Coordinate: (503.65457, 3,276) ft

## Seismic Coefficients

Horz Seismic Coef.: 0.03

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | 503.65457 | 3,220 |
| Point 2 | 80.09388 | 3,220 |
| Point 3 | 80.09388 | 3,205 |
| Point 4 | 503.65457 | 3,205 |
| Point 5 | 360.71496 | 3,236 |
| Point 6 | 80.09388 | 3,236 |
| Point 7 | 328.71496 | 3,220 |
| Point 8 | 190.26764 | 3,278.4866 |
| Point 9 | 161.10229 | 3,269.9113 |
| Point 10 | 80.09388 | 3,269.615 |
| Point 11 | 126.53777 | 3,236 |
| Point 12 | 320.47589 | 3,291.0763 |
| Point 13 | 266.71491 | 3,291.0763 |
| Point 14 | 253.33343 | 3,292.922 |
| Point 15 | 240.39384 | 3,293.2249 |
| Point 16 | 368.71496 | 3,240 |
| Point 17 | 403.71496 | 3,240 |

| | | |
|---|---|---|
| Point 18 | 503.65457 | 3,265.0868 |
| Point 19 | 375.51773 | 3,257.3021 |
| Point 20 | 503.65457 | 3,257.3021 |
| Point 21 | 443.71496 | 3,220 |
| Point 22 | 348.30513 | 3,274 |
| Point 23 | 374 | 3,274 |
| Point 24 | 503.65457 | 3,276 |
| Point 25 | 232.82677 | 3,291 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Foundation Soil | 1,21,7,2,3,4 | 6,353.4 |
| Region 2 | Fly Ash Slurry - Seismic | 5,11,6,2,7 | 4,233.9 |
| Region 3 | Paste - Seismic | 8,9,10,6,11 | 2,495.4 |
| Region 4 | Bottom Ash Fill - Seismic | 12,13,25,8,11,5,16,17,19,22 | 10,557 |
| Region 5 | Paste - Sat. - Seismic | 19,20,18,24,23,22 | 2,496.5 |
| Region 6 | Fly Ash Slurry - Sat. - Seismic | 20,19,17,21,1 | 3,571.9 |
| Region 7 | Embankment Fill - Seismic | 17,16,5,7,21 | 1,500 |
| Region 8 | Bottom Ash Fill - Seismic | 14,15,25,13 | 47.325 |

## Current Slip Surface

Slip Surface: 1
F of S: 2.27
Volume: 272.30012 ft³
Weight: 25,185.092 lbs
Resisting Moment: 2,996,232 lbs-ft
Activating Moment: 1,321,354 lbs-ft
Resisting Force: 16,433.235 lbs
Activating Force: 7,246.7481 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (161.27851, 3,269.9631) ft
Entry: (240.3142, 3,293.2015) ft
Radius: 173.84982 ft
Center: (153.15256, 3,443.6229) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 1 | 162.64622 | 3,270.0379 | 0 | 33.265664 | 17.687667 | 0 |
| Slice 2 | 165.38164 | 3,270.2092 | 0 | 97.884153 | 52.045927 | 0 |
| Slice 3 | 168.11707 | 3,270.4238 | 0 | 158.28096 | 84.159478 | 0 |
| Slice 4 | 170.85249 | 3,270.6819 | 0 | 214.04171 | 113.80799 | 0 |
| Slice 5 | 173.58792 | 3,270.9838 | 0 | 264.80117 | 140.79728 | 0 |
| Slice 6 | 176.32334 | 3,271.3297 | 0 | 310.26675 | 164.97176 | 0 |
| Slice 7 | 179.05877 | 3,271.7197 | 0 | 350.23526 | 186.22339 | 0 |
| Slice 8 | 181.65662 | 3,272.1303 | 0 | 379.95184 | 237.42026 | 40 |
| Slice 9 | 184.11691 | 3,272.5574 | 0 | 393.35941 | 245.79824 | 40 |
| Slice 10 | 186.5772 | 3,273.0211 | 0 | 402.60881 | 251.57791 | 40 |
| Slice 11 | 189.03749 | 3,273.5216 | 0 | 407.8003 | 254.82191 | 40 |
| Slice 12 | 191.59761 | 3,274.0827 | 0 | 414.60569 | 259.07439 | 40 |
| Slice 13 | 194.25756 | 3,274.708 | 0 | 422.71269 | 264.1402 | 40 |
| Slice 14 | 196.9175 | 3,275.3776 | 0 | 426.46705 | 266.48619 | 40 |
| Slice 15 | 199.57745 | 3,276.0921 | 0 | 426.12155 | 266.2703 | 40 |
| Slice 16 | 202.2374 | 3,276.8521 | 0 | 421.93195 | 263.65234 | 40 |
| Slice 17 | 204.89734 | 3,277.6582 | 0 | 414.14124 | 258.78417 | 40 |
| Slice 18 | 207.55729 | 3,278.5111 | 0 | 402.96571 | 251.80092 | 40 |
| Slice 19 | 210.21723 | 3,279.4115 | 0 | 388.58205 | 242.81301 | 40 |
| Slice 20 | 212.87718 | 3,280.3602 | 0 | 371.11825 | 231.90042 | 40 |
| Slice 21 | 215.53712 | 3,281.358 | 0 | 350.64645 | 219.10822 | 40 |
| Slice 22 | 218.19707 | 3,282.4059 | 0 | 327.17673 | 204.44271 | 40 |
| Slice 23 | 220.85701 | 3,283.5049 | 0 | 300.65281 | 187.86873 | 40 |
| Slice 24 | 223.51696 | 3,284.656 | 0 | 270.9482 | 169.30723 | 40 |
| Slice 25 | 226.17691 | 3,285.8603 | 0 | 237.86272 | 148.63312 | 40 |
| Slice 26 | 228.83685 | 3,287.119 | 0 | 201.11934 | 125.67331 | 40 |
| Slice 27 | 231.4968 | 3,288.4336 | 0 | 160.36241 | 100.20555 | 40 |
| Slice 28 | 234.62039 | 3,290.0566 | 0 | 106.28011 | 66.411184 | 40 |
| Slice 29 | 238.36411 | 3,292.1048 | 0 | 32.524412 | 20.323508 | 40 |