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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 1 & 2 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 surface impoundments of Units 1 & 2 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 1 & 2 Second Stage Evaporation Ponds (STEP) and the Units 1 & 2 Bottom Ash Pond. 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 1 & 2
COLSTRIP, MONTANA

Prepared for:

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

Prepared by:

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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 1 & 2 in surface impoundments at two main areas: the Units 1 & 2 Second Stage Evaporation Ponds (STEP) and the Units 1 & 2 Bottom Ash Pond. This report summarizes the findings of the initial safety factor assessment of surface impoundments in both areas. Calculated factors of safety for embankments and dikes surrounding CCR surface impoundments of the CSES Units 1 & 2 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 1 & 2 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).

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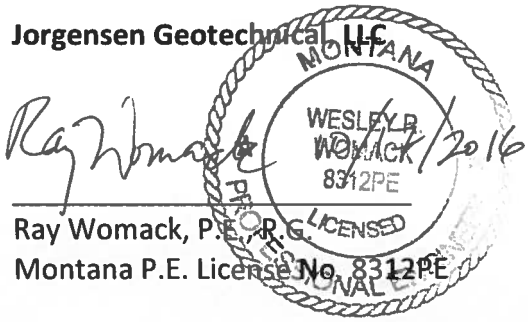

Ray Womack, P.E., P.G.
Montana P.E. License No. 8312PE

2.0 REVIEW OF PAST STABILITY ANALYSES

Since Bechtel's original design (Bechtel, 1979), numerous stability analyses have been performed on the CSES Units 1 & 2 surface impoundments by 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 for input into the initial safety factor assessment of the Units 1 & 2 surface impoundments:

- Bechtel, 1979. "Second Stage Evaporation Pond Design Report." Prepared by Bechtel Power Corporation, December 1979.
- WAI, 2010a. "Units 1 & 2 Stage Two Evaporation Pond (STEP) Dam – Geotechnical Investigations Report for the EPA Recommended Corrective Measures at the Colstrip Power Plant." Prepared by Womack & Associates, Inc., January 8, 2010.
- WAI, 2010b. "Units 1 & 2 Pond "A" Waste Impoundment Embankment – Geotechnical Investigations & Analyses Report for the EPA Recommended Corrective Measures at the Colstrip Power Plant." Prepared by Womack & Associates, Inc., January 14, 2010.
- WAI, 2010c. "Units 1 & 2 Bottom Ash Waste Impoundment Pond – Geotechnical Investigations & Analyses Report for the EPA Recommended Corrective Measures at the Colstrip Power Plan." Prepared by Womack & Associates, Inc., January 22, 2010.
- WAI, 2010d. "Units 1 & 2 STEP Dam – Geotechnical Investigation & Analyses Memo for the Units 1 & 2 STEP Dam Inspection Issue, Prepared by Womack & Associates, Inc., March 22, 2010 [Additional piezometers to detect seepage in embankment shell].
- Jorgensen, 2016a. "Geotechnical Investigation and Embankment Stability Report—Revision 1." Prepared by Jorgensen Geotechnical, LLC, March 3, 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. As summarized in Table 3-1, the water level elevations for the modeled surface impoundments are the maximum storage pool under normal operations. Calculated factors of safety for this loading condition are summarized in Section 5.1.

Table 3-1: Maximum Storage Pool

SURFACE IMPOUNDMENT	WATER LEVEL ELEVATION
STEP B-Cell	3,267-ft
STEP E-Cell	3,267-ft
STEP Clearwell	3,267-ft
STEP D-Cell	3,267-ft
1&2 Bottom Ash Pond	3,260-ft

In the case of several embankments at the STEP, the embankment serves as a divider dike between CCR 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.

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 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
STEP B-Cell	3,270-ft
STEP E-Cell	3,270-ft
STEP Clearwell	3,270-ft
STEP D-Cell	3,274-ft
1&2 Bottom Ash Pond	3,262.5-ft

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 the impounded water and calculated factors of safety for the modeled Maximum Surcharge Pool condition (Table 5-2) are the same as those for the Maximum Storage Pool condition (Table 5-1) for each cross-section.

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 about 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.

3.2 Geometry

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. 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 Figure 2. Figures showing model geometry are in Appendix A.

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. Critical slip surfaces of each analysis are indicated on the figures of Appendix A.

Figure 1: Units 1 & 2 STEP Cross-Section Location Map

Figure 2: Units 1 & 2 Bottom Ash Pond Cross-Section Location Map

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 and Table 3-4. The 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). Strength parameters of paste materials were adopted from laboratory testing performed by Golder Associates and Womack & Associates (Golder, 2001).

Table 3-3: Material Strength Parameters – Units 1 & 2 STEP Area

MATERIAL	UNIT WEIGHT		EFFECTIVE FRICTION ANGLE, Φ'	EFFECTIVE COHESION, C'
	MOIST (PCF)	SAT. (PCF)		
EMBANKMENT FILL*	124.5	130	33°	50 psf
CLAY CORE*	127	-	33.5°	0 psf
DRAIN*	130	135	35°	0 psf
FOUNDATION SOIL*	115	125	32° (27°‡)	0 psf
PASTE†	-	112	34.4°	0 psf
BEDROCK	IMPENETRABLE			

* Bechtel, 1979

† Golder, 2001

‡ Foundation material under the south embankment of D-Cell assigned ϕ'=27° based on recent direct shear testing (Jorgensen, 2016a)

- Denotes material parameter not applied in models

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 embankment fill. 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, unsaturated fine-grained 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.

Bedrock is 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 are generally equal to moist unit weights in the analyses performed for this assessment due to the presence of liners and the lack of seepage detected by the vibrating wire piezometers. Saturated unit weights are used for CCR waste materials stored inboard of cell liners within the surface impoundments (e.g., paste), foundation material under the drain on the downstream side of the STEP Main Dam, and soils below observed groundwater surface levels at the Units 1 & 2 Bottom Ash Pond (JG, 2016, Initial Annual Inspection Report).

Table 3-4: Material Strength Parameters – Units 1 & 2 Bottom Ash Pond

MATERIAL	UNIT WEIGHT		EFFECTIVE FRICTION ANGLE, Φ' (DEG)	EFFECTIVE COHESION, C' (PSF)
	MOIST (PCF)	SAT. (PCF)		
EMBANKMENT FILL* Section A-A' (Figure 2)	127	146.4	30.9	372.9
EMBANKMENT FILL** Section B-B' (Figure 2)	120	126.8	31.5	204.2
CLAY CORE†	127	140.4	33.5	0
FOUNDATION SOIL**	118.2	123.8	29.2	107.8
BEDROCK	IMPENETRABLE			

* Parameters based on laboratory testing (WAI, 2010c)

** Parameters based on laboratory testing (WAI, 2010b)

† Bechtel, 1979.

Material parameters for Units 1 & 2 Bottom Ash ponds differ somewhat from material models at the Units 1 & 2 STEP. Embankment fill material was sampled and tested by Womack & Associates as a part of the two "EPA Recommended Corrective Measures at the Colstrip Power Plant" dated January 2010 (see Section 2.0). As at the STEP, core material proved too stiff to sample and material parameters from Bechtel's STEP Design report (1979) were used.

3.4 Phreatic Surface

All cells analyzed have been constructed with liners (Geosyntec, 2016a) and vibrating wire piezometers installed in each embankment have not detected seepage within embankment materials (Jorgensen, 2016b). Therefore, a phreatic surface has not been applied. The single exception to this rule is the foundation material underlying Section B-B' at the Units 1 & 2 Bottom Ash Pond where a piezometric surface line was drawn at an elevation of 3,225 feet to model the influence of groundwater detected by VW piezometer PONDA-09-3P (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. In general, seepage pressures do not affect the stability models of the Units 1 & 2 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 1 & 2 surface impoundments are as follows:

1. Materials: Embankment soil (i.e., shell and core materials) 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 1 & 2 embankments are too high to predict liquefaction at this site.
2. Saturation: Since seepage has not been detected within embankment materials by piezometers, saturated conditions are only expected below the depth of the instrumentation resulting in relatively small differences in the soil's total stress (σ_v) and effective stress (σ_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 1 & 2 STEP and Bottom Ash ponds 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, Table 5-2, and Table 5-3. Cross-section figures from 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
E/C Divider Dike	A-A’	Downstream (North)	1.56
E/B Divider Dike	B-B’	B-Cell (NW)	2.42
		E-Cell (SE)	1.78
	C-C’	B-Cell (NW)	2.41
		E-Cell (SE)	2.19
E/D Divider Dike	D-D’	D-Cell (South)	2.26
		E-Cell (North)	4.37
CW/D Divider Dike	E-E’	D-Cell (South)	2.27
		Clearwell (North)	1.76
D-Cell: South Embankment	F-F’	Downstream (South)	2.09
STEP Main Dam	G-G’	Downstream (East)	2.11
1 & 2 Bottom Ash Pond	A-A’	Downstream (East)	2.41
	B-B’	Downstream (NW)	1.99

* Cross-sections for STEP embankments are shown on Figure 1.
Units 1 & 2 Bottom Ash Pond cross sections are shown on Figure 2.

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 loading condition (see 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 5-2: Results Summary – Static, Maximum Surcharge Pool

Embankment	Stability Section*	Direction	Calculated Factor of Safety
E/C Divider Dike	A-A’	Downstream (North)	1.56
E/B Divider Dike	B-B’	B-Cell (NW)	2.42
		E-Cell (SE)	1.78
	C-C’	B-Cell (NW)	2.41
		E-Cell (SE)	2.19
E/D Divider Dike	D-D’	D-Cell (South)	2.26
		E-Cell (North)	4.37
CW/D Divider Dike	E-E’	D-Cell (South)	2.27
		Clearwell (North)	1.76
D-Cell: South Embankment	F-F’	Downstream (South)	2.09
STEP Main Dam	G-G’	Downstream (East)	2.11
1 & 2 Bottom Ash Pond	A-A’	Downstream (East)	2.41
	B-B’	Downstream (NW)	1.99

* Cross-sections for STEP embankments are shown on Figure 1.
Units 1 & 2 Bottom Ash Pond cross sections are shown on Figure 2.

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 5-3: Results Summary – Seismic, Maximum Storage Pool

Embankment	Stability Section*	Direction	Calculated Factor of Safety
E/C Divider Dike	A-A'	Downstream (North)	1.11
E/B Divider Dike	B-B'	B-Cell (NW)	1.71
		E-Cell (SE)	1.28
	C-C'	B-Cell (NW)	1.68
		E-Cell (SE)	1.55
E/D Divider Dike	D-D'	D-Cell (South)	2.05
		E-Cell (North)	3.80
CW/D Divider Dike	E-E'	D-Cell (South)	1.58
		Clearwell (North)	1.25
D-Cell: South Embankment	F-F'	Downstream (South)	1.49
STEP Main Dam	G-G'	Downstream (East)	1.47
1 & 2 Bottom Ash Pond	A-A'	Downstream (East)	1.74
	B-B'	Downstream (NW)	1.43

* Cross-sections for STEP embankments are shown on Figure 1.
Units 1 & 2 Bottom Ash Pond cross sections are shown on Figure 2.

5.4 Loading Condition: Liquefaction

Liquefaction requirements are described in §274.73(e)(1)(iv). It has been determined that embankments of the Units 1 & 2 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 1 & 2 surface impoundments were designed and constructed using conservative approaches to stability. In particular, the embankment slopes are not steep and the highest embankment (STEP Main Dam) employed zoned construction with drains and filters to prevent piping. Placement of fill appears to have been carefully controlled. 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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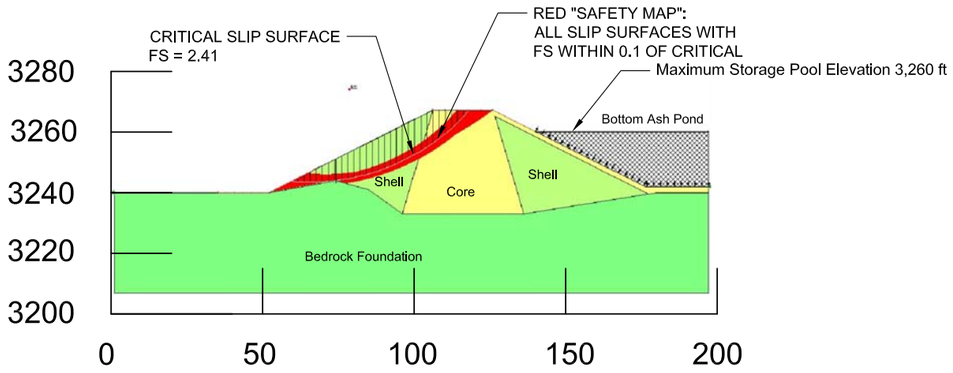
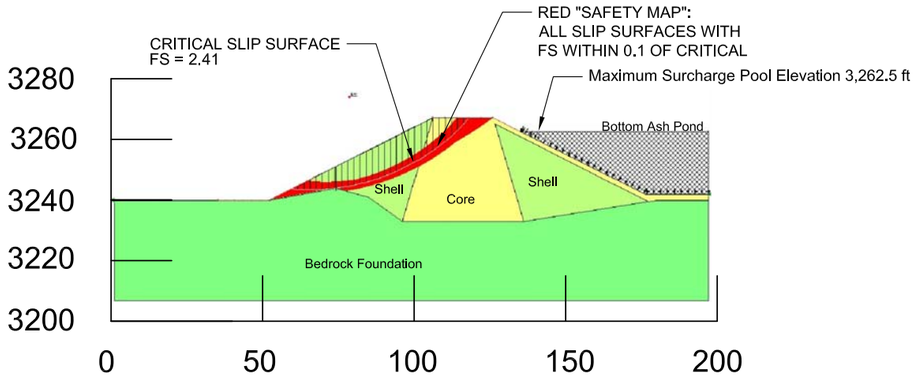
APPENDIX A

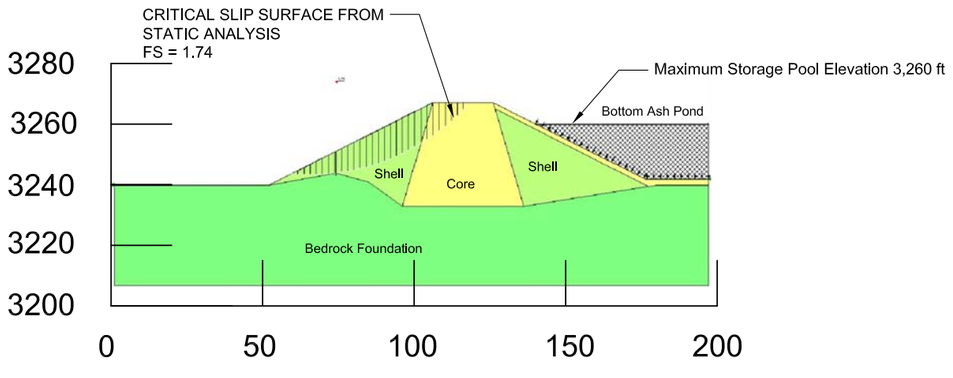
Stability Model Cross-Section Figures



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



BOTTOM ASH CROSS-SECTION A-A' OUTBOARD
STATIC MAXIMUM SURCHARGE POOL



BOTTOM ASH CROSS-SECTION A-A' OUTBOARD
SEISMIC

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

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PROJECT TITLE:
UNITS 1 & 2 SAFETY
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ELECTRIC STATION
COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
BOTTOM ASH
CROSS SECTION A-A'
OUTBOARD FACE

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

PROJECT NUMBER
16419

SHEET
A-1

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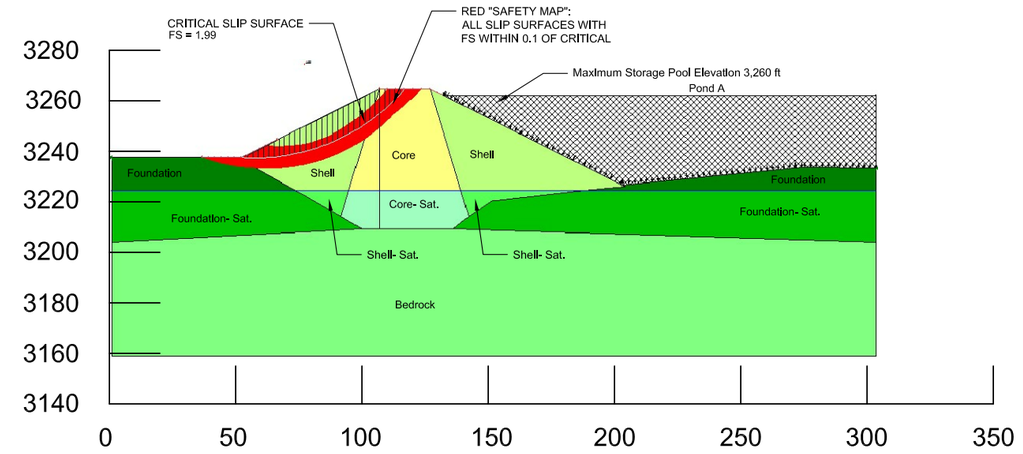
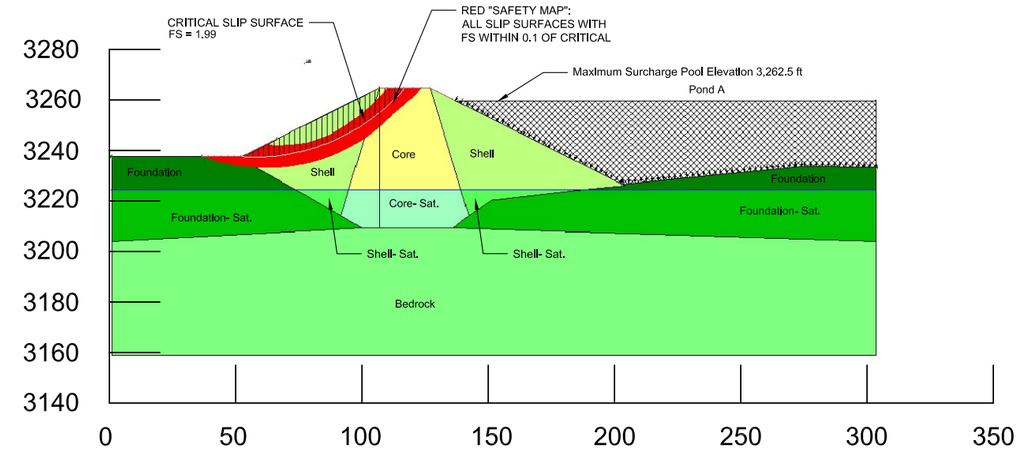
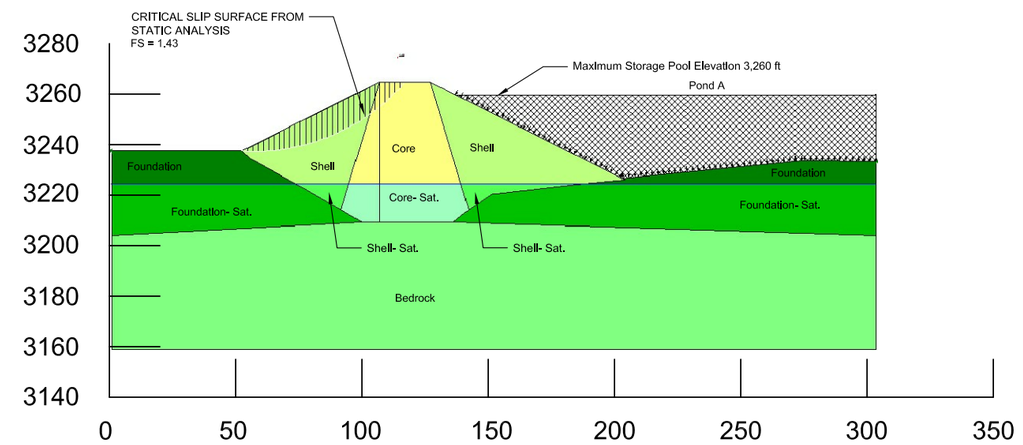


BOTTOM ASH CROSS-SECTION B-B' OUTBOARD STATIC MAXIMUM STORAGE POOL



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



BOTTOM ASH CROSS-SECTION B-B' OUTBOARD SEISMIC

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

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COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
BOTTOM ASH
CROSS SECTION B-B'
OUTBOARD FACE

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	10/14/2016

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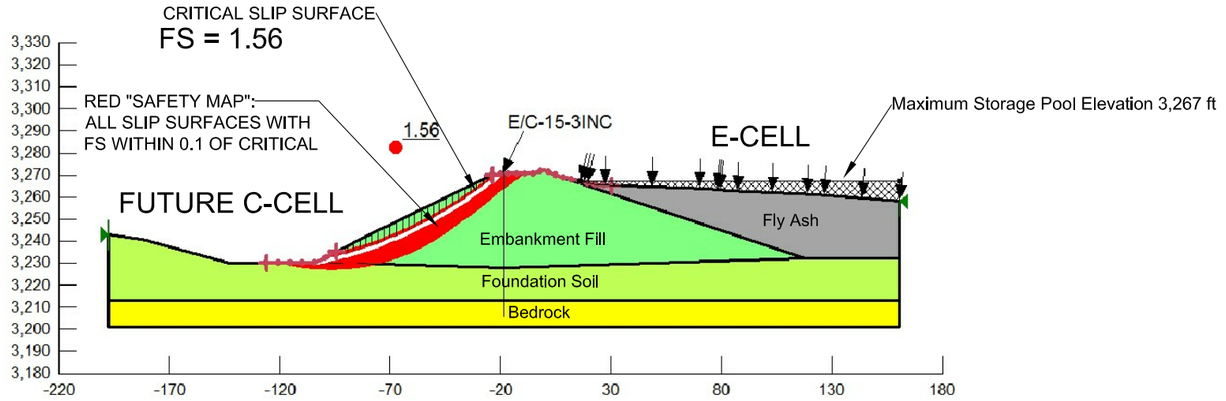
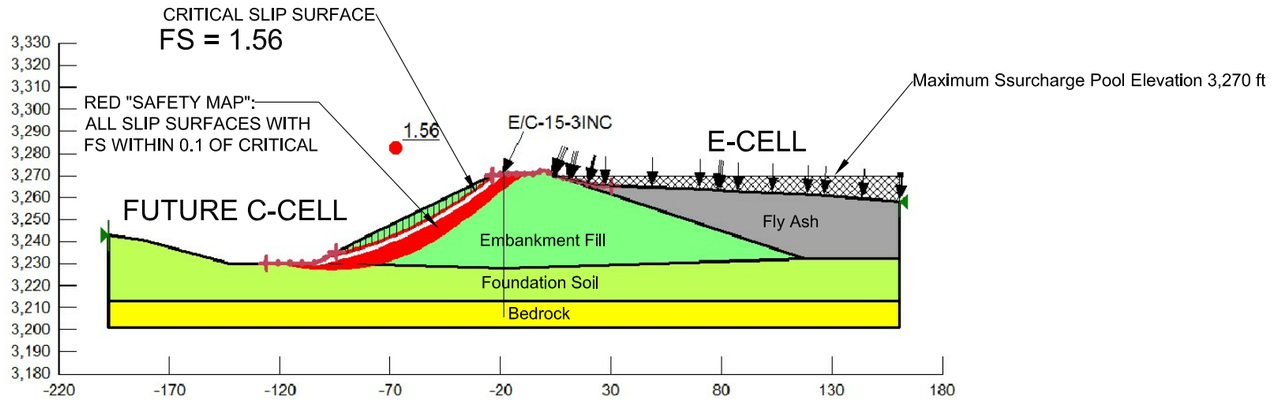
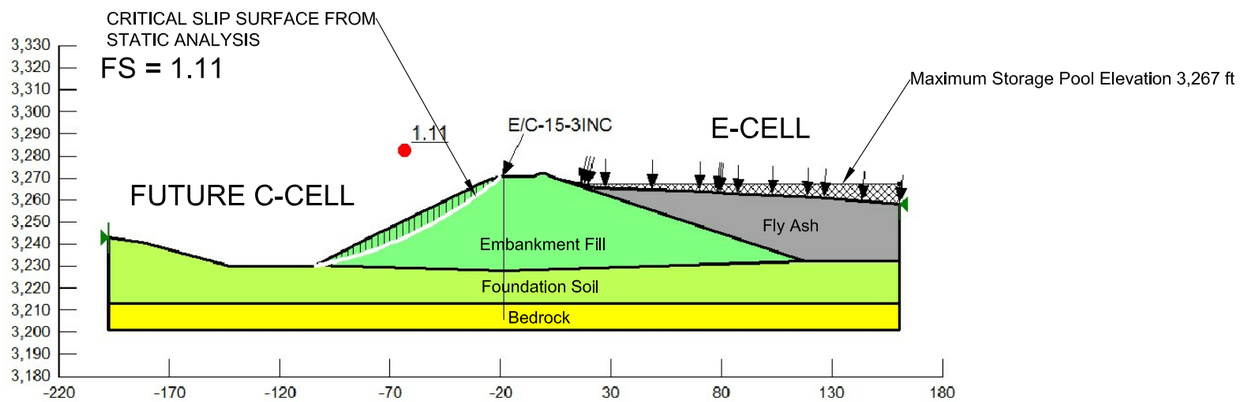


CROSS-SECTION A-A' OUTBOARD MAXIMUM STORAGE POOL



CROSS-SECTION A-A' OUTBOARD MAXIMUM SURCHARGE POOL



CROSS-SECTION A-A' OUTBOARD SEISMIC

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

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CROSS SECTION A-A'
OUTBOARD FACE

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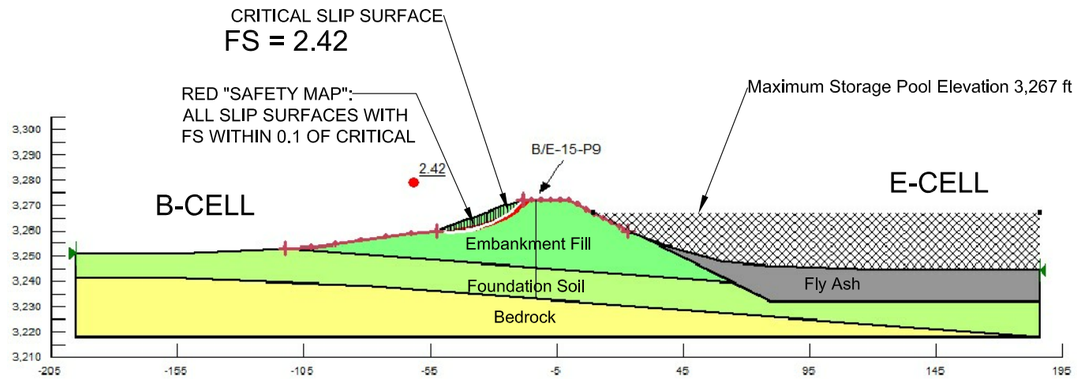
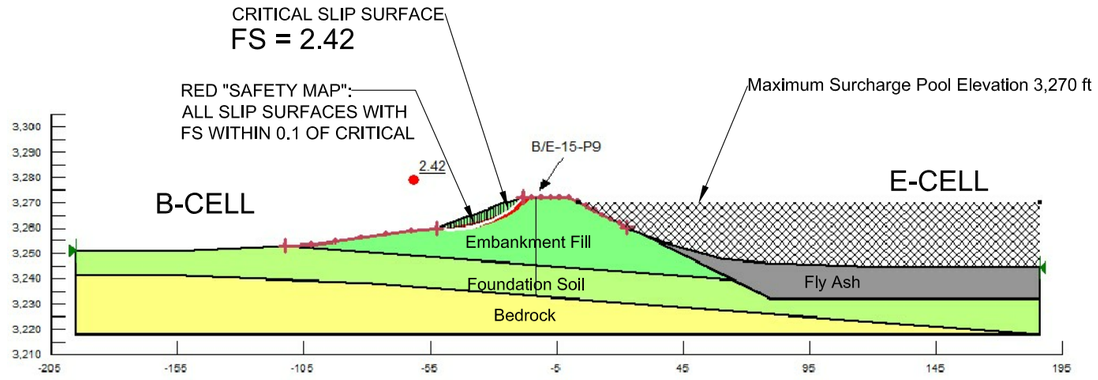
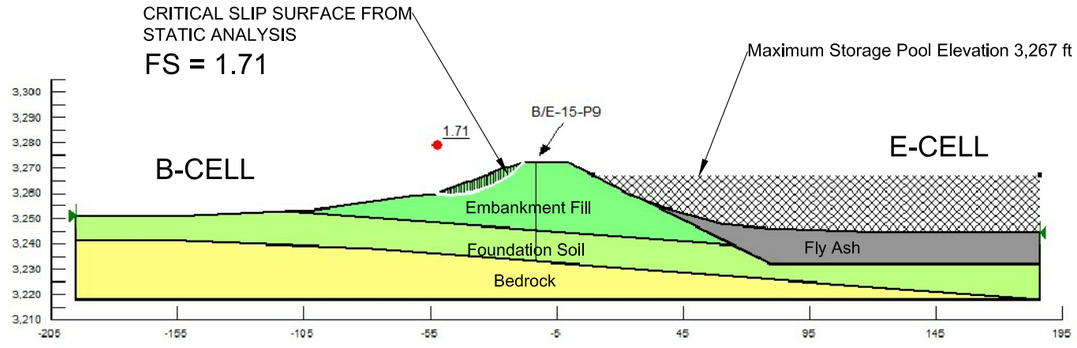


CROSS-SECTION B-B' MAXIMUM STORAGE POOL B-CELL DIRECTION



CROSS-SECTION B-B' MAXIMUM SURCHARGE POOL B-CELL DIRECTION



CROSS-SECTION B-B' B-CELL DIRECTION SEISMIC

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

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CROSS SECTION B-B'
B-CELL DIRECTION

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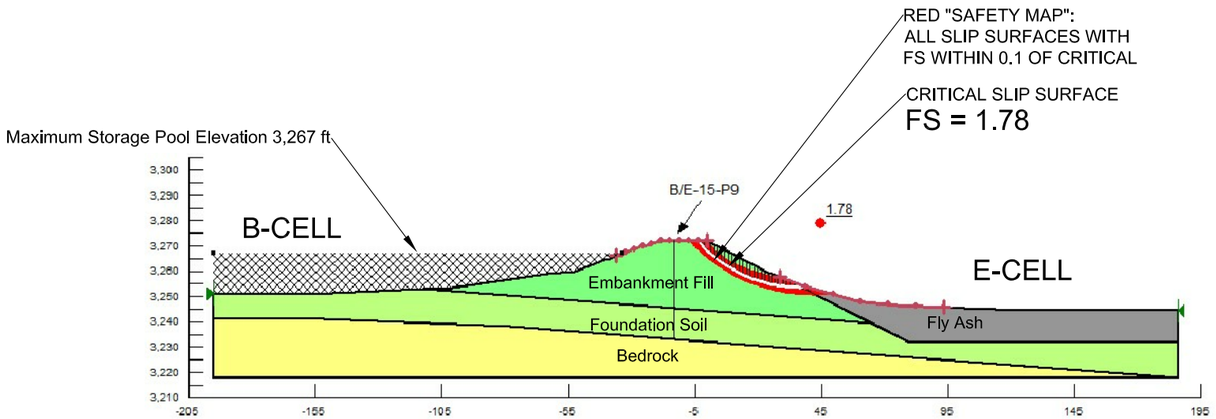
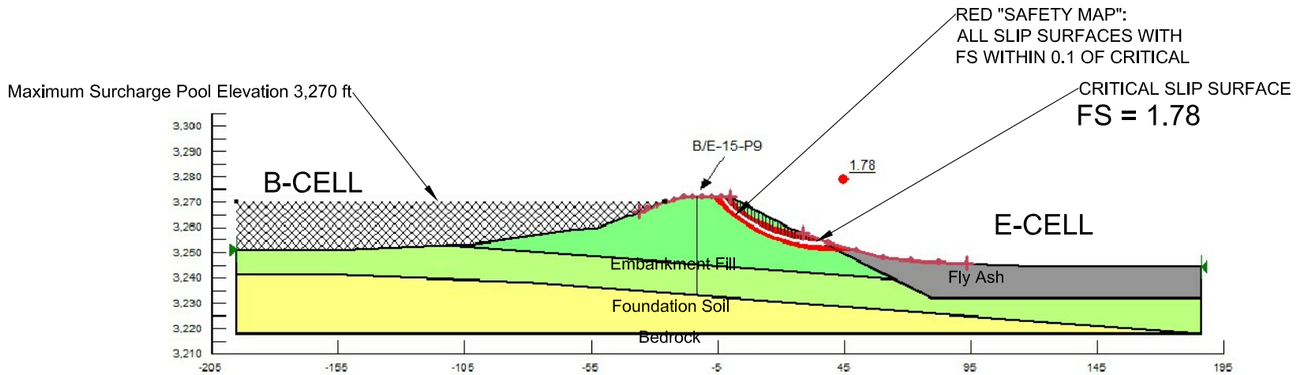
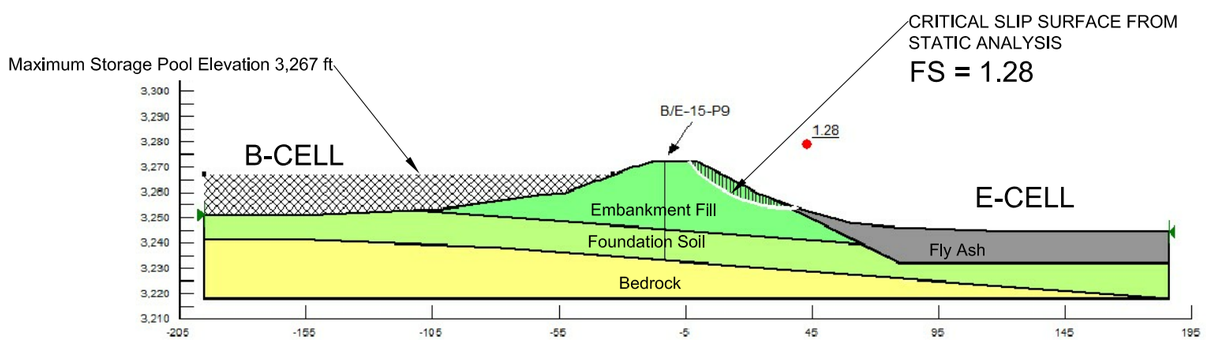


CROSS-SECTION B-B' MAXIMUM STORAGE POOL E-CELL DIRECTION



CROSS-SECTION B-B' MAXIMUM SURCHARGE POOL E-CELL DIRECTION



CROSS-SECTION B-B' E-CELL DIRECTION SEISMIC

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

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E-CELL DIRECTION

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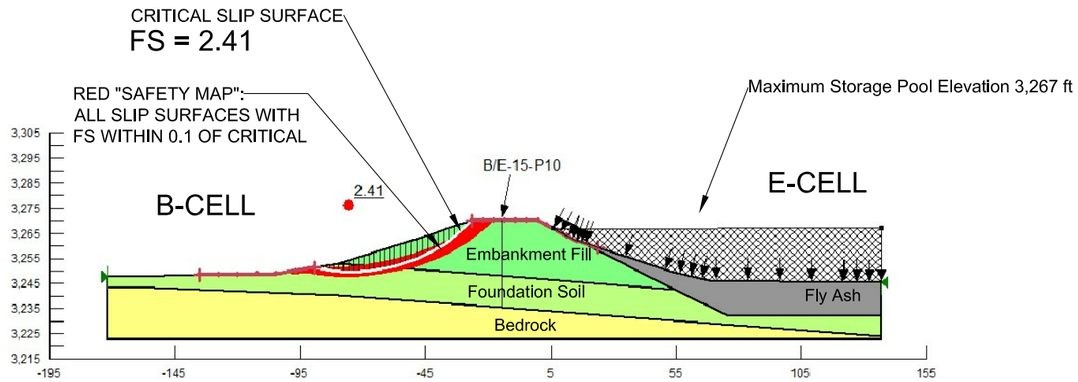
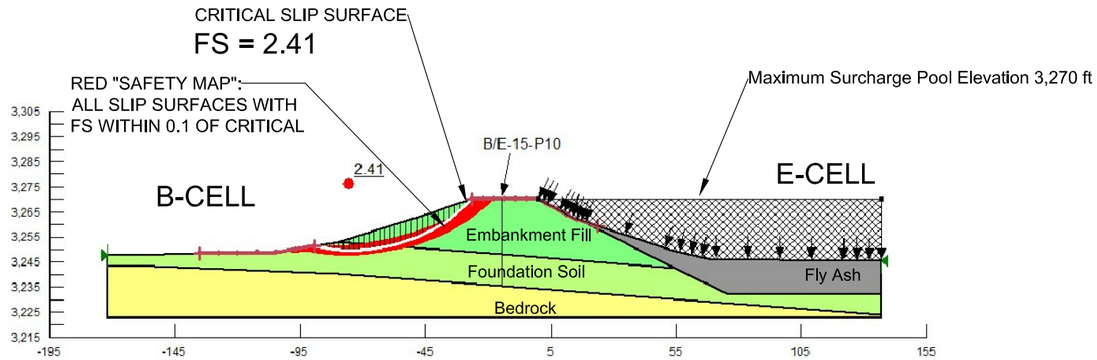


CROSS-SECTION C-C' MAXIMUM STORAGE POOL B-CELL DIRECTION



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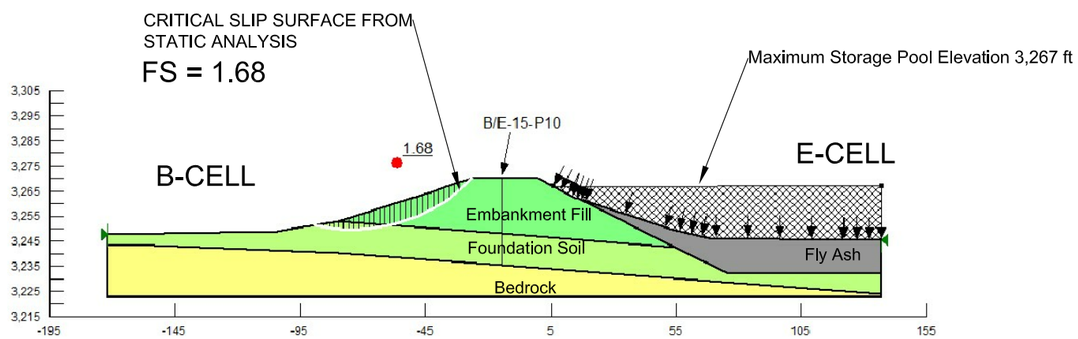

CROSS-SECTION C-C' B-CELL DIRECTION SEISMIC

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

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B-CELL DIRECTION

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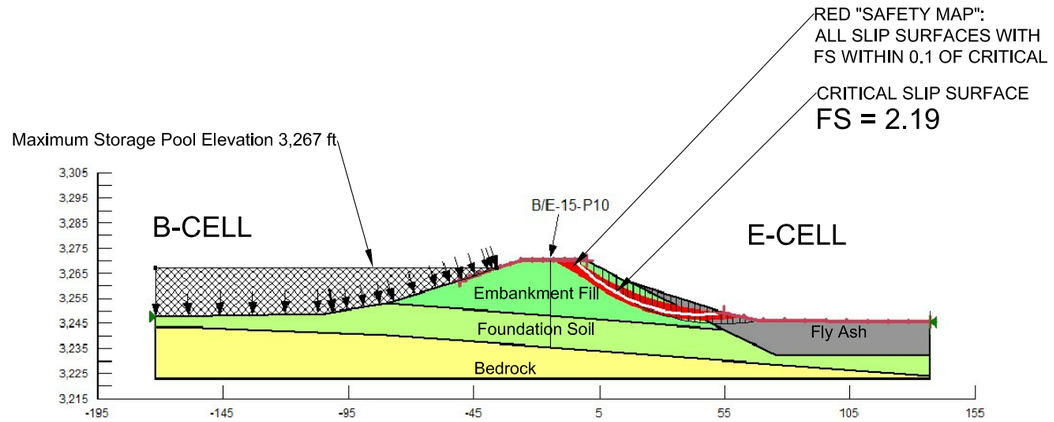
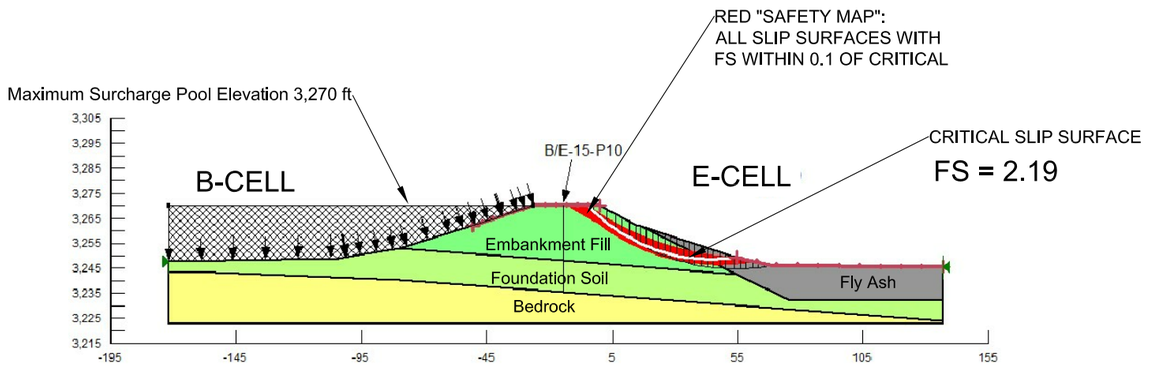
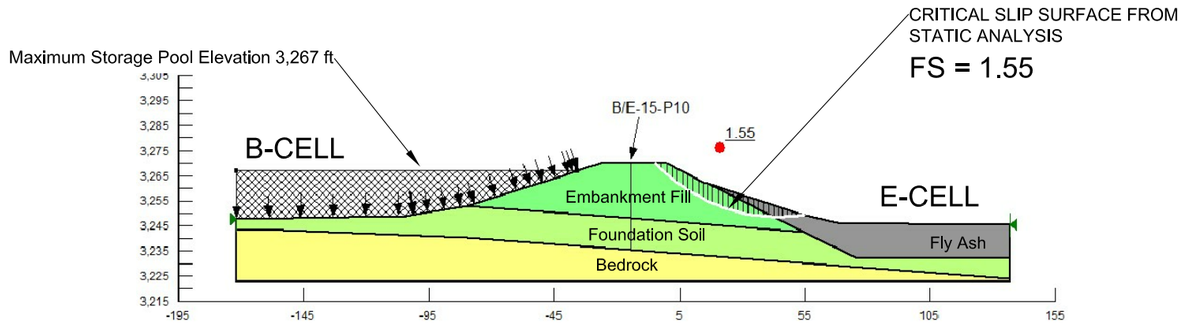


CROSS-SECTION C-C' MAXIMUM STORAGE POOL E-CELL DIRECTION



CROSS-SECTION C-C' MAXIMUM SURCHARGE POOL E-CELL DIRECTION



CROSS-SECTION C-C' E-CELL DIRECTION SEISMIC

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

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

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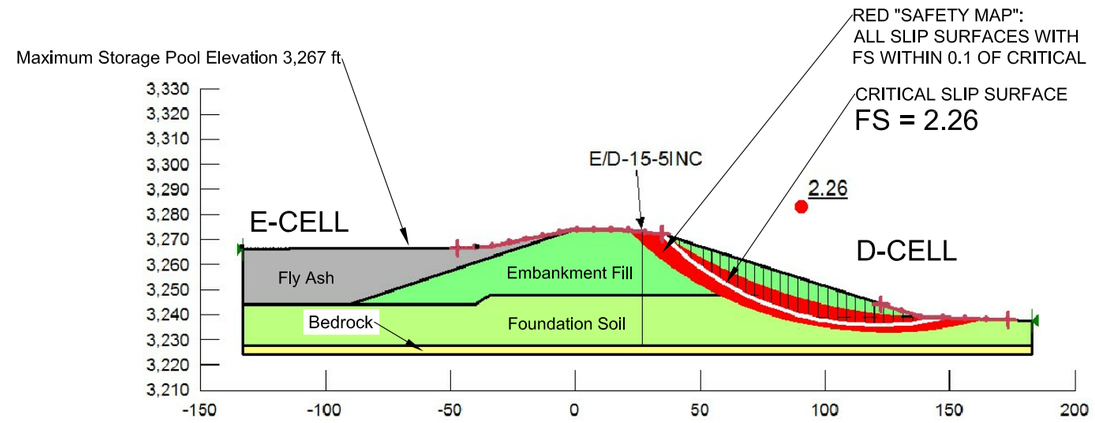
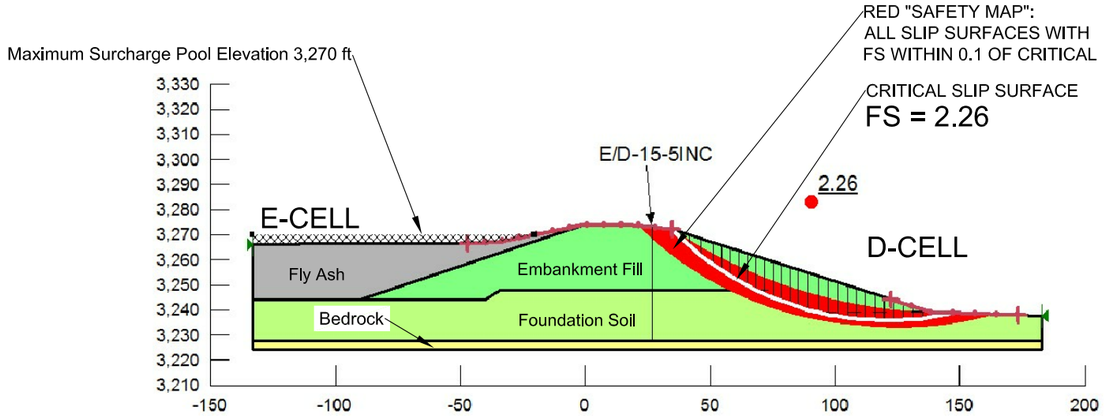
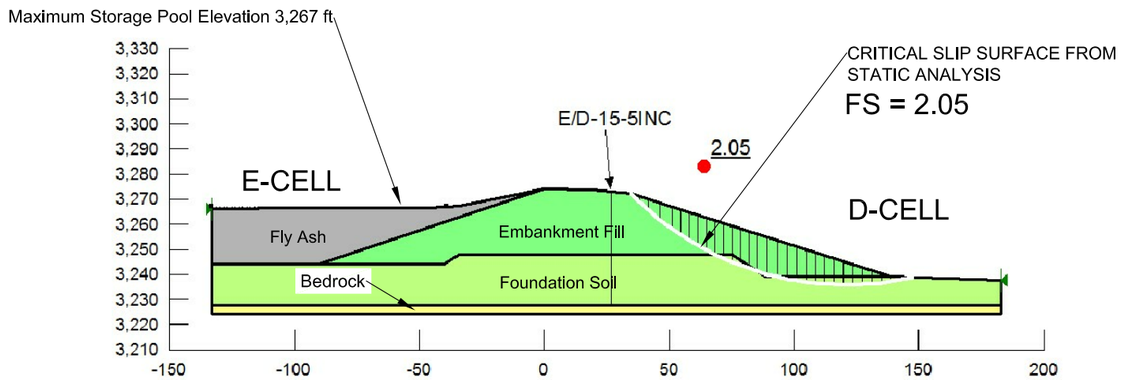


CROSS-SECTION D-D' MAXIMUM STORAGE POOL D-CELL DIRECTION



CROSS-SECTION D-D' MAXIMUM SURCHARGE POOL D-CELL DIRECTION



CROSS-SECTION D-D' D-CELL DIRECTION SEISMIC

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

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COLSTRIP, MONTANA

SHEET TITLE:
STABILITY MODEL
CROSS SECTION D-D'
D-CELL DIRECTION

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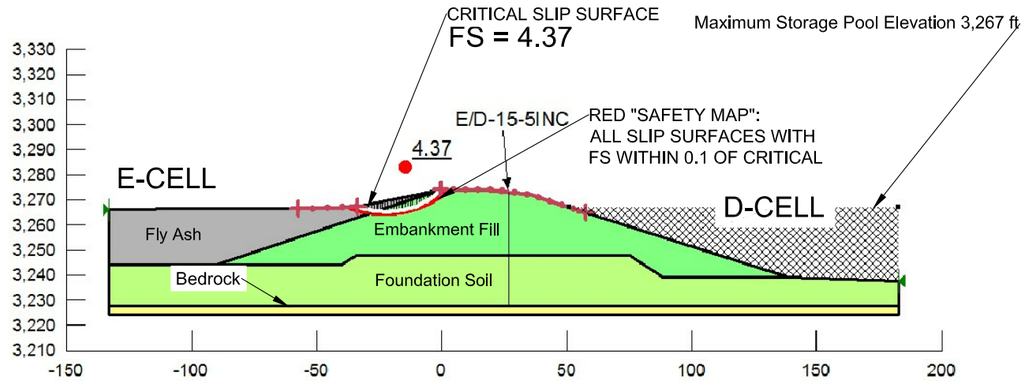
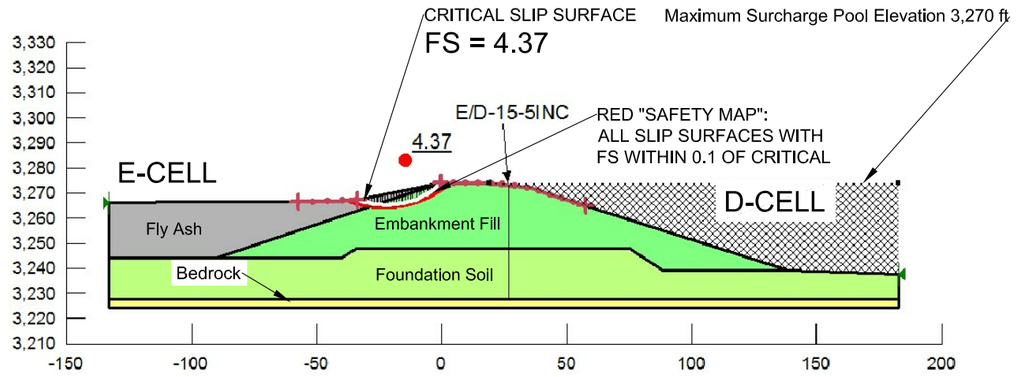


CROSS-SECTION D-D' MAXIMUM STORAGE POOL E-CELL DIRECTION



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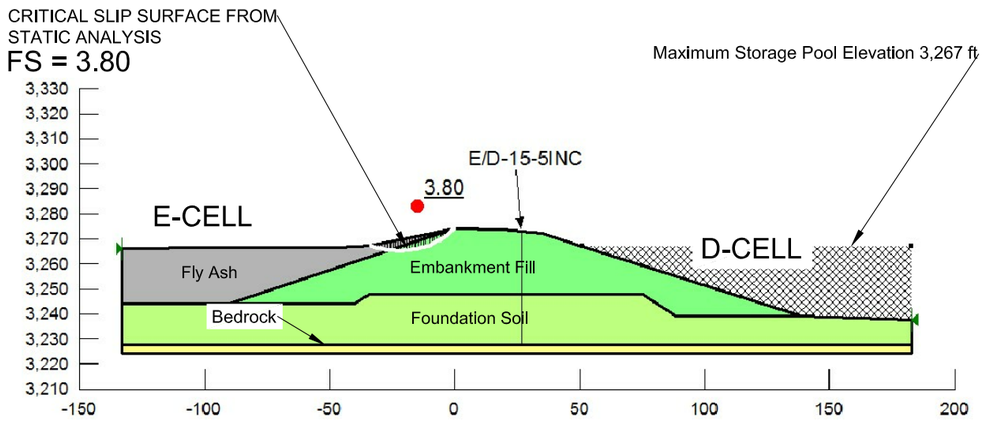

CROSS-SECTION D-D' E-CELL DIRECTION SEISMIC

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

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CROSS SECTION D-D'
E-CELL DIRECTION

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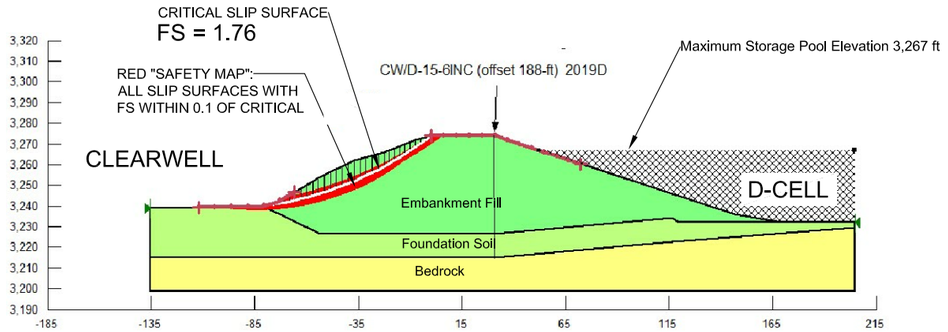
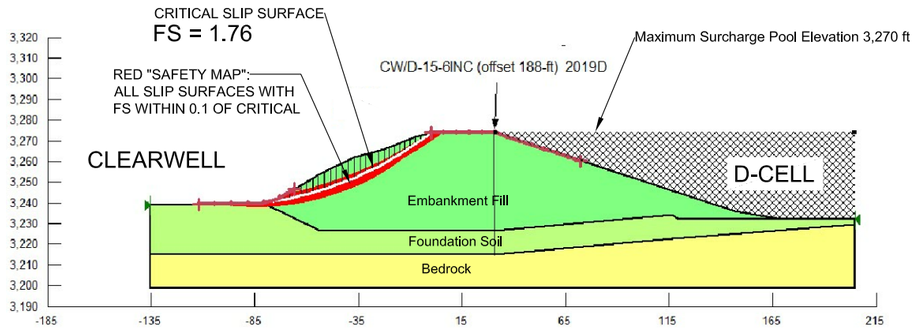
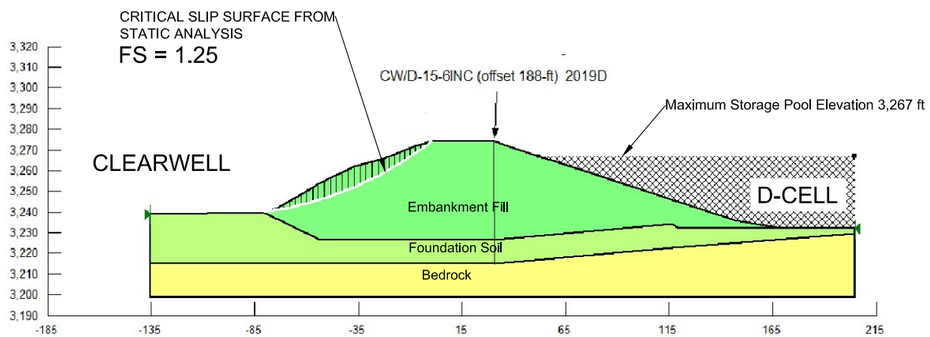


CROSS-SECTION E-E' MAXIMUM STORAGE POOL CLEARWELL DIRECTION



CROSS-SECTION E-E' MAXIMUM SURCHARGE POOL CLEARWELL DIRECTION



CROSS-SECTION E-E' CLEARWELL DIRECTION SEISMIC

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

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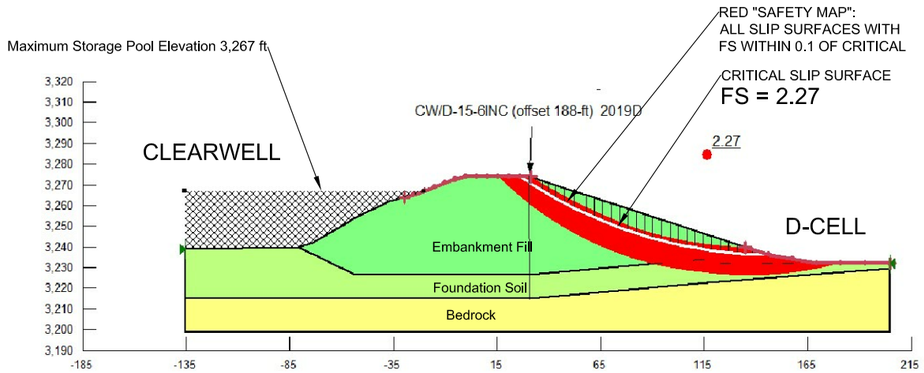
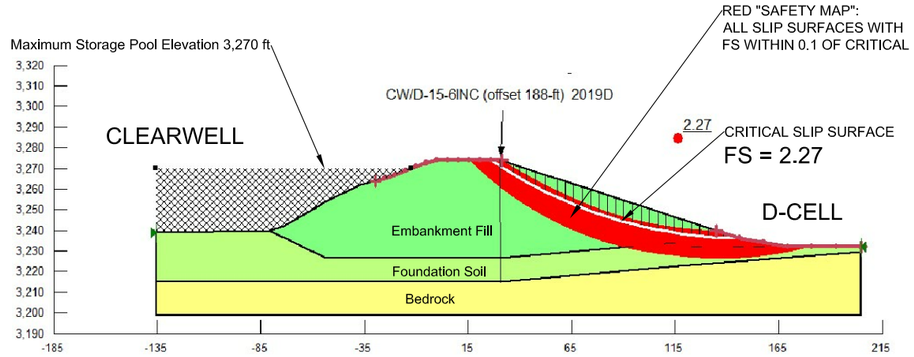
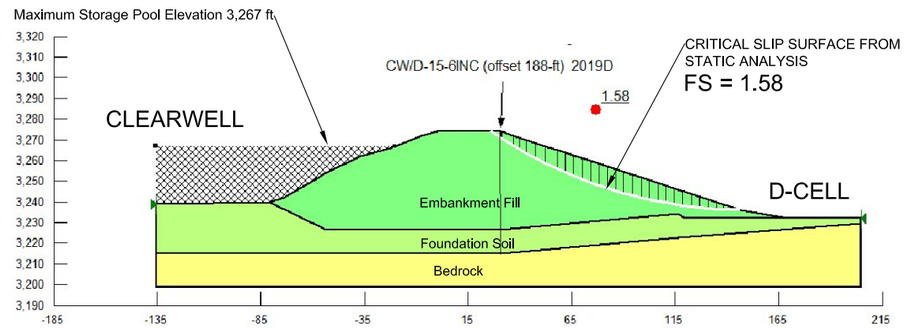


CROSS-SECTION E-E' MAXIMUM STORAGE POOL D-CELL DIRECTION



CROSS-SECTION E-E' MAXIMUM SURCHARGE POOL D-CELL DIRECTION



CROSS-SECTION E-E' D-CELL DIRECTION SEISMIC

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

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CROSS-SECTION E-E'
B-CELL DIRECTION

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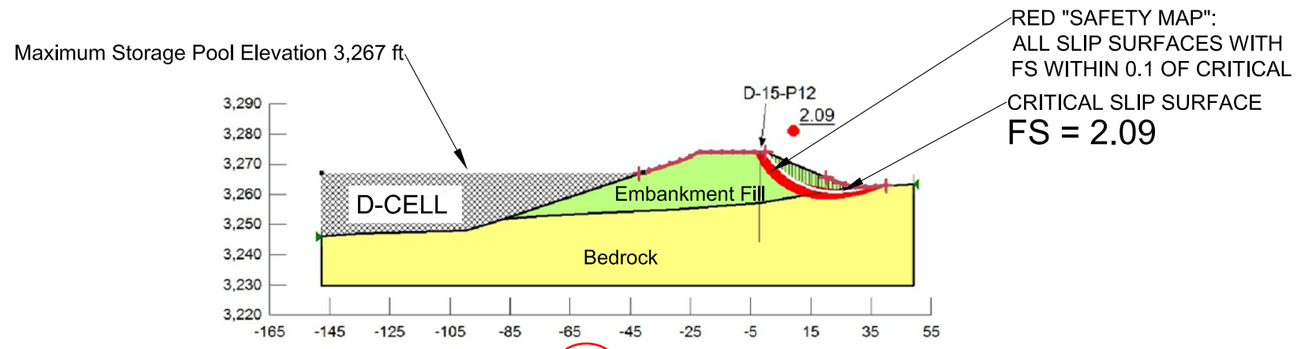
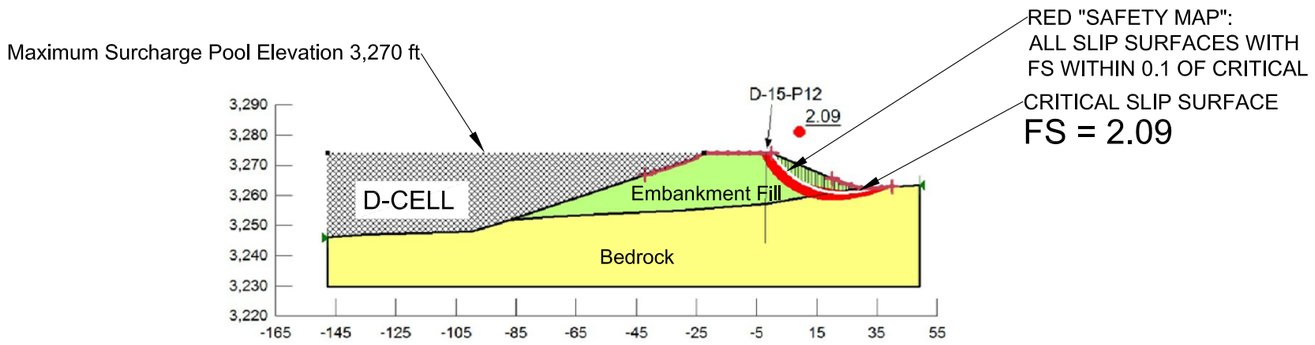
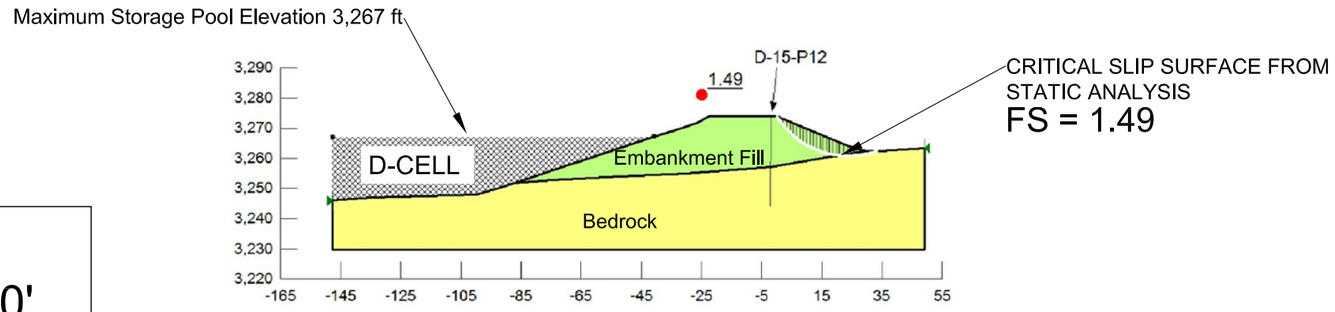


CROSS-SECTION F-F" OUTBOARD STATIC
MAXIMUM STORAGE POOL



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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OUTBOARD FACE

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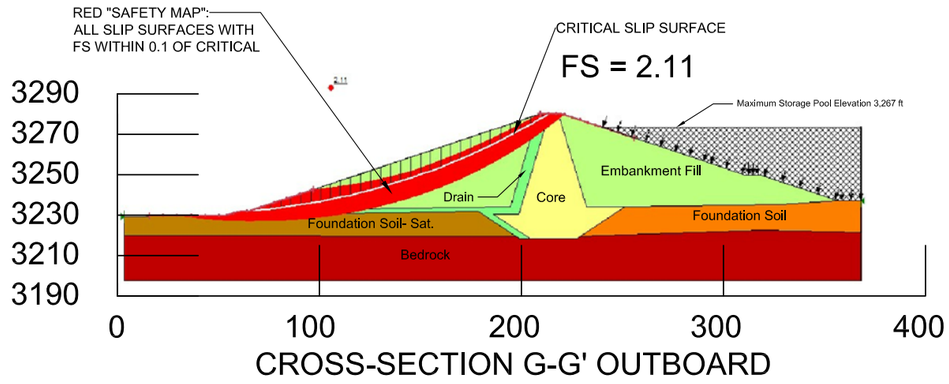
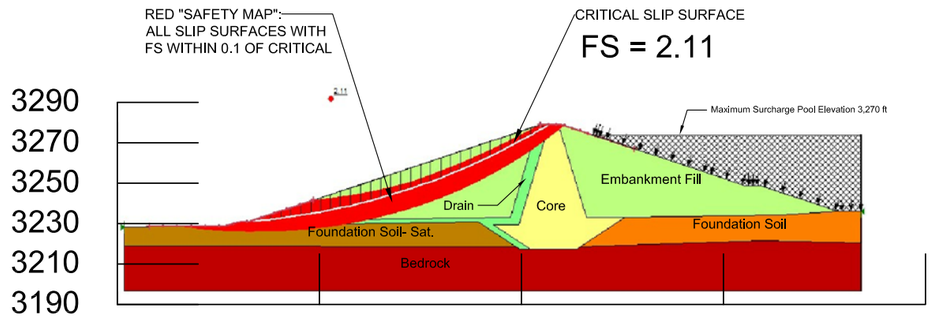
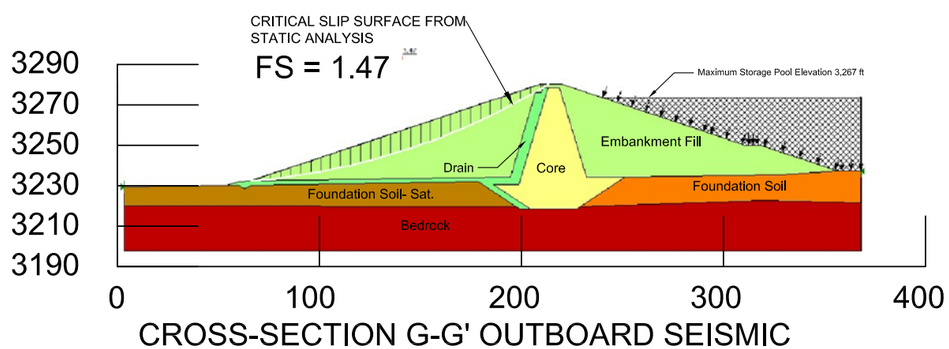
SHEET
A-12



CROSS-SECTION G-G' OUTBOARD



CROSS-SECTION G-G' OUTBOARD



CROSS-SECTION G-G' OUTBOARD SEISMIC

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

JORGENSEN
JACKSON, WYOMING
307.733.5150
www.jorgensenassociates.com

PROJECT TITLE:
UNITS 1 & 2 SAFETY FACTOR ASSESSMENT
COLSTRIP STEAM ELECTRIC STATION
COLSTRIP, MONTANA

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

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

PROJECT NUMBER
16419

SHEET
A-13

H:\2016\16419 Talen\32-33 Safety Factor Assessments\CAD\Appendix A\16419_12STEP Stability Figures.dwg

APPENDIX B

Slope Stability Analyses Reports

Static Safety Factor: Operational Storage Pool

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 29
Date: 9/27/2016
Time: 9:57:01 AM
Tool Version: 8.15
File Name: EC-15-3INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:57:02 AM

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 FS: Operational 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

Foundation Soil
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Bedrock
Model: Bedrock (Impenetrable)

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-126, 3,230) ft
Left-Zone Right Coordinate: (-94.3469, 3,235.0838) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-23.65162, 3,270) ft
Right-Zone Right Coordinate: (30.425, 3,265.142) ft
Right-Zone Increment: 15
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-197.66858, 3,243.0428) ft
Right Coordinate: (161, 3,258.0919) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	16.10978	3,267.0211
	161	3,267

Points

	X (ft)	Y (ft)
Point 1	-18.40852	3,213.0359
Point 2	-197.66858	3,213.0359
Point 3	-197.66858	3,200.9397
Point 4	161	3,200.9397
Point 5	161	3,213.0359
Point 6	-18.40852	3,270.5359
Point 7	-23.65162	3,270
Point 8	-27.89711	3,268.168
Point 9	-81.122	3,242
Point 10	-103.32505	3,230.3885
Point 11	-18.40852	3,228.0359
Point 12	6.48018	3,269.2675
Point 13	0	3,272
Point 14	-2.042	3,271.9944
Point 15	-5.21772	3,270.5359
Point 16	117.59613	3,232.2289
Point 17	161	3,258.0919
Point 18	122.73292	3,261.1364
Point 19	83.40645	3,262.7572
Point 20	74.09769	3,263.7914
Point 21	23.20828	3,265.3652

Point 22	161	3,232.2289
Point 23	-104.06799	3,230
Point 24	-142.6227	3,230
Point 25	-182.21732	3,241.0535
Point 26	-197.66858	3,243.0428
Point 27	40.28819	3,257.9982
Point 28	161	3,270
Point 29	4.74304	3,270
Point 30	161	3,267
Point 31	16.10978	3,267.0211

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5	4,338.5
Region 2	Embankment Fill	16,27,12,29,13,14,15,6,7,8,9,10,11	5,218.9
Region 3	Fly Ash	17,18,19,20,21,31,12,27,16,22	2,681
Region 4	Foundation Soil	5,22,16,11,10,23,24,25,26,2,1	6,537.5

Current Slip Surface

Slip Surface: 457
F of S: 1.56
Volume: 454.48638 ft³
Weight: 56,581.575 lbs
Resisting Moment: 7,158,493.4 lbs-ft
Activating Moment: 4,598,896.3 lbs-ft
Resisting Force: 34,094.483 lbs
Activating Force: 21,903.679 lbs
F of S Rank (Analysis): 1 of 784 slip surfaces
F of S Rank (Query): 1 of 784 slip surfaces
Exit: (-104.06553, 3,230.0013) ft
Entry: (-19.975573, 3,270.3757) ft
Radius: 188.26208 ft
Center: (-140.96569, 3,414.6117) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-103.69529	3,230.0761	0	12.67806	7.9221312	0

Slice 2	-102.81858	3,230.2556	0	45.018448	28.130648	0
Slice 3	-100.98774	3,230.6482	0	108.28928	70.323883	50
Slice 4	-98.338971	3,231.2439	0	204.40376	132.74135	50
Slice 5	-95.690206	3,231.8799	0	296.30231	192.42097	50
Slice 6	-93.041441	3,232.5567	0	383.02826	248.74146	50
Slice 7	-90.392677	3,233.2747	0	463.67896	301.11664	50
Slice 8	-87.743912	3,234.0344	0	537.46067	349.03104	50
Slice 9	-85.095147	3,234.8363	0	603.73354	392.06915	50
Slice 10	-82.446382	3,235.6811	0	662.04306	429.93579	50
Slice 11	-79.721345	3,236.5961	0	708.44998	460.0728	50
Slice 12	-76.920035	3,237.5847	0	742.51281	482.19345	50
Slice 13	-74.118725	3,238.6235	0	767.77146	498.59661	50
Slice 14	-71.317415	3,239.7132	0	784.63681	509.5491	50
Slice 15	-68.516105	3,240.855	0	793.65801	515.40754	50
Slice 16	-65.714795	3,242.0498	0	795.47364	516.58662	50
Slice 17	-62.913485	3,243.2988	0	790.76338	513.52774	50
Slice 18	-60.112175	3,244.6031	0	780.20357	506.67012	50
Slice 19	-57.310865	3,245.964	0	764.42876	496.42584	50

Slice 20	-54.509555	3,247.3829	0	744.00011	483.15932	50
Slice 21	-51.708245	3,248.8613	0	719.38037	467.17107	50
Slice 22	-48.906935	3,250.4008	0	690.91484	448.68534	50
Slice 23	-46.105625	3,252.0031	0	658.81713	427.84085	50
Slice 24	-43.304315	3,253.6701	0	623.15865	404.68396	50
Slice 25	-40.503005	3,255.4039	0	583.86077	379.16362	50
Slice 26	-37.701695	3,257.2066	0	540.68853	351.12724	50
Slice 27	-34.900385	3,259.0807	0	493.24479	320.31691	50
Slice 28	-32.099075	3,261.0287	0	440.96326	286.36489	50
Slice 29	-29.297765	3,263.0536	0	383.09909	248.78746	50
Slice 30	-26.835738	3,264.8946	0	321.4837	208.77396	50
Slice 31	-24.712992	3,266.537	0	256.6275	166.65584	50
Slice 32	-21.813597	3,268.873	0	101.99364	66.235442	50

Static Safety Factor: Maximum Storage Pool

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 29
Date: 9/27/2016
Time: 9:57:01 AM
Tool Version: 8.15
File Name: EC-15-3INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:57:02 AM

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 FS: Max 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

Foundation Soil
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Bedrock
Model: Bedrock (Impenetrable)

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-126, 3,230) ft
Left-Zone Right Coordinate: (-94.3469, 3,235.0838) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-23.65162, 3,270) ft
Right-Zone Right Coordinate: (30.425, 3,265.142) ft
Right-Zone Increment: 15
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-197.66858, 3,243.0428) ft
Right Coordinate: (161, 3,258.0919) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	4.74304	3,270
	161	3,270

Points

	X (ft)	Y (ft)
Point 1	-18.40852	3,213.0359
Point 2	-197.66858	3,213.0359
Point 3	-197.66858	3,200.9397
Point 4	161	3,200.9397
Point 5	161	3,213.0359
Point 6	-18.40852	3,270.5359
Point 7	-23.65162	3,270
Point 8	-27.89711	3,268.168
Point 9	-81.122	3,242
Point 10	-103.32505	3,230.3885
Point 11	-18.40852	3,228.0359
Point 12	6.48018	3,269.2675
Point 13	0	3,272
Point 14	-2.042	3,271.9944
Point 15	-5.21772	3,270.5359
Point 16	117.59613	3,232.2289
Point 17	161	3,258.0919
Point 18	122.73292	3,261.1364
Point 19	83.40645	3,262.7572
Point 20	74.09769	3,263.7914
Point 21	23.20828	3,265.3652

Point 22	161	3,232.2289
Point 23	-104.06799	3,230
Point 24	-142.6227	3,230
Point 25	-182.21732	3,241.0535
Point 26	-197.66858	3,243.0428
Point 27	40.28819	3,257.9982
Point 28	161	3,270
Point 29	4.74304	3,270
Point 30	161	3,267
Point 31	16.10978	3,267.0211

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5	4,338.5
Region 2	Embankment Fill	16,27,12,29,13,14,15,6,7,8,9,10,11	5,218.9
Region 3	Fly Ash	17,18,19,20,21,31,12,27,16,22	2,681
Region 4	Foundation Soil	5,22,16,11,10,23,24,25,26,2,1	6,537.5

Current Slip Surface

Slip Surface: 457
F of S: 1.56
Volume: 454.48638 ft³
Weight: 56,581.575 lbs
Resisting Moment: 7,158,493.4 lbs-ft
Activating Moment: 4,598,896.3 lbs-ft
Resisting Force: 34,094.483 lbs
Activating Force: 21,903.679 lbs
F of S Rank (Analysis): 1 of 784 slip surfaces
F of S Rank (Query): 1 of 784 slip surfaces
Exit: (-104.06553, 3,230.0013) ft
Entry: (-19.975573, 3,270.3757) ft
Radius: 188.26208 ft
Center: (-140.96569, 3,414.6117) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-103.69529	3,230.0761	0	12.67806	7.9221312	0

Slice 2	-102.81858	3,230.2556	0	45.018448	28.130648	0
Slice 3	-100.98774	3,230.6482	0	108.28928	70.323883	50
Slice 4	-98.338971	3,231.2439	0	204.40376	132.74135	50
Slice 5	-95.690206	3,231.8799	0	296.30231	192.42097	50
Slice 6	-93.041441	3,232.5567	0	383.02826	248.74146	50
Slice 7	-90.392677	3,233.2747	0	463.67896	301.11664	50
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Slice 12	-76.920035	3,237.5847	0	742.51281	482.19345	50
Slice 13	-74.118725	3,238.6235	0	767.77146	498.59661	50
Slice 14	-71.317415	3,239.7132	0	784.63681	509.5491	50
Slice 15	-68.516105	3,240.855	0	793.65801	515.40754	50
Slice 16	-65.714795	3,242.0498	0	795.47364	516.58662	50
Slice 17	-62.913485	3,243.2988	0	790.76338	513.52774	50
Slice 18	-60.112175	3,244.6031	0	780.20357	506.67012	50
Slice 19	-57.310865	3,245.964	0	764.42876	496.42584	50

Slice 20	-54.509555	3,247.3829	0	744.00011	483.15932	50
Slice 21	-51.708245	3,248.8613	0	719.38037	467.17107	50
Slice 22	-48.906935	3,250.4008	0	690.91484	448.68534	50
Slice 23	-46.105625	3,252.0031	0	658.81713	427.84085	50
Slice 24	-43.304315	3,253.6701	0	623.15865	404.68396	50
Slice 25	-40.503005	3,255.4039	0	583.86077	379.16362	50
Slice 26	-37.701695	3,257.2066	0	540.68853	351.12724	50
Slice 27	-34.900385	3,259.0807	0	493.24479	320.31691	50
Slice 28	-32.099075	3,261.0287	0	440.96326	286.36489	50
Slice 29	-29.297765	3,263.0536	0	383.09909	248.78746	50
Slice 30	-26.835738	3,264.8946	0	321.4837	208.77396	50
Slice 31	-24.712992	3,266.537	0	256.6275	166.65584	50
Slice 32	-21.813597	3,268.873	0	101.99364	66.235442	50

Seismic Safety Factor

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 29
Date: 9/27/2016
Time: 9:57:01 AM
Tool Version: 8.15
File Name: EC-15-3INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:57:02 AM

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 FS

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 FS: Operational 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)

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Fly Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 27.52 °
Phi-B: 0 °

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-197.66858, 3,243.0428) ft
Right Coordinate: (161, 3,258.0919) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	16.10978	3,267.0211
	161	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	-18.40852	3,213.0359
Point 2	-197.66858	3,213.0359
Point 3	-197.66858	3,200.9397
Point 4	161	3,200.9397
Point 5	161	3,213.0359
Point 6	-18.40852	3,270.5359
Point 7	-23.65162	3,270
Point 8	-27.89711	3,268.168
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Point 10	-103.32505	3,230.3885
Point 11	-18.40852	3,228.0359
Point 12	6.48018	3,269.2675
Point 13	0	3,272
Point 14	-2.042	3,271.9944
Point 15	-5.21772	3,270.5359
Point 16	117.59613	3,232.2289
Point 17	161	3,258.0919
Point 18	122.73292	3,261.1364
Point 19	83.40645	3,262.7572
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Point 21	23.20828	3,265.3652
Point 22	161	3,232.2289
Point 23	-104.06799	3,230
Point 24	-142.6227	3,230
Point 25	-182.21732	3,241.0535

Point 26	-197.66858	3,243.0428
Point 27	40.28819	3,257.9982
Point 28	161	3,270
Point 29	4.74304	3,270
Point 30	161	3,267
Point 31	16.10978	3,267.0211

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5	4,338.5
Region 2	Embankment Fill - Seismic	16,27,12,29,13,14,15,6,7,8,9,10,11	5,218.9
Region 3	Fly Ash - Seismic	17,18,19,20,21,31,12,27,16,22	2,681
Region 4	Foundation Soil - Seismic	5,22,16,11,10,23,24,25,26,2,1	6,537.5

Current Slip Surface

Slip Surface: 1
F of S: 1.11
Volume: 454.48637 ft³
Weight: 56,581.574 lbs
Resisting Moment: 5,436,555.2 lbs-ft
Activating Moment: 4,879,447.6 lbs-ft
Resisting Force: 25,904.532 lbs
Activating Force: 23,248.561 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-104.06553, 3,230.0013) ft
Entry: (-19.975573, 3,270.3757) ft
Radius: 188.26208 ft
Center: (-140.96569, 3,414.6117) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-103.69529	3,230.0761	0	12.61339	6.043324	0
Slice 2	-102.81858	3,230.2556	0	44.797703	21.463463	0
Slice 3	-100.98774	3,230.6482	0	107.65141	53.438625	40
Slice 4	-98.338971	3,231.2439	0	204.10935	101.32076	40
Slice 5	-95.690206	3,231.8799	0	296.40003	147.13425	40
Slice 6	-93.041441	3,232.5567	0	383.47392	190.35811	40

Slice 7	-90.392677	3,233.2747	0	464.33632	230.49855	40
Slice 8	-87.743912	3,234.0344	0	538.11178	267.12101	40
Slice 9	-85.095147	3,234.8363	0	604.09744	299.87657	40
Slice 10	-82.446382	3,235.6811	0	661.80101	328.52087	40
Slice 11	-79.721345	3,236.5961	0	707.28185	351.09776	40
Slice 12	-76.920035	3,237.5847	0	740.10952	367.39355	40
Slice 13	-74.118725	3,238.6234	0	763.86375	379.18526	40
Slice 14	-71.317415	3,239.7132	0	779.03381	386.71574	40
Slice 15	-68.516105	3,240.855	0	786.26226	390.30397	40
Slice 16	-65.714795	3,242.0498	0	786.28374	390.31464	40
Slice 17	-62.913485	3,243.2988	0	779.87287	387.13225	40
Slice 18	-60.112175	3,244.6031	0	767.78864	381.13359	40
Slice 19	-57.310865	3,245.964	0	750.73523	372.6682	40
Slice 20	-54.509555	3,247.3829	0	729.32591	362.04053	40
Slice 21	-51.708245	3,248.8613	0	704.05706	349.49696	40
Slice 22	-48.906935	3,250.4008	0	675.29089	335.21731	40
Slice 23	-46.105625	3,252.0031	0	643.24226	319.30823	40
Slice 24	-43.304315	3,253.6701	0	607.9687	301.79829	40
Slice 25	-40.503005	3,255.4039	0	569.36678	282.63612	40
Slice 26	-37.701695	3,257.2066	0	527.1654	261.68718	40
Slice 27	-34.900385	3,259.0807	0	480.92289	238.7322	40
Slice 28	-32.099075	3,261.0287	0	430.02095	213.46425	40
Slice 29	-29.297765	3,263.0536	0	373.65708	185.48499	40
Slice 30	-26.835738	3,264.8946	0	313.51921	155.63229	40
Slice 31	-24.712992	3,266.537	0	250.05207	124.12693	40
Slice 32	-21.813597	3,268.873	0	98.151335	48.722746	40

Static Safety Factor: Maximum Storage Pool (B-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 67
Date: 10/12/2016
Time: 8:42:53 AM
Tool Version: 8.15.1.11236
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 8:42:54 AM

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

A1 Static FS: 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-112.31643, 3,253.1304) ft
Left-Zone Right Coordinate: (-52.61754, 3,259.9987) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-18.56898, 3,272) ft
Right-Zone Right Coordinate: (23.22569, 3,259.9503) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	9.57367	3,267.0331
	186.10449	3,267

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127

Point 22	-12.95585	3,233
Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251
Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065
Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 549
F of S: 2.42
Volume: 115.13801 ft³
Weight: 14,334.682 lbs
Resisting Moment: 422,637.67 lbs-ft
Activating Moment: 174,445.28 lbs-ft
Resisting Force: 10,123.112 lbs
Activating Force: 4,178.4308 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-52.61754, 3,259.9987) ft
Entry: (-18.56898, 3,272) ft
Radius: 38.667185 ft

Center: (-46.960796, 3,298.2499) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-52.069074	3,259.9256	0	39.152634	25.426018	50
Slice 2	-50.972141	3,259.7953	0	110.16044	71.539024	50
Slice 3	-49.875208	3,259.6966	0	178.23909	115.74982	50
Slice 4	-48.778275	3,259.6293	0	242.52571	157.49804	50
Slice 5	-47.681343	3,259.5933	0	302.1719	196.23272	50
Slice 6	-46.58441	3,259.5884	0	356.40527	231.45229	50
Slice 7	-45.487477	3,259.6147	0	404.5832	262.7394	50
Slice 8	-44.390545	3,259.6721	0	446.23338	289.78735	50
Slice 9	-43.293612	3,259.7609	0	481.07749	312.41537	50
Slice 10	-42.196679	3,259.8813	0	509.03671	330.5723	50
Slice 11	-41.099746	3,260.0335	0	530.2203	344.32909	50
Slice 12	-40.117433	3,260.1956	0	545.38667	354.17824	50
Slice 13	-39.249738	3,260.362	0	556.10621	361.1396	50
Slice 14	-38.303602	3,260.5679	0	563.45114	365.90945	50
Slice 15	-37.279026	3,260.8181	0	566.97998	368.20111	50
Slice 16	-36.25445	3,261.0983	0	566.18462	367.68459	50
Slice 17	-35.229874	3,261.409	0	561.50996	364.64883	50
Slice 18	-34.205298	3,261.7512	0	553.37848	359.36819	50
Slice 19	-33.137664	3,262.1428	0	541.5617	351.69428	50
Slice 20	-32.026973	3,262.588	0	526.197	341.71633	50
Slice 21	-30.916281	3,263.0739	0	507.93587	329.85741	50
Slice 22	-29.80559	3,263.6021	0	486.9949	316.25819	50
Slice 23	-28.694899	3,264.1748	0	463.47541	300.98445	50
Slice 24	-27.584207	3,264.7941	0	437.35452	284.02134	50
Slice 25	-26.473516	3,265.4628	0	408.47537	265.26701	50
Slice 26	-25.315755	3,266.2168	0	351.99879	228.59069	50
Slice 27	-24.098904	3,267.0745	0	286.07403	185.77865	50
Slice 28	-22.870032	3,268.0146	0	233.3086	151.51238	50
Slice 29	-21.64116	3,269.0368	0	173.63291	112.75853	50
Slice 30	-20.412288	3,270.1498	0	105.23567	68.340842	50

Slice 31	-19.183416	3,271.3652	0	25.729784	16.709117	50

Static Safety Factor: Maximum Surcharge Pool (B-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 67
Date: 10/12/2016
Time: 8:42:53 AM
Tool Version: 8.15
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 8:42:54 AM

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

A2 Static FS: Max 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-112.31643, 3,253.1304) ft
Left-Zone Right Coordinate: (-52.61754, 3,259.9987) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-18.56898, 3,272) ft
Right-Zone Right Coordinate: (22.92363, 3,260.107) ft
Right-Zone Increment: 12

Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	3.85498	3,270
	186.10449	3,270

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127
Point 22	-12.95585	3,233

Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251
Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065
Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 549
F of S: 2.42
Volume: 115.13801 ft³
Weight: 14,334.682 lbs
Resisting Moment: 422,637.67 lbs-ft
Activating Moment: 174,445.28 lbs-ft
Resisting Force: 10,123.112 lbs
Activating Force: 4,178.4308 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-52.61754, 3,259.9987) ft
Entry: (-18.56898, 3,272) ft

Radius: 38.667185 ft
Center: (-46.960796, 3,298.2499) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-52.069074	3,259.9256	0	39.152634	25.426018	50
Slice 2	-50.972141	3,259.7953	0	110.16044	71.539024	50
Slice 3	-49.875208	3,259.6966	0	178.23909	115.74982	50
Slice 4	-48.778275	3,259.6293	0	242.52571	157.49804	50
Slice 5	-47.681343	3,259.5933	0	302.1719	196.23272	50
Slice 6	-46.58441	3,259.5884	0	356.40527	231.45229	50
Slice 7	-45.487477	3,259.6147	0	404.5832	262.7394	50
Slice 8	-44.390545	3,259.6721	0	446.23338	289.78735	50
Slice 9	-43.293612	3,259.7609	0	481.07749	312.41537	50
Slice 10	-42.196679	3,259.8813	0	509.03671	330.5723	50
Slice 11	-41.099746	3,260.0335	0	530.2203	344.32909	50
Slice 12	-40.117433	3,260.1956	0	545.38667	354.17824	50
Slice 13	-39.249738	3,260.362	0	556.10621	361.1396	50
Slice 14	-38.303602	3,260.5679	0	563.45114	365.90945	50
Slice 15	-37.279026	3,260.8181	0	566.97998	368.20111	50
Slice 16	-36.25445	3,261.0983	0	566.18462	367.68459	50
Slice 17	-35.229874	3,261.409	0	561.50996	364.64883	50
Slice 18	-34.205298	3,261.7512	0	553.37848	359.36819	50
Slice 19	-33.137664	3,262.1428	0	541.5617	351.69428	50
Slice 20	-32.026973	3,262.588	0	526.197	341.71633	50
Slice 21	-30.916281	3,263.0739	0	507.93587	329.85741	50
Slice 22	-29.80559	3,263.6021	0	486.9949	316.25819	50
Slice 23	-28.694899	3,264.1748	0	463.47541	300.98445	50
Slice 24	-27.584207	3,264.7941	0	437.35452	284.02134	50
Slice 25	-26.473516	3,265.4628	0	408.47537	265.26701	50
Slice 26	-25.315755	3,266.2168	0	351.99879	228.59069	50
Slice 27	-24.098904	3,267.0745	0	286.07403	185.77865	50
Slice 28	-22.870032	3,268.0146	0	233.3086	151.51238	50
Slice 29	-21.64116	3,269.0368	0	173.63291	112.75853	50
Slice 30	-20.412288	3,270.1498	0	105.23567	68.340842	50
Slice 31	-19.183416	3,271.3652	0	25.729784	16.709117	50

Seismic Safety Factor (B-Cell Direction)

File Information

File Version: 8.15
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Revision Number: 67
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Time: 8:42:53 AM
Tool Version: 8.15
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 8:42:56 AM

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

A3 Seismic FS (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 FS: 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: 0.001
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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Fly Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 27.52 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	9.57367	3,267.0331
	186.10449	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127
Point 22	-12.95585	3,233
Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251
Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065

Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft^2)
Region 1	Fly Ash - Seismic	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill - Seismic	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil - Seismic	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 1
F of S: 1.71
Volume: 115.13801 ft^3
Weight: 14,334.682 lbs
Resisting Moment: 323,250.94 lbs-ft
Activating Moment: 188,962.23 lbs-ft
Resisting Force: 7,747.8336 lbs
Activating Force: 4,529.28 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-52.61754, 3,259.9987) ft
Entry: (-18.56898, 3,272) ft
Radius: 38.667185 ft
Center: (-46.960796, 3,298.2499) ft

Slip Slices

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

Slice 1	-52.069074	3,259.9256	0	39.929872	19.821361	40
Slice 2	-50.972141	3,259.7953	0	111.73001	55.463259	40
Slice 3	-49.875208	3,259.6966	0	180.70348	89.701987	40
Slice 4	-48.778275	3,259.6293	0	245.88313	122.05745	40
Slice 5	-47.681343	3,259.5933	0	306.31118	152.05419	40
Slice 6	-46.58441	3,259.5884	0	361.11377	179.25843	40
Slice 7	-45.487477	3,259.6147	0	409.56484	203.30975	40
Slice 8	-44.390545	3,259.6721	0	451.1359	223.9458	40
Slice 9	-43.293612	3,259.7609	0	485.52687	241.01763	40
Slice 10	-42.196679	3,259.8813	0	512.66885	254.49103	40
Slice 11	-41.099746	3,260.0335	0	532.7132	264.44113	40
Slice 12	-40.117433	3,260.1956	0	546.63603	271.35248	40
Slice 13	-39.249738	3,260.362	0	556.11568	276.05822	40
Slice 14	-38.303602	3,260.5679	0	562.01883	278.98857	40
Slice 15	-37.279026	3,260.8181	0	563.94709	279.94577	40
Slice 16	-36.25445	3,261.0983	0	561.57789	278.76969	40
Slice 17	-35.229874	3,261.409	0	555.41895	275.71236	40
Slice 18	-34.205298	3,261.7512	0	545.94778	271.01083	40
Slice 19	-33.137664	3,262.1428	0	532.93556	264.55151	40
Slice 20	-32.026973	3,262.588	0	516.5775	256.4313	40
Slice 21	-30.916281	3,263.0739	0	497.60439	247.01297	40
Slice 22	-29.80559	3,263.6021	0	476.24282	236.40899	40

Slice 23	-28.694899	3,264.1748	0	452.59355	224.66939	40
Slice 24	-27.584207	3,264.7941	0	426.62331	211.77765	40
Slice 25	-26.473516	3,265.4628	0	398.15703	197.64687	40
Slice 26	-25.315755	3,266.2168	0	342.84967	170.19205	40
Slice 27	-24.098904	3,267.0745	0	278.40502	138.20145	40
Slice 28	-22.870032	3,268.0146	0	226.86743	112.61797	40
Slice 29	-21.64116	3,269.0368	0	168.52062	83.65436	40
Slice 30	-20.412288	3,270.1498	0	101.47165	50.370965	40
Slice 31	-19.183416	3,271.3652	0	23.22737	11.530166	40

Static Safety Factor: Maximum Storage Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 68
Date: 10/12/2016
Time: 9:31:47 AM
Tool Version: 8.15
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 9:31:48 AM

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

B1 Static FS: Maximum Storage Pool (E 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-36.02089, 3,266.0855) ft
Left-Zone Right Coordinate: (-0, 3,272) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (28.62508, 3,257.6934) ft
Right-Zone Right Coordinate: (93.33269, 3,245.8489) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-195.54169	3,267
	-33.69301	3,266.9875

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127
Point 22	-12.95585	3,233
Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251

Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065
Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 451
F of S: 1.78
Volume: 176.04242 ft³
Weight: 21,864.407 lbs
Resisting Moment: 825,389.52 lbs-ft
Activating Moment: 463,872.53 lbs-ft
Resisting Force: 14,017.975 lbs
Activating Force: 7,874.6221 lbs
F of S Rank (Analysis): 1 of 539 slip surfaces
F of S Rank (Query): 1 of 539 slip surfaces
Exit: (38.949115, 3,253.77) ft
Entry: (-3.7070065, 3,272) ft
Radius: 52.873823 ft
Center: (36.293809, 3,306.5771) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-3.0891721	3,271.3101	0	38.703997	25.13467	50
Slice 2	-1.8535032	3,269.9762	0	156.09217	101.36744	50
Slice 3	-0.61783441	3,268.7297	0	263.94208	171.40599	50
Slice 4	0.64249667	3,267.5404	0	337.45588	219.14641	50
Slice 5	1.92749	3,266.4039	0	378.27326	245.65353	50
Slice 6	3.2124833	3,265.3389	0	414.65721	269.28154	50
Slice 7	4.5698162	3,264.2873	0	448.98542	291.57454	50
Slice 8	5.9994888	3,263.2512	0	481.65121	312.78795	50
Slice 9	7.4291612	3,262.2855	0	511.07755	331.89764	50
Slice 10	8.8588338	3,261.3857	0	537.57147	349.10299	50
Slice 11	10.302858	3,260.54	0	561.43058	364.59728	50
Slice 12	11.761234	3,259.7464	0	582.52399	378.2955	50
Slice 13	13.21961	3,259.0107	0	600.28177	389.82754	50
Slice 14	14.677986	3,258.3302	0	614.22819	398.88445	50
Slice 15	16.136362	3,257.7028	0	623.7182	405.04733	50
Slice 16	17.594738	3,257.1263	0	627.96002	407.80201	50
Slice 17	19.053114	3,256.5991	0	626.04952	406.56131	50
Slice 18	20.51149	3,256.1194	0	617.01918	400.69694	50
Slice 19	21.969866	3,255.6861	0	599.90365	389.58199	50
Slice 20	23.428242	3,255.2979	0	573.82051	372.6434	50
Slice 21	24.772635	3,254.9776	0	550.58622	357.55487	50
Slice 22	26.003045	3,254.7182	0	531.89721	345.41808	50
Slice 23	27.233455	3,254.4891	0	506.28621	328.78611	50
Slice 24	28.20804	3,254.3265	0	481.39719	312.62299	50
Slice 25	29.236116	3,254.1808	0	448.71134	291.39655	50
Slice 26	30.573507	3,254.0179	0	399.20031	259.24371	50
Slice 27	31.910898	3,253.8895	0	342.38018	222.34429	50
Slice 28	33.248289	3,253.7953	0	279.11315	181.2582	50
Slice 29	34.58568	3,253.7351	0	210.45681	136.67225	50
Slice 30	35.923071	3,253.7088	0	137.58677	89.349894	50
Slice 31	37.031318	3,253.7103	0	76.089111	52.099302	0
Slice 32	38.209992	3,253.7432	0	27.084913	18.545427	0

Static Safety Factor: Maximum Surcharge Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 68
Date: 10/12/2016
Time: 9:31:47 AM
Tool Version: 8.15
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 9:31:58 AM

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

B2 Static FS: Max Surcharge Pool (E 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-36.08077, 3,266.0623) ft
Left-Zone Right Coordinate: (-0, 3,272) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (28.62508, 3,257.6934) ft
Right-Zone Right Coordinate: (93.33269, 3,245.8489) ft
Right-Zone Increment: 6

Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-195.54169	3,270
	-25.91817	3,270

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127
Point 22	-12.95585	3,233

Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251
Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065
Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft^2)
Region 1	Fly Ash	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 451
F of S: 1.78
Volume: 176.15362 ft^3
Weight: 21,878.249 lbs
Resisting Moment: 825,928.98 lbs-ft
Activating Moment: 464,159.23 lbs-ft
Resisting Force: 14,026.335 lbs
Activating Force: 7,879.0348 lbs
F of S Rank (Analysis): 1 of 539 slip surfaces
F of S Rank (Query): 1 of 539 slip surfaces
Exit: (38.949115, 3,253.77) ft
Entry: (-3.7134282, 3,272) ft

Radius: 52.877743 ft
Center: (36.289369, 3,306.5808) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-3.0945235	3,271.3089	0	38.805321	25.20047	50
Slice 2	-1.8567141	3,269.973	0	156.37716	101.55251	50
Slice 3	-0.6189047	3,268.7247	0	264.38574	171.6941	50
Slice 4	0.64249667	3,267.5347	0	337.95895	219.47311	50
Slice 5	1.92749	3,266.3987	0	378.74781	245.9617	50
Slice 6	3.2124833	3,265.334	0	415.10904	269.57496	50
Slice 7	4.5698162	3,264.2827	0	449.41812	291.85554	50
Slice 8	5.9994888	3,263.247	0	482.06759	313.05835	50
Slice 9	7.4291612	3,262.2816	0	511.48043	332.15927	50
Slice 10	8.8588338	3,261.3821	0	537.96265	349.35703	50
Slice 11	10.302858	3,260.5367	0	561.81089	364.84426	50
Slice 12	11.761234	3,259.7433	0	582.89351	378.53547	50
Slice 13	13.21961	3,259.0079	0	600.64	390.06018	50
Slice 14	14.677986	3,258.3277	0	614.57406	399.10906	50
Slice 15	16.136362	3,257.7004	0	624.05015	405.26291	50
Slice 16	17.594738	3,257.1242	0	628.2762	408.00733	50
Slice 17	19.053114	3,256.5971	0	626.34783	406.75504	50
Slice 18	20.51149	3,256.1176	0	617.29754	400.87771	50
Slice 19	21.969866	3,255.6845	0	600.1601	389.74853	50
Slice 20	23.428242	3,255.2965	0	574.05342	372.79465	50
Slice 21	24.772635	3,254.9763	0	550.797	357.69175	50
Slice 22	26.003045	3,254.717	0	532.08773	345.54181	50
Slice 23	27.233455	3,254.488	0	506.45612	328.89645	50
Slice 24	28.20804	3,254.3255	0	481.55072	312.72269	50
Slice 25	29.236147	3,254.1799	0	448.84668	291.48444	50
Slice 26	30.573602	3,254.0172	0	399.31125	259.31576	50
Slice 27	31.911057	3,253.8889	0	342.46703	222.40069	50
Slice 28	33.248512	3,253.7948	0	279.17652	181.29935	50
Slice 29	34.585967	3,253.7347	0	210.49752	136.69869	50
Slice 30	35.923421	3,253.7086	0	137.60575	89.362219	50
Slice 31	37.031509	3,253.7101	0	76.100488	52.107091	0
Slice 32	38.209992	3,253.7431	0	27.092711	18.550766	0

Seismic Safety Factor (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 68
Date: 10/12/2016
Time: 9:31:47 AM
Tool Version: 8.15
File Name: BE-15-P9.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 10/12/2016
Last Solved Time: 9:31:58 AM

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

B3 Seismic FS (E 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 FS: Maximum Storage Pool (E 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: 0.001
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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Fly Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 0 psf
Phi': 27.52 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-195.54169, 3,251.2121) ft
Right Coordinate: (186.10449, 3,244.3768) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-195.54169	3,267
	-33.69301	3,266.9875

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	186.10449	3,244.3768
Point 2	126.21933	3,244.5613
Point 3	77.32303	3,246.4757
Point 4	60.12217	3,247.8688
Point 5	37.47087	3,254.182
Point 6	28.56742	3,257.7163
Point 7	80	3,232
Point 8	186.10449	3,232
Point 9	-12.95585	3,272
Point 10	-18.56898	3,272
Point 11	-24.71334	3,270
Point 12	-25.91817	3,270
Point 13	-40.55128	3,264.3301
Point 14	-52.61754	3,259.9987
Point 15	-63.19981	3,259
Point 16	-101.0126	3,253.6659
Point 17	-112.28999	3,253.1317
Point 18	-12.95585	3,245.5
Point 19	24.15743	3,259.4669
Point 20	-0	3,272
Point 21	64.97454	3,239.5127
Point 22	-12.95585	3,233
Point 23	186.10449	3,217.7065
Point 24	-157.29187	3,251
Point 25	-195.54169	3,251.2121
Point 26	-195.54169	3,240.9571
Point 27	-151.66459	3,240.9571
Point 28	-78.03594	3,238
Point 29	-195.54169	3,217.7065

Point 30	27.84866	3,258.0016
Point 31	-38.81589	3,265.0025
Point 32	3.85498	3,270
Point 33	186.10449	3,270
Point 34	-195.54169	3,270
Point 35	-195.54169	3,267
Point 36	186.10449	3,267
Point 37	9.57367	3,267.0331
Point 38	-33.69301	3,266.9875

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash - Seismic	1,2,3,4,5,6,7,8	1,651.5
Region 2	Embankment Fill - Seismic	21,6,30,19,37,32,20,9,10,11,12,38,31,13,14,15,16,17,18	2,357.4
Region 3	Foundation Soil - Seismic	23,8,7,21,18,17,24,25,26,27,28,22	4,380.7
Region 4	Bedrock	28,27,26,29,23,22	5,303.4

Current Slip Surface

Slip Surface: 1
F of S: 1.28
Volume: 176.04241 ft³
Weight: 21,864.406 lbs
Resisting Moment: 628,875.2 lbs-ft
Activating Moment: 493,238.79 lbs-ft
Resisting Force: 10,691.789 lbs
Activating Force: 8,379.3132 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (38.949115, 3,253.77) ft
Entry: (-3.7070065, 3,272) ft
Radius: 52.873823 ft
Center: (36.293809, 3,306.5771) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-3.0891721	3,271.3101	0	35.557923	17.651106	40

Slice 2	-1.8535032	3,269.9762	0	150.76411	74.839952	40
Slice 3	-0.61783441	3,268.7297	0	256.2072	127.18236	40
Slice 4	0.64249667	3,267.5404	0	327.81481	162.72868	40
Slice 5	1.92749	3,266.4039	0	367.39582	182.37687	40
Slice 6	3.2124833	3,265.3389	0	402.6859	199.89502	40
Slice 7	4.5698162	3,264.2873	0	436.05759	216.46087	40
Slice 8	5.9994888	3,263.2512	0	467.96989	232.30227	40
Slice 9	7.4291612	3,262.2855	0	496.94713	246.6867	40
Slice 10	8.8588338	3,261.3857	0	523.33258	259.78455	40
Slice 11	10.302858	3,260.54	0	547.4571	271.76006	40
Slice 12	11.761234	3,259.7464	0	569.21732	282.56193	40
Slice 13	13.21961	3,259.0107	0	588.04737	291.90925	40
Slice 14	14.677986	3,258.3302	0	603.45502	299.55767	40
Slice 15	16.136362	3,257.7028	0	614.75339	305.16623	40
Slice 16	17.594738	3,257.1263	0	621.08384	308.3087	40
Slice 17	19.053114	3,256.5991	0	621.44466	308.48781	40
Slice 18	20.51149	3,256.1194	0	614.74737	305.16325	40
Slice 19	21.969866	3,255.6861	0	599.88307	297.78454	40
Slice 20	23.428242	3,255.2979	0	575.82283	285.84093	40
Slice 21	24.772635	3,254.9776	0	554.10238	275.05881	40
Slice 22	26.003045	3,254.7182	0	536.44933	266.29576	40
Slice 23	27.233455	3,254.4891	0	511.5316	253.92649	40
Slice 24	28.20804	3,254.3265	0	486.93385	241.71606	40
Slice 25	29.236116	3,254.1808	0	454.27859	225.50585	40
Slice 26	30.573507	3,254.0179	0	404.44449	200.76799	40
Slice 27	31.910898	3,253.8895	0	346.93968	172.22235	40
Slice 28	33.248289	3,253.7953	0	282.7296	140.34819	40
Slice 29	34.58568	3,253.7351	0	212.99783	105.73304	40
Slice 30	35.923071	3,253.7088	0	139.05282	69.026421	40
Slice 31	37.031318	3,253.7103	0	76.364351	39.786651	0
Slice 32	38.209992	3,253.7432	0	27.156105	14.148624	0

Static Safety Factor: Maximum Storage Pool (B-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:03:56 AM

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

A1 Static FS: Operational 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-135.01217, 3,248.4322) ft
Left-Zone Right Coordinate: (-89.35651, 3,251.4339) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-26.3966, 3,270) ft
Right-Zone Right Coordinate: (23.84313, 3,259.3901) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	6.11049	3,266.9448
	137	3,267

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270
Point 20	-57.35997	3,260
Point 21	-79.71415	3,253
Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475

Point 25	-172	3,243.4571
Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 549
F of S: 2.41
Volume: 336.84965 ft³
Weight: 41,394.672 lbs
Resisting Moment: 1,866,340.8 lbs-ft
Activating Moment: 774,293.8 lbs-ft
Resisting Force: 25,976.499 lbs
Activating Force: 10,777.395 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-89.356515, 3,251.4339) ft
Entry: (-26.3966, 3,270) ft
Radius: 67.002421 ft
Center: (-74.398618, 3,316.7454) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-88.392278	3,251.228	0	44.881237	28.044909	0
Slice 2	-86.463805	3,250.8455	0	132.54939	82.82605	0
Slice 3	-84.535332	3,250.5214	0	214.77134	134.20403	0
Slice 4	-82.606859	3,250.2547	0	290.63231	181.60722	0
Slice 5	-80.678386	3,250.0449	0	359.24684	224.48234	0

Slice 6	-78.699091	3,249.8888	0	444.36873	277.6724	0
Slice 7	-76.668972	3,249.7891	0	544.6327	340.32428	0
Slice 8	-74.638854	3,249.7511	0	634.23747	396.31556	0
Slice 9	-72.608736	3,249.7746	0	712.43749	445.18035	0
Slice 10	-70.578617	3,249.8597	0	778.81767	486.65929	0
Slice 11	-68.548499	3,250.0066	0	833.29611	520.7012	0
Slice 12	-66.51838	3,250.2158	0	876.09934	547.44763	0
Slice 13	-64.488262	3,250.4879	0	907.71605	567.20394	0
Slice 14	-62.458144	3,250.8236	0	928.83671	580.4016	0
Slice 15	-60.428025	3,251.2239	0	940.2867	587.55634	0
Slice 16	-58.386468	3,251.693	0	942.7709	612.24258	50
Slice 17	-56.254135	3,252.2568	0	930.61305	604.34718	50
Slice 18	-54.042465	3,252.9206	0	910.44181	591.24782	50
Slice 19	-51.830795	3,253.6689	0	882.13647	572.86612	50
Slice 20	-49.619125	3,254.5048	0	846.50885	549.72928	50
Slice 21	-47.407455	3,255.4319	0	804.13146	522.20908	50
Slice 22	-45.195785	3,256.4543	0	755.30608	490.5015	50
Slice 23	-42.984115	3,257.5771	0	700.03785	454.6099	50
Slice 24	-40.861422	3,258.7523	0	640.85425	416.17562	50
Slice 25	-38.827705	3,259.9775	0	577.58789	375.08996	50
Slice 26	-36.793988	3,261.3044	0	507.27995	329.43145	50
Slice 27	-34.604564	3,262.86	0	421.93821	274.00988	50
Slice 28	-32.259431	3,264.6749	0	318.37316	206.75395	50
Slice 29	-29.914299	3,266.6653	0	198.73251	129.0584	50
Slice 30	-27.569166	3,268.8534	0	58.941941	38.277344	50

Static Safety Factor: Maximum Storage Pool (B-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:03:58 AM

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

A2 Static FS: Max 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-135.01217, 3,248.4322) ft
Left-Zone Right Coordinate: (-89.35651, 3,251.4339) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (-26.3966, 3,270) ft
Right-Zone Right Coordinate: (23.84313, 3,259.3901) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-0	3,270
	137	3,270

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270
Point 20	-57.35997	3,260
Point 21	-79.71415	3,253

Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475
Point 25	-172	3,243.4571
Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 549
F of S: 2.41
Volume: 336.84965 ft³
Weight: 41,394.672 lbs
Resisting Moment: 1,866,340.8 lbs-ft
Activating Moment: 774,293.8 lbs-ft
Resisting Force: 25,976.499 lbs
Activating Force: 10,777.395 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-89.356515, 3,251.4339) ft
Entry: (-26.3966, 3,270) ft
Radius: 67.002421 ft
Center: (-74.398618, 3,316.7454) ft

Slip Slices

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

Slice 1	-88.392278	3,251.228	0	44.881237	28.044909	0
Slice 2	-86.463805	3,250.8455	0	132.54939	82.82605	0
Slice 3	-84.535332	3,250.5214	0	214.77134	134.20403	0
Slice 4	-82.606859	3,250.2547	0	290.63231	181.60722	0
Slice 5	-80.678386	3,250.0449	0	359.24684	224.48234	0
Slice 6	-78.699091	3,249.8888	0	444.36873	277.6724	0
Slice 7	-76.668972	3,249.7891	0	544.6327	340.32428	0
Slice 8	-74.638854	3,249.7511	0	634.23747	396.31556	0
Slice 9	-72.608736	3,249.7746	0	712.43749	445.18035	0
Slice 10	-70.578617	3,249.8597	0	778.81767	486.65929	0
Slice 11	-68.548499	3,250.0066	0	833.29611	520.7012	0
Slice 12	-66.51838	3,250.2158	0	876.09934	547.44763	0
Slice 13	-64.488262	3,250.4879	0	907.71605	567.20394	0
Slice 14	-62.458144	3,250.8236	0	928.83671	580.4016	0
Slice 15	-60.428025	3,251.2239	0	940.2867	587.55634	0
Slice 16	-58.386468	3,251.693	0	942.7709	612.24258	50
Slice 17	-56.254135	3,252.2568	0	930.61305	604.34718	50
Slice 18	-54.042465	3,252.9206	0	910.44181	591.24782	50
Slice 19	-51.830795	3,253.6689	0	882.13647	572.86612	50
Slice 20	-49.619125	3,254.5048	0	846.50885	549.72928	50
Slice 21	-47.407455	3,255.4319	0	804.13146	522.20908	50
Slice 22	-45.195785	3,256.4543	0	755.30608	490.5015	50
Slice 23	-42.984115	3,257.5771	0	700.03785	454.6099	50
Slice 24	-40.861422	3,258.7523	0	640.85425	416.17562	50
Slice 25	-38.827705	3,259.9775	0	577.58789	375.08996	50
Slice 26	-36.793988	3,261.3044	0	507.27995	329.43145	50
Slice 27	-34.604564	3,262.86	0	421.93821	274.00988	50
Slice 28	-32.259431	3,264.6749	0	318.37316	206.75395	50
Slice 29	-29.914299	3,266.6653	0	198.73251	129.0584	50
Slice 30	-27.569166	3,268.8534	0	58.941941	38.277344	50

Seismic Safety Factor (B-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:04:00 AM

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

A3 Seismic FS (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 FS: Operational 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: 0.001
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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Fly Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 40 psf
Phi': 27.52 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	6.11049	3,266.9448
	137	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270
Point 20	-57.35997	3,260
Point 21	-79.71415	3,253
Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475
Point 25	-172	3,243.4571

Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash - Seismic	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil - Seismic	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill - Seismic	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 1
F of S: 1.68
Volume: 336.84965 ft³
Weight: 41,394.672 lbs
Resisting Moment: 1,421,632.6 lbs-ft
Activating Moment: 848,056.29 lbs-ft
Resisting Force: 19,798.091 lbs
Activating Force: 11,812.139 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-89.356515, 3,251.4339) ft
Entry: (-26.3966, 3,270) ft
Radius: 67.002421 ft
Center: (-74.398618, 3,316.7454) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-88.392278	3,251.228	0	45.617628	21.856305	0
Slice 2	-86.463805	3,250.8455	0	134.72742	64.550565	0
Slice 3	-84.535332	3,250.5214	0	218.27592	104.5803	0
Slice 4	-82.606859	3,250.2547	0	295.25596	141.46295	0

Slice 5	-80.678386	3,250.0449	0	364.71307	174.74122	0
Slice 6	-78.699091	3,249.8889	0	450.50315	215.84494	0
Slice 7	-76.668972	3,249.7891	0	551.17116	264.07697	0
Slice 8	-74.638854	3,249.7511	0	640.72188	306.98249	0
Slice 9	-72.608736	3,249.7746	0	718.39634	344.19785	0
Slice 10	-70.578617	3,249.8597	0	783.7912	375.52982	0
Slice 11	-68.548499	3,250.0066	0	836.86026	400.95626	0
Slice 12	-66.51838	3,250.2158	0	877.88958	420.61421	0
Slice 13	-64.488262	3,250.4879	0	907.45021	434.77729	0
Slice 14	-62.458144	3,250.8236	0	926.3315	443.82369	0
Slice 15	-60.428025	3,251.2239	0	935.4715	448.20285	0
Slice 16	-58.386468	3,251.693	0	936.8545	465.05861	40
Slice 17	-56.254135	3,252.2568	0	922.36293	457.86494	40
Slice 18	-54.042465	3,252.9206	0	899.99923	446.7635	40
Slice 19	-51.830795	3,253.6689	0	869.8348	431.78975	40
Slice 20	-49.619125	3,254.5048	0	832.74281	413.37712	40
Slice 21	-47.407455	3,255.4319	0	789.3299	391.82677	40
Slice 22	-45.195785	3,256.4543	0	739.91543	367.29721	40
Slice 23	-42.984115	3,257.5771	0	684.51929	339.79833	40
Slice 24	-40.861422	3,258.7523	0	625.65984	310.58024	40
Slice 25	-38.827705	3,259.9775	0	563.14344	279.54683	40
Slice 26	-36.793988	3,261.3044	0	494.02431	245.2358	40
Slice 27	-34.604564	3,262.86	0	410.4534	203.75084	40
Slice 28	-32.259431	3,264.6749	0	309.26013	153.51806	40
Slice 29	-29.914299	3,266.6653	0	192.34285	95.47982	40
Slice 30	-27.569166	3,268.8534	0	55.423928	27.512677	40

Static Safety Factor: Operational Storage Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:03:58 AM

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

B1 Static FS: Operational Storage Pool (E-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-50.68793, 3,262.1548) ft
Left-Zone Right Coordinate: (-0, 3,270) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (54.55347, 3,249.4155) ft
Right-Zone Right Coordinate: (137, 3,245.5536) ft
Right-Zone Increment: 10

Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-172	3,267
	-35.77713	3,266.9704

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270

Point 20	-57.35997	3,260
Point 21	-79.71415	3,253
Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475
Point 25	-172	3,243.4571
Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 1
F of S: 5.08
Volume: 947.46261 ft³
Weight: 116,988.69 lbs
Resisting Moment: 49,260,400 lbs-ft
Activating Moment: 9,691,034.1 lbs-ft
Resisting Force: 81,456.685 lbs
Activating Force: 16,024.983 lbs
F of S Rank (Analysis): 762 of 1,001 slip surfaces
F of S Rank (Query): 762 of 1,001 slip surfaces
Exit: (54.553475, 3,249.4155) ft
Entry: (-50.687935, 3,262.1548) ft
Radius: 599.25322 ft
Center: (73.663427, 3,848.364) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-49.219659	3,261.8472	0	355.1489	230.63639	50
Slice 2	-46.283107	3,261.2396	0	483.55498	314.02427	50
Slice 3	-43.346556	3,260.6473	0	610.91966	396.73587	50
Slice 4	-40.352992	3,260.0594	0	739.7836	480.42109	50
Slice 5	-37.302417	3,259.4764	0	870.21882	565.12671	50
Slice 6	-34.213708	3,258.9028	0	1,031.1489	669.63592	50
Slice 7	-31.086865	3,258.3391	0	1,222.0616	793.61611	50
Slice 8	-27.960022	3,257.7926	0	1,411.43	916.59338	50
Slice 9	-24.852843	3,257.2662	0	1,537.7505	998.62683	50
Slice 10	-21.76533	3,256.7599	0	1,600.9931	1,039.697	50
Slice 11	-18.677817	3,256.2702	0	1,662.8086	1,079.8405	50
Slice 12	-15.88406	3,255.8405	0	1,717.5815	1,115.4105	50
Slice 13	-13.098935	3,255.4269	0	1,770.8267	1,149.9883	50
Slice 14	-9.6365083	3,254.9318	0	1,835.2573	1,191.83	50
Slice 15	-5.781905	3,254.4035	0	1,904.7817	1,236.9797	50
Slice 16	-1.9273017	3,253.9006	0	1,971.6693	1,280.417	50
Slice 17	1.5276225	3,253.4703	0	1,935.619	1,257.0057	50
Slice 18	4.5828675	3,253.1078	0	1,796.5536	1,166.6956	50
Slice 19	8.2146625	3,252.6993	0	1,618.7673	1,051.2398	50
Slice 20	12.423008	3,252.2519	0	1,400.8036	909.69246	50
Slice 21	15.36723	3,251.9536	0	1,267.0527	822.83365	50
Slice 22	17.897584	3,251.7136	0	1,192.0359	774.11719	50
Slice 23	21.278192	3,251.4072	0	1,087.0193	705.91861	50
Slice 24	24.6588	3,251.1202	0	978.92608	635.72203	50
Slice 25	28.039408	3,250.8525	0	867.81154	563.56341	50
Slice 26	31.420016	3,250.6039	0	753.75884	489.49671	50
Slice 27	34.800623	3,250.3746	0	636.87582	413.59199	50
Slice 28	38.181231	3,250.1645	0	517.29099	335.9327	50
Slice 29	41.581762	3,249.9726	0	403.95318	276.59251	50
Slice 30	45.002216	3,249.799	0	296.97125	203.34046	50
Slice 31	48.422669	3,249.645	0	187.91094	128.66531	50
Slice 32	51.843123	3,249.5106	0	76.916428	52.665778	50

Slice 33	54.053412	3,249.4319	0	10.333577	7.0755481	50

Static Safety Factor: Maximum Storage Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:04:00 AM

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

B2 Static FS: Max Storage Pool (E-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-50.68793, 3,262.1548) ft
Left-Zone Right Coordinate: (-0, 3,270) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (54.55347, 3,249.4155) ft
Right-Zone Right Coordinate: (137, 3,245.5536) ft
Right-Zone Increment: 10
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-172	3,270
	-26.3966	3,270

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270
Point 20	-57.35997	3,260
Point 21	-79.71415	3,253

Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475
Point 25	-172	3,243.4571
Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 1
F of S: 4.68
Volume: 947.46261 ft³
Weight: 116,988.69 lbs
Resisting Moment: 50,621,862 lbs-ft
Activating Moment: 10,811,857 lbs-ft
Resisting Force: 83,687.981 lbs
Activating Force: 17,873.993 lbs
F of S Rank (Analysis): 729 of 1,001 slip surfaces
F of S Rank (Query): 729 of 1,001 slip surfaces
Exit: (54.553475, 3,249.4155) ft
Entry: (-50.687935, 3,262.1548) ft
Radius: 599.25322 ft
Center: (73.663427, 3,848.364) ft

Slip Slices

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

Slice 1	-49.219659	3,261.8472	0	535.911	348.02467	50
Slice 2	-46.283107	3,261.2396	0	660.83298	429.14995	50
Slice 3	-43.346556	3,260.6473	0	785.10578	509.85365	50
Slice 4	-40.352992	3,260.0594	0	911.28336	591.79433	50
Slice 5	-37.302417	3,259.4764	0	1,039.5137	675.06811	50
Slice 6	-34.213708	3,258.9028	0	1,169.0772	759.20761	50
Slice 7	-31.086865	3,258.3391	0	1,300.0535	844.26459	50
Slice 8	-27.960022	3,257.7926	0	1,430.8502	929.20497	50
Slice 9	-24.852843	3,257.2662	0	1,528.8425	992.8419	50
Slice 10	-21.76533	3,256.7599	0	1,593.2817	1,034.6892	50
Slice 11	-18.677817	3,256.2702	0	1,656.4238	1,075.6942	50
Slice 12	-15.88406	3,255.8405	0	1,712.4899	1,112.1039	50
Slice 13	-13.098935	3,255.4269	0	1,767.0936	1,147.564	50
Slice 14	-9.6365083	3,254.9318	0	1,833.2727	1,190.5412	50
Slice 15	-5.781905	3,254.4035	0	1,904.7669	1,236.9701	50
Slice 16	-1.9273017	3,253.9006	0	1,973.5783	1,281.6567	50
Slice 17	1.5276225	3,253.4703	0	1,939.0113	1,259.2087	50
Slice 18	4.5828675	3,253.1078	0	1,800.8864	1,169.5093	50
Slice 19	8.2146625	3,252.6993	0	1,623.8704	1,054.5538	50
Slice 20	12.423008	3,252.2519	0	1,406.3468	913.29229	50
Slice 21	15.36723	3,251.9536	0	1,272.6996	826.50076	50
Slice 22	17.897584	3,251.7136	0	1,197.712	777.80327	50
Slice 23	21.278192	3,251.4072	0	1,092.5325	709.49891	50
Slice 24	24.6588	3,251.1202	0	984.06819	639.06135	50
Slice 25	28.039408	3,250.8525	0	872.41024	566.54983	50
Slice 26	31.420016	3,250.6039	0	757.68581	492.04692	50
Slice 27	34.800623	3,250.3746	0	640.05341	415.65555	50
Slice 28	38.181231	3,250.1645	0	519.69696	337.49515	50
Slice 29	41.581762	3,249.9726	0	405.68439	277.7779	50
Slice 30	45.002216	3,249.799	0	298.01672	204.05631	50
Slice 31	48.422669	3,249.645	0	188.40446	129.00323	50
Slice 32	51.843123	3,249.5106	0	77.040883	52.750993	50
Slice 33	54.053412	3,249.4319	0	10.32474	7.069497	50

Seismic Safety Factor (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 54
Date: 9/27/2016
Time: 9:03:56 AM
Tool Version: 8.15
File Name: BE-15-P10.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:04:00 AM

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

B3 Seismic FS (E-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 FS: Operational Storage Pool (E-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: 0.001
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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Fly Ash - Seismic
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 40 psf
Phi': 27.52 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-172, 3,247.7475) ft
Right Coordinate: (137, 3,245.5536) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-172	3,267
	-35.77713	3,266.9704

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	137	3,245.5536
Point 2	124.53613	3,245.4294
Point 3	68.20422	3,246.3748
Point 4	53.55335	3,249.6383
Point 5	16.20728	3,261.8964
Point 6	54.64524	3,242.6774
Point 7	76	3,232
Point 8	137	3,232
Point 9	-14.63406	3,248
Point 10	-14.63406	3,235.5
Point 11	137	3,223.8575
Point 12	-26.3966	3,270
Point 13	-41.87828	3,265
Point 14	14.52718	3,262.4478
Point 15	6.11049	3,266.9448
Point 16	-0	3,270
Point 17	-11.56381	3,270
Point 18	-14.63406	3,270
Point 19	-17.13406	3,270
Point 20	-57.35997	3,260
Point 21	-79.71415	3,253
Point 22	-98.18528	3,250
Point 23	-104.34233	3,249
Point 24	-172	3,247.7475
Point 25	-172	3,243.4571

Point 26	-153.3428	3,243.4571
Point 27	-79.71415	3,240.5
Point 28	-172	3,223
Point 29	137	3,223
Point 30	-172	3,270
Point 31	137	3,270
Point 32	-172	3,267
Point 33	137	3,267
Point 34	-35.77713	3,266.9704

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash - Seismic	6,7,8,1,2,3,4,5	1,179.6
Region 2	Foundation Soil - Seismic	21,22,23,24,25,26,27,10,11,8,7,6,9	2,830.9
Region 3	Bedrock	25,28,29,11,10,27,26	3,768
Region 4	Embankment Fill - Seismic	6,5,14,15,16,17,18,19,12,34,13,20,21,9	1,773

Current Slip Surface

Slip Surface: 1
F of S: 1.55
Volume: 312.56036 ft³
Weight: 37,807.345 lbs
Resisting Moment: 1,383,655.5 lbs-ft
Activating Moment: 894,266.25 lbs-ft
Resisting Force: 19,160.746 lbs
Activating Force: 12,376.702 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (54.553475, 3,249.4155) ft
Entry: (-4.3269473, 3,270) ft
Radius: 66.647139 ft
Center: (44.550921, 3,315.3078) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-3.2452105	3,268.8862	0	82.778658	41.091683	40
Slice 2	-1.0817368	3,266.7558	0	277.64203	137.8227	40
Slice 3	1.018415	3,264.8603	0	401.72801	199.41952	40
Slice 4	3.055245	3,263.1709	0	461.12333	228.90361	40

Slice 5	5.092075	3,261.6119	0	511.15778	253.74093	40
Slice 6	7.1625762	3,260.1504	0	550.64476	273.34243	40
Slice 7	9.2667487	3,258.7805	0	580.48071	288.15313	40
Slice 8	11.370921	3,257.5197	0	603.91667	299.78684	40
Slice 9	13.475094	3,256.361	0	621.27208	308.40214	40
Slice 10	15.36723	3,255.3972	0	649.46468	322.39707	40
Slice 11	17.223269	3,254.5311	0	692.06676	343.54493	40
Slice 12	19.255246	3,253.6574	0	733.0267	363.87761	40
Slice 13	21.287223	3,252.8621	0	768.92808	381.69921	40
Slice 14	23.3192	3,252.1421	0	799.0566	396.65514	40
Slice 15	25.351178	3,251.4949	0	822.44937	408.26741	40
Slice 16	27.383155	3,250.9183	0	837.93608	415.95508	40
Slice 17	29.415132	3,250.4105	0	844.20002	419.06453	40
Slice 18	31.44711	3,249.9698	0	839.85892	416.90959	40
Slice 19	33.479087	3,249.5948	0	823.57679	408.82707	40
Slice 20	35.511064	3,249.2845	0	794.18529	394.237	40
Slice 21	37.543041	3,249.038	0	750.8215	372.71103	40
Slice 22	39.575019	3,248.8545	0	693.05001	344.03301	40
Slice 23	41.606996	3,248.7335	0	620.96061	308.24752	40
Slice 24	43.533848	3,248.6746	0	548.06733	285.54899	40
Slice 25	45.355576	3,248.6717	0	472.42071	246.13629	40
Slice 26	47.177303	3,248.7187	0	388.40591	202.36367	40
Slice 27	48.999031	3,248.8155	0	297.34639	154.92068	40
Slice 28	50.820759	3,248.9625	0	200.69297	104.5632	40
Slice 29	52.642486	3,249.16	0	99.915853	52.057237	40
Slice 30	54.053412	3,249.3435	0	26.464751	13.788421	40

Static Safety Factor: Operational Storage Pool (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:32 AM

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

A1 Static FS: Operational Storage Pool (D-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-46.78307, 3,266.5399) ft
Left-Zone Right Coordinate: (34.99258, 3,272.1269) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (122.25741, 3,244.2392) ft
Right-Zone Right Coordinate: (173.31045, 3,238.0249) ft
Right-Zone Increment: 6

Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-132.98031	3,267
	-39.02657	3,267.0091

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843

Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843
Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981
Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 612
F of S: 2.26
Volume: 1,080.7604 ft³
Weight: 133,196.6 lbs
Resisting Moment: 10,224,280 lbs-ft
Activating Moment: 4,520,995.9 lbs-ft
Resisting Force: 79,695.554 lbs
Activating Force: 35,241.36 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (147.37847, 3,238.7541) ft
Entry: (34.992583, 3,272.1269) ft
Radius: 119.87551 ft
Center: (120.95163, 3,355.6804) ft

Slip Slices

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

Slice 1	35.071997	3,272.0454	0	-10.550963	-6.8518756	50
Slice 2	36.813617	3,270.3253	0	103.1197	66.966715	50
Slice 3	40.138033	3,267.1692	0	303.6921	197.21995	50
Slice 4	44.124758	3,263.7098	0	511.46519	332.14938	50
Slice 5	48.773792	3,260.0142	0	723.56708	469.88996	50
Slice 6	52.815745	3,257.0737	0	886.15464	575.47555	50
Slice 7	56.250616	3,254.7856	0	1,008.4168	654.87354	50
Slice 8	59.685486	3,252.6629	0	1,119.5271	727.02941	50
Slice 9	63.120357	3,250.6954	0	1,220.7772	792.78196	50
Slice 10	66.555227	3,248.8747	0	1,313.0517	852.70572	50
Slice 11	69.987679	3,247.1943	0	1,395.6377	872.09122	0
Slice 12	73.417713	3,245.6478	0	1,456.3249	910.01283	0
Slice 13	76.823866	3,244.2373	0	1,518.419	948.81351	0
Slice 14	80.206137	3,242.9563	0	1,582.0447	988.57126	0
Slice 15	83.588409	3,241.7903	0	1,637.8474	1,023.4406	0
Slice 16	87.324488	3,240.6377	0	1,684.2481	1,093.7635	50
Slice 17	91.414376	3,239.52	0	1,713.7446	1,112.9188	50
Slice 18	95.341546	3,238.5883	0	1,715.5438	1,071.9907	0
Slice 19	99.105996	3,237.8278	0	1,698.7302	1,061.4844	0
Slice 20	102.87045	3,237.1916	0	1,662.9831	1,039.1472	0
Slice 21	106.6349	3,236.678	0	1,606.5462	1,003.8815	0
Slice 22	110.39935	3,236.2852	0	1,527.962	954.7766	0
Slice 23	114.1638	3,236.012	0	1,426.2259	891.20484	0
Slice 24	117.92825	3,235.8578	0	1,300.9249	812.90811	0
Slice 25	121.6927	3,235.8219	0	1,152.3394	720.06157	0
Slice 26	125.45715	3,235.9044	0	981.49074	613.30348	0
Slice 27	129.2216	3,236.1054	0	790.12066	493.72218	0
Slice 28	132.98605	3,236.4255	0	580.59638	362.79689	0
Slice 29	136.7505	3,236.8657	0	355.74635	222.29499	0
Slice 30	140.81917	3,237.4835	0	184.18412	115.09101	0
Slice 31	145.19204	3,238.3025	0	63.97634	39.976854	0

Static Safety Factor: Maximum Storage Pool (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:34 AM

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

A2 Static FS: Max Storage Pool (D-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-46.78307, 3,266.5399) ft
Left-Zone Right Coordinate: (34.99258, 3,272.1269) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (122.25741, 3,244.2392) ft
Right-Zone Right Coordinate: (173.31045, 3,238.0249) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-132.98031	3,270
	-20.29113	3,270.0001

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843
Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843

Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981
Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 612
F of S: 2.26
Volume: 1,080.7604 ft³
Weight: 133,196.6 lbs
Resisting Moment: 10,224,280 lbs-ft
Activating Moment: 4,520,995.9 lbs-ft
Resisting Force: 79,695.554 lbs
Activating Force: 35,241.36 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (147.37847, 3,238.7541) ft
Entry: (34.992583, 3,272.1269) ft
Radius: 119.87551 ft
Center: (120.95163, 3,355.6804) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	35.071997	3,272.0454	0	-10.550963	-6.8518756	50
Slice 2	36.813617	3,270.3253	0	103.1197	66.966715	50

Slice 3	40.138033	3,267.1692	0	303.6921	197.21995	50
Slice 4	44.124758	3,263.7098	0	511.46519	332.14938	50
Slice 5	48.773792	3,260.0142	0	723.56708	469.88996	50
Slice 6	52.815745	3,257.0737	0	886.15464	575.47555	50
Slice 7	56.250616	3,254.7856	0	1,008.4168	654.87354	50
Slice 8	59.685486	3,252.6629	0	1,119.5271	727.02941	50
Slice 9	63.120357	3,250.6954	0	1,220.7772	792.78196	50
Slice 10	66.555227	3,248.8747	0	1,313.0517	852.70572	50
Slice 11	69.987679	3,247.1943	0	1,395.6377	872.09122	0
Slice 12	73.417713	3,245.6478	0	1,456.3249	910.01283	0
Slice 13	76.823866	3,244.2373	0	1,518.419	948.81351	0
Slice 14	80.206137	3,242.9563	0	1,582.0447	988.57126	0
Slice 15	83.588409	3,241.7903	0	1,637.8474	1,023.4406	0
Slice 16	87.324488	3,240.6377	0	1,684.2481	1,093.7635	50
Slice 17	91.414376	3,239.52	0	1,713.7446	1,112.9188	50
Slice 18	95.341546	3,238.5883	0	1,715.5438	1,071.9907	0
Slice 19	99.105996	3,237.8278	0	1,698.7302	1,061.4844	0
Slice 20	102.87045	3,237.1916	0	1,662.9831	1,039.1472	0
Slice 21	106.6349	3,236.678	0	1,606.5462	1,003.8815	0
Slice 22	110.39935	3,236.2852	0	1,527.962	954.7766	0
Slice 23	114.1638	3,236.012	0	1,426.2259	891.20484	0
Slice 24	117.92825	3,235.8578	0	1,300.9249	812.90811	0
Slice 25	121.6927	3,235.8219	0	1,152.3394	720.06157	0
Slice 26	125.45715	3,235.9044	0	981.49074	613.30348	0
Slice 27	129.2216	3,236.1054	0	790.12066	493.72218	0
Slice 28	132.98605	3,236.4255	0	580.59638	362.79689	0
Slice 29	136.7505	3,236.8657	0	355.74635	222.29499	0
Slice 30	140.81917	3,237.4835	0	184.18412	115.09101	0
Slice 31	145.19204	3,238.3025	0	63.97634	39.976854	0

Seismic Safety Factor (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:34 AM

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

A3 Seismic FS (D-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 FS: Operational Storage Pool (D-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-132.98031	3,267
	-39.02657	3,267.0091

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843
Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843
Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981

Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 1
F of S: 2.05
Volume: 1,080.7604 ft³
Weight: 133,196.6 lbs
Resisting Moment: 10,142,995 lbs-ft
Activating Moment: 4,944,961.6 lbs-ft
Resisting Force: 79,129.503 lbs
Activating Force: 38,580.413 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (147.37847, 3,238.7541) ft
Entry: (34.992583, 3,272.1269) ft
Radius: 119.87551 ft
Center: (120.95163, 3,355.6804) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	35.071997	3,272.0454	0	-12.059506	-7.8315346	50
Slice 2	36.813617	3,270.3253	0	99.099632	64.356054	50
Slice 3	40.138033	3,267.1692	0	295.01259	191.58341	50
Slice 4	44.124758	3,263.7098	0	497.59473	323.1418	50
Slice 5	48.773792	3,260.0142	0	704.28717	457.36944	50
Slice 6	52.815745	3,257.0737	0	862.89093	560.36792	50

Slice 7	56.250616	3,254.7856	0	982.4516	638.01153	50
Slice 8	59.685486	3,252.6629	0	1,091.5317	708.84895	50
Slice 9	63.120357	3,250.6954	0	1,191.483	773.75812	50
Slice 10	66.555227	3,248.8747	0	1,283.2395	833.34545	50
Slice 11	69.987679	3,247.1943	0	1,365.5864	853.31307	0
Slice 12	73.417713	3,245.6478	0	1,427.2823	891.86494	0
Slice 13	76.823866	3,244.2373	0	1,491.0312	931.69973	0
Slice 14	80.206137	3,242.9563	0	1,556.9531	972.89229	0
Slice 15	83.588409	3,241.7903	0	1,615.8072	1,009.6684	0
Slice 16	87.324488	3,240.6377	0	1,668.193	1,083.3372	50
Slice 17	91.414376	3,239.52	0	1,703.2789	1,106.1223	50
Slice 18	95.341546	3,238.5883	0	1,708.5969	1,067.6498	0
Slice 19	99.105996	3,237.8278	0	1,697.1103	1,060.4722	0
Slice 20	102.87045	3,237.1916	0	1,666.3798	1,041.2696	0
Slice 21	106.6349	3,236.678	0	1,614.3245	1,008.7419	0
Slice 22	110.39935	3,236.2852	0	1,539.1898	961.79254	0
Slice 23	114.1638	3,236.012	0	1,439.7397	899.64923	0
Slice 24	117.92825	3,235.8578	0	1,315.4275	821.97031	0
Slice 25	121.6927	3,235.8219	0	1,166.5263	728.92655	0
Slice 26	125.45715	3,235.9044	0	994.18802	621.23762	0

Slice 27	129.2216	3,236.1054	0	800.41579	500.1553	0
Slice 28	132.98605	3,236.4255	0	587.94354	367.3879	0
Slice 29	136.7505	3,236.8657	0	360.02872	224.97091	0
Slice 30	140.81917	3,237.4835	0	186.17734	116.33651	0
Slice 31	145.19204	3,238.3025	0	64.544575	40.331927	0

Static Safety Factor: Operational Storage Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:34 AM

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

B1 Static FS: Operational Storage Pool (E-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-57.15089, 3,266.4961) ft
Left-Zone Right Coordinate: (-33.68286, 3,267.3323) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (-0, 3,274) ft
Right-Zone Right Coordinate: (57.56481, 3,264.9372) ft
Right-Zone Increment: 12

Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	51.09831	3,267.0061
	182.69848	3,267

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843

Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843
Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981
Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 367
F of S: 4.37
Volume: 115.09722 ft³
Weight: 13,573.091 lbs
Resisting Moment: 349,920.3 lbs-ft
Activating Moment: 80,109.853 lbs-ft
Resisting Force: 10,290.538 lbs
Activating Force: 2,356.1139 lbs
F of S Rank (Analysis): 1 of 455 slip surfaces
F of S Rank (Query): 1 of 455 slip surfaces
Exit: (-33.68286, 3,267.3323) ft
Entry: (-0, 3,274) ft
Radius: 32.325034 ft
Center: (-22.160028, 3,297.5338) ft

Slip Slices

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

Slice 1	-33.117495	3,267.1286	0	42.727147	29.255888	50
Slice 2	-31.986766	3,266.7444	0	116.94401	80.073235	50
Slice 3	-30.856037	3,266.406	0	186.54617	127.73083	50
Slice 4	-29.725308	3,266.1119	0	251.01038	171.87039	50
Slice 5	-28.594578	3,265.8609	0	309.84408	212.15467	50
Slice 6	-27.463849	3,265.652	0	362.62378	248.29369	50
Slice 7	-26.33312	3,265.4844	0	409.02535	280.0655	50
Slice 8	-25.220093	3,265.3587	0	450.43522	292.51605	50
Slice 9	-24.124768	3,265.2732	0	488.60969	317.30685	50
Slice 10	-23.029443	3,265.2251	0	520.03537	337.71492	50
Slice 11	-21.934118	3,265.2142	0	544.84785	353.82833	50
Slice 12	-20.838793	3,265.2405	0	563.27801	365.79701	50
Slice 13	-19.736018	3,265.3046	0	575.6776	373.84941	50
Slice 14	-18.625794	3,265.4074	0	582.32328	378.16516	50
Slice 15	-17.51557	3,265.5491	0	583.49196	378.92411	50
Slice 16	-16.405346	3,265.7302	0	579.58362	376.38601	50
Slice 17	-15.295122	3,265.9513	0	570.97662	370.79655	50
Slice 18	-14.173087	3,266.2165	0	557.64942	362.14177	50
Slice 19	-13.03924	3,266.5279	0	539.80628	350.5543	50
Slice 20	-11.905393	3,266.8843	0	517.91919	336.34065	50
Slice 21	-10.771546	3,267.2874	0	492.09938	319.57307	50
Slice 22	-9.6376988	3,267.7392	0	462.34694	300.25162	50
Slice 23	-8.5038519	3,268.2418	0	428.53792	278.29578	50
Slice 24	-7.370005	3,268.7978	0	390.41041	253.53548	50
Slice 25	-6.2361581	3,269.4106	0	347.54812	225.70039	50
Slice 26	-5.1023112	3,270.0839	0	299.35962	194.40641	50
Slice 27	-3.9684642	3,270.8223	0	245.05065	159.13775	50
Slice 28	-2.8346173	3,271.6314	0	183.58618	119.22226	50
Slice 29	-1.7007704	3,272.518	0	113.63671	73.79654	50
Slice 30	-0.56692346	3,273.4908	0	33.499865	21.755067	50

Static Safety Factor: Maximum Storage Pool (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:34 AM

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

B2 Static FS: Max Storage Pool (E-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-57.15089, 3,266.4961) ft
Left-Zone Right Coordinate: (-33.68286, 3,267.3323) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (-0, 3,274) ft
Right-Zone Right Coordinate: (57.56481, 3,264.9372) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	19.21588	3,273.9772
	182.69848	3,274

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843
Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843

Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981
Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 367
F of S: 4.37
Volume: 115.09722 ft³
Weight: 13,573.091 lbs
Resisting Moment: 349,920.3 lbs-ft
Activating Moment: 80,109.853 lbs-ft
Resisting Force: 10,290.538 lbs
Activating Force: 2,356.1139 lbs
F of S Rank (Analysis): 1 of 455 slip surfaces
F of S Rank (Query): 1 of 455 slip surfaces
Exit: (-33.68286, 3,267.3323) ft
Entry: (-0, 3,274) ft
Radius: 32.325034 ft
Center: (-22.160028, 3,297.5338) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-33.117495	3,267.1286	0	42.727147	29.255888	50
Slice 2	-31.986766	3,266.7444	0	116.94401	80.073235	50

Slice 3	-30.856037	3,266.406	0	186.54617	127.73083	50
Slice 4	-29.725308	3,266.1119	0	251.01038	171.87039	50
Slice 5	-28.594578	3,265.8609	0	309.84408	212.15467	50
Slice 6	-27.463849	3,265.652	0	362.62378	248.29369	50
Slice 7	-26.33312	3,265.4844	0	409.02535	280.0655	50
Slice 8	-25.220093	3,265.3587	0	450.43522	292.51605	50
Slice 9	-24.124768	3,265.2732	0	488.60969	317.30685	50
Slice 10	-23.029443	3,265.2251	0	520.03537	337.71492	50
Slice 11	-21.934118	3,265.2142	0	544.84785	353.82833	50
Slice 12	-20.838793	3,265.2405	0	563.27801	365.79701	50
Slice 13	-19.736018	3,265.3046	0	575.6776	373.84941	50
Slice 14	-18.625794	3,265.4074	0	582.32328	378.16516	50
Slice 15	-17.51557	3,265.5491	0	583.49196	378.92411	50
Slice 16	-16.405346	3,265.7302	0	579.58362	376.38601	50
Slice 17	-15.295122	3,265.9513	0	570.97662	370.79655	50
Slice 18	-14.173087	3,266.2165	0	557.64942	362.14177	50
Slice 19	-13.03924	3,266.5279	0	539.80628	350.5543	50
Slice 20	-11.905393	3,266.8843	0	517.91919	336.34065	50
Slice 21	-10.771546	3,267.2874	0	492.09938	319.57307	50
Slice 22	-9.6376988	3,267.7392	0	462.34694	300.25162	50
Slice 23	-8.5038519	3,268.2418	0	428.53792	278.29578	50
Slice 24	-7.370005	3,268.7978	0	390.41041	253.53548	50

Slice 25	-6.2361581	3,269.4106	0	347.54812	225.70039	50
Slice 26	-5.1023112	3,270.0839	0	299.35962	194.40641	50
Slice 27	-3.9684642	3,270.8223	0	245.05065	159.13775	50
Slice 28	-2.8346173	3,271.6314	0	183.58618	119.22226	50
Slice 29	-1.7007704	3,272.518	0	113.63671	73.79654	50
Slice 30	-0.56692346	3,273.4908	0	33.499865	21.755067	50

Seismic Safety Factor (E-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 28
Date: 9/27/2016
Time: 10:51:32 AM
Tool Version: 8.15
File Name: ED-15-5INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 10:51:34 AM

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

B3 Seismic FS (E-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 FS: Operational Storage Pool (E-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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Fly Ash
Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion': 50 psf
Phi': 34.4 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-132.98031, 3,266.1674) ft
Right Coordinate: (182.69848, 3,237.7609) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	51.09831	3,267.0061
	182.69848	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	-0	3,274
Point 2	-14.74001	3,271.1059
Point 3	-33.68286	3,267.3323
Point 4	-46.83374	3,266.5368
Point 5	-95.33536	3,266.3455
Point 6	-132.98031	3,266.1674
Point 7	-132.98031	3,244
Point 8	-90	3,244
Point 9	35.15141	3,272.1083
Point 10	26.82915	3,273.0843
Point 11	26.82915	3,248
Point 12	75.13273	3,248
Point 13	88.63273	3,239
Point 14	138.63273	3,239
Point 15	19.21588	3,273.9772
Point 16	-40	3,244
Point 17	-34	3,248
Point 18	-132.98031	3,227.8843
Point 19	182.69848	3,227.8843
Point 20	182.69848	3,237.7609
Point 21	-132.98031	3,224.0843
Point 22	182.69848	3,224.0843
Point 23	-132.98031	3,270
Point 24	-20.29113	3,270.0001
Point 25	41.80024	3,269.981

Point 26	182.69848	3,267
Point 27	-132.98031	3,267
Point 28	182.69848	3,274
Point 29	-39.02657	3,267.0091
Point 30	51.09831	3,267.0061

Regions

	Material	Points	Area (ft²)
Region 1	Fly Ash	1,2,24,3,29,4,5,6,7,8	1,776.5
Region 2	Embankment Fill	9,10,11,12,13,14,30,25	1,497.2
Region 3	Embankment Fill	10,15,1,8,16,17,11	1,895.8
Region 4	Foundation Soil	17,16,8,7,18,19,20,14,13,12,11	5,031.5
Region 5	Bedrock	19,18,21,22	1,199.6

Current Slip Surface

Slip Surface: 1
F of S: 3.80
Volume: 115.09722 ft³
Weight: 13,573.091 lbs
Resisting Moment: 348,591.5 lbs-ft
Activating Moment: 91,825.767 lbs-ft
Resisting Force: 10,257.156 lbs
Activating Force: 2,702.2402 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-33.68286, 3,267.3323) ft
Entry: (-0, 3,274) ft
Radius: 32.325034 ft
Center: (-22.160028, 3,297.5338) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-33.117495	3,267.1286	0	43.970754	30.107404	50
Slice 2	-31.986766	3,266.7444	0	119.2836	81.675184	50
Slice 3	-30.856037	3,266.406	0	190.06689	130.14152	50
Slice 4	-29.725308	3,266.1119	0	255.67155	175.06196	50
Slice 5	-28.594578	3,265.8609	0	315.4857	216.01757	50
Slice 6	-27.463849	3,265.652	0	368.98276	252.64777	50

Slice 7	-26.33312	3,265.4844	0	415.76065	284.67726	50
Slice 8	-25.220093	3,265.3587	0	456.89587	296.71165	50
Slice 9	-24.124768	3,265.2732	0	494.68298	321.25089	50
Slice 10	-23.029443	3,265.2251	0	525.35113	341.16702	50
Slice 11	-21.934118	3,265.2142	0	549.07541	356.57374	50
Slice 12	-20.838793	3,265.2405	0	566.14787	367.66073	50
Slice 13	-19.736018	3,265.3046	0	576.9826	374.69688	50
Slice 14	-18.625794	3,265.4074	0	581.93783	377.91484	50
Slice 15	-17.51557	3,265.5491	0	581.38651	377.55681	50
Slice 16	-16.405346	3,265.7302	0	575.81055	373.93574	50
Slice 17	-15.295122	3,265.9513	0	565.66246	367.3455	50
Slice 18	-14.173087	3,266.2165	0	550.971	357.80475	50
Slice 19	-13.03924	3,266.5279	0	531.9981	345.48361	50
Slice 20	-11.905393	3,266.8843	0	509.26728	330.72204	50
Slice 21	-10.771546	3,267.2874	0	482.91354	313.60772	50
Slice 22	-9.6376988	3,267.7392	0	452.94687	294.14714	50
Slice 23	-8.5038519	3,268.2418	0	419.24193	272.25889	50
Slice 24	-7.370005	3,268.7978	0	381.52485	247.76513	50
Slice 25	-6.2361581	3,269.4106	0	339.35752	220.38135	50
Slice 26	-5.1023112	3,270.0839	0	292.11733	189.70321	50

Slice 27	-3.9684642	3,270.8223	0	238.96918	155.1884	50
Slice 28	-2.8346173	3,271.6314	0	178.82638	116.13121	50
Slice 29	-1.7007704	3,272.518	0	110.29418	71.625877	50
Slice 30	-0.56692346	3,273.4908	0	31.586893	20.512768	50

Static Safety Factor: Operational Storage Pool (CW Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:26 AM

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

B1 Static FS: Operational Storage Pool (CW)

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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-112.09825, 3,239.4019) ft
Left-Zone Right Coordinate: (-65.94174, 3,246.7174) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (0, 3,274) ft
Right-Zone Right Coordinate: (72.46361, 3,260.2378) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	52.28426	3,266.8852
	204.69032	3,267

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953

Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267
Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 366
F of S: 1.76
Volume: 465.63629 ft³
Weight: 57,971.718 lbs
Resisting Moment: 6,579,878 lbs-ft
Activating Moment: 3,737,919.9 lbs-ft
Resisting Force: 36,123.441 lbs
Activating Force: 20,520.734 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-80.292051, 3,240.13) ft
Entry: (0, 3,274) ft
Radius: 167.06578 ft
Center: (-102.83214, 3,405.6682) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-78.684411	3,240.3648	0	25.52275	16.574667	50
Slice 2	-75.46913	3,240.8666	0	80.729909	52.426616	50
Slice 3	-72.461608	3,241.3923	0	177.24801	115.1062	50
Slice 4	-69.661845	3,241.9347	0	315.48787	204.88022	50
Slice 5	-66.862082	3,242.527	0	446.82758	290.17322	50
Slice 6	-64.062318	3,243.1696	0	569.91743	370.10871	50
Slice 7	-61.262555	3,243.8632	0	683.61754	443.94642	50
Slice 8	-58.462792	3,244.6085	0	787.06922	511.12873	50
Slice 9	-55.73258	3,245.3851	0	877.65191	569.95382	50
Slice 10	-52.955899	3,246.2285	0	940.49163	610.76241	50
Slice 11	-50.063198	3,247.1624	0	977.92256	635.07033	50
Slice 12	-47.170496	3,248.1551	0	1,005.3031	652.85148	50
Slice 13	-44.277794	3,249.2075	0	1,023.4113	664.6111	50
Slice 14	-41.385092	3,250.3208	0	1,033.1389	670.92822	50
Slice 15	-38.492391	3,251.4965	0	1,035.4223	672.41113	50
Slice 16	-35.599195	3,252.7362	0	999.83576	649.30093	50
Slice 17	-32.705505	3,254.0414	0	928.57499	603.02365	50
Slice 18	-29.811815	3,255.4137	0	853.90033	554.52936	50
Slice 19	-26.918125	3,256.8549	0	776.01046	503.94709	50
Slice 20	-24.024435	3,258.3671	0	694.86215	451.24876	50
Slice 21	-21.441545	3,259.7749	0	633.1212	411.15371	50
Slice 22	-19.001838	3,261.165	0	587.22651	381.34935	50
Slice 23	-16.394515	3,262.7095	0	534.6208	347.1868	50
Slice 24	-13.787192	3,264.319	0	477.7254	310.2385	50
Slice 25	-11.221773	3,265.9677	0	417.04469	270.83199	50
Slice 26	-8.6982575	3,267.6557	0	352.02193	228.60572	50
Slice 27	-6.1970833	3,269.3952	0	266.44313	173.03019	50
Slice 28	-3.71825	3,271.1876	0	159.14801	103.35193	50
Slice 29	-1.2394167	3,273.0505	0	43.256849	28.091326	50

Static Safety Factor: Maximum Storage Pool (CW direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:26 AM

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

B2 Static FS: Max Storage Pool (CW)

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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-112.09825, 3,239.4019) ft
Left-Zone Right Coordinate: (-65.94174, 3,246.7174) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (0, 3,274) ft
Right-Zone Right Coordinate: (72.46361, 3,260.2378) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	31.35369	3,274.0073
	204.69032	3,274

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953

Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267
Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 366
F of S: 1.76
Volume: 465.63629 ft³
Weight: 57,971.718 lbs
Resisting Moment: 6,579,878 lbs-ft
Activating Moment: 3,737,919.9 lbs-ft
Resisting Force: 36,123.441 lbs
Activating Force: 20,520.734 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (-80.292051, 3,240.13) ft
Entry: (0, 3,274) ft
Radius: 167.06578 ft
Center: (-102.83214, 3,405.6682) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-78.684411	3,240.3648	0	25.52275	16.574667	50
Slice 2	-75.46913	3,240.8666	0	80.729909	52.426616	50
Slice 3	-72.461608	3,241.3923	0	177.24801	115.1062	50
Slice 4	-69.661845	3,241.9347	0	315.48787	204.88022	50
Slice 5	-66.862082	3,242.527	0	446.82758	290.17322	50
Slice 6	-64.062318	3,243.1696	0	569.91743	370.10871	50
Slice 7	-61.262555	3,243.8632	0	683.61754	443.94642	50
Slice 8	-58.462792	3,244.6085	0	787.06922	511.12873	50
Slice 9	-55.73258	3,245.3851	0	877.65191	569.95382	50
Slice 10	-52.955899	3,246.2285	0	940.49163	610.76241	50
Slice 11	-50.063198	3,247.1624	0	977.92256	635.07033	50
Slice 12	-47.170496	3,248.1551	0	1,005.3031	652.85148	50
Slice 13	-44.277794	3,249.2075	0	1,023.4113	664.6111	50
Slice 14	-41.385092	3,250.3208	0	1,033.1389	670.92822	50
Slice 15	-38.492391	3,251.4965	0	1,035.4223	672.41113	50
Slice 16	-35.599195	3,252.7362	0	999.83576	649.30093	50
Slice 17	-32.705505	3,254.0414	0	928.57499	603.02365	50

Slice 18	-29.811815	3,255.4137	0	853.90033	554.52936	50
Slice 19	-26.918125	3,256.8549	0	776.01046	503.94709	50
Slice 20	-24.024435	3,258.3671	0	694.86215	451.24876	50
Slice 21	-21.441545	3,259.7749	0	633.1212	411.15371	50
Slice 22	-19.001838	3,261.165	0	587.22651	381.34935	50
Slice 23	-16.394515	3,262.7095	0	534.6208	347.1868	50
Slice 24	-13.787192	3,264.319	0	477.7254	310.2385	50
Slice 25	-11.221773	3,265.9677	0	417.04469	270.83199	50
Slice 26	-8.6982575	3,267.6557	0	352.02193	228.60572	50
Slice 27	-6.1970833	3,269.3952	0	266.44313	173.03019	50
Slice 28	-3.71825	3,271.1876	0	159.14801	103.35193	50
Slice 29	-1.2394167	3,273.0505	0	43.256849	28.091326	50

Seismic Safety Factor (CW Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:28 AM

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

B3 Seismic FS (CW)

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 FS: Operational Storage Pool (CW) [(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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	52.28426	3,266.8852
	204.69032	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953
Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267

Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill - Seismic	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil - Seismic	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 1
F of S: 1.25
Volume: 465.63629 ft³
Weight: 57,971.718 lbs
Resisting Moment: 5,002,212.7 lbs-ft
Activating Moment: 3,997,584.2 lbs-ft
Resisting Force: 27,473.999 lbs
Activating Force: 21,954.315 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-80.292051, 3,240.13) ft
Entry: (0, 3,274) ft
Radius: 167.06578 ft
Center: (-102.83214, 3,405.6682) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-78.684411	3,240.3648	0	25.431706	12.624409	40
Slice 2	-75.46913	3,240.8666	0	81.495883	40.454908	40
Slice 3	-72.461608	3,241.3923	0	178.85002	88.781922	40

Slice 4	-69.661845	3,241.9347	0	317.82192	157.76817	40
Slice 5	-66.862082	3,242.527	0	449.77375	223.26963	40
Slice 6	-64.062318	3,243.1696	0	573.14802	284.51315	40
Slice 7	-61.262555	3,243.8632	0	686.63395	340.84805	40
Slice 8	-58.462792	3,244.6085	0	789.25683	391.79049	40
Slice 9	-55.73258	3,245.3851	0	878.39228	436.03771	40
Slice 10	-52.955899	3,246.2285	0	939.25576	466.25061	40
Slice 11	-50.063198	3,247.1624	0	974.24813	483.62097	40
Slice 12	-47.170496	3,248.1551	0	998.84082	495.82889	40
Slice 13	-44.277794	3,249.2075	0	1,013.9864	503.34723	40
Slice 14	-41.385092	3,250.3208	0	1,020.7554	506.70738	40
Slice 15	-38.492391	3,251.4965	0	1,020.2544	506.45869	40
Slice 16	-35.599195	3,252.7362	0	982.76299	487.84778	40
Slice 17	-32.705505	3,254.0414	0	910.69556	452.0732	40
Slice 18	-29.811815	3,255.4137	0	835.82585	414.90755	40
Slice 19	-26.918125	3,256.8549	0	758.34277	376.44462	40
Slice 20	-24.024435	3,258.3671	0	678.16191	336.64249	40
Slice 21	-21.441545	3,259.7749	0	617.39673	306.4784	40
Slice 22	-19.001838	3,261.165	0	572.39753	284.1406	40
Slice 23	-16.394515	3,262.7095	0	521.04619	258.64958	40
Slice 24	-13.787192	3,264.319	0	465.66197	231.15661	40
Slice 25	-11.221773	3,265.9677	0	406.65052	201.86307	40
Slice 26	-8.6982575	3,267.6557	0	343.37429	170.45248	40
Slice 27	-6.1970833	3,269.3952	0	259.83869	128.98504	40
Slice 28	-3.71825	3,271.1876	0	154.70853	76.797982	40
Slice 29	-1.2394167	3,273.0505	0	40.653746	20.180695	40

Static Safety Factor: Operational Storage Pool (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:26 AM

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

A1 Static FS: Operational Storage Pool (D 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-29.80452, 3,264.002) ft
Left-Zone Right Coordinate: (31.35369, 3,274.0073) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (134.95234, 3,239.748) ft
Right-Zone Right Coordinate: (204.69032, 3,232) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-135.63145	3,267
	-20.3055	3,266.9004

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953

Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267
Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 548
F of S: 2.27
Volume: 849.50529 ft³
Weight: 105,763.41 lbs
Resisting Moment: 15,879,148 lbs-ft
Activating Moment: 6,992,616.6 lbs-ft
Resisting Force: 68,545.439 lbs
Activating Force: 30,181.789 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (146.19311, 3,236.2562) ft
Entry: (26.117103, 3,274.0061) ft
Radius: 219.01305 ft
Center: (149.06934, 3,455.2503) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	28.433416	3,272.4773	0	146.68883	95.260839	50
Slice 2	31.05171	3,270.7553	0	325.04547	211.087	50
Slice 3	34.075415	3,268.8827	0	412.70979	268.01687	50
Slice 4	38.347858	3,266.2947	0	520.73539	338.16952	50
Slice 5	41.449292	3,264.511	0	597.63181	388.10664	50
Slice 6	45.321073	3,262.3875	0	684.22753	444.34255	50
Slice 7	49.963198	3,259.961	0	778.32992	505.45336	50
Slice 8	55.13343	3,257.4302	0	869.60674	564.72922	50
Slice 9	60.008695	3,255.1753	0	946.71628	614.80474	50
Slice 10	64.060885	3,253.4201	0	1,002.1688	650.816	50
Slice 11	68.113075	3,251.7607	0	1,050.5145	682.21206	50
Slice 12	72.165265	3,250.1947	0	1,091.6	708.89332	50
Slice 13	76.217455	3,248.7202	0	1,125.0845	730.63844	50
Slice 14	80.269645	3,247.335	0	1,150.4604	747.11775	50
Slice 15	84.321835	3,246.0376	0	1,167.0797	757.91044	50
Slice 16	88.374025	3,244.8261	0	1,174.1876	762.52634	50
Slice 17	92.426215	3,243.6992	0	1,170.9637	760.4327	50
Slice 18	96.478405	3,242.6555	0	1,156.5706	751.08574	50
Slice 19	100.5306	3,241.6938	0	1,130.2093	733.96652	50
Slice 20	104.58279	3,240.813	0	1,091.178	708.61931	50
Slice 21	108.63498	3,240.012	0	1,038.9317	674.69016	50

Slice 22	112.68716	3,239.2901	0	973.13703	631.96258	50
Slice 23	116.73936	3,238.6463	0	893.71688	580.38653	50
Slice 24	120.79155	3,238.0801	0	800.87974	520.09738	50
Slice 25	124.84374	3,237.5908	0	695.12843	451.42168	50
Slice 26	128.89593	3,237.1778	0	577.24571	374.86774	50
Slice 27	132.83091	3,236.8485	0	456.65091	296.55257	50
Slice 28	136.64868	3,236.5981	0	335.02365	217.5669	50
Slice 29	140.46645	3,236.4146	0	205.5309	133.47333	50
Slice 30	144.28423	3,236.2979	0	69.236727	44.962856	50

Static Safety Factor: Maximum Storage Pool (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:26 AM

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

A2 Static FS: Max Storage Pool (D 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: 0.001
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: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit
Left Projection: Range
Left-Zone Left Coordinate: (-29.80452, 3,264.002) ft
Left-Zone Right Coordinate: (31.35369, 3,274.0073) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (134.95234, 3,239.748) ft
Right-Zone Right Coordinate: (204.69032, 3,232) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-135.63145	3,270
	-12.48353	3,270

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953

Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267
Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 548
F of S: 2.27
Volume: 849.50529 ft³
Weight: 105,763.41 lbs
Resisting Moment: 15,879,148 lbs-ft
Activating Moment: 6,992,616.6 lbs-ft
Resisting Force: 68,545.439 lbs
Activating Force: 30,181.789 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (146.19311, 3,236.2562) ft
Entry: (26.117103, 3,274.0061) ft
Radius: 219.01305 ft
Center: (149.06934, 3,455.2503) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	28.433416	3,272.4773	0	146.68883	95.260839	50
Slice 2	31.05171	3,270.7553	0	325.04547	211.087	50
Slice 3	34.075415	3,268.8827	0	412.70979	268.01687	50
Slice 4	38.347858	3,266.2947	0	520.73539	338.16952	50
Slice 5	41.449292	3,264.511	0	597.63181	388.10664	50
Slice 6	45.321073	3,262.3875	0	684.22753	444.34255	50
Slice 7	49.963198	3,259.961	0	778.32992	505.45336	50
Slice 8	55.13343	3,257.4302	0	869.60674	564.72922	50
Slice 9	60.008695	3,255.1753	0	946.71628	614.80474	50
Slice 10	64.060885	3,253.4201	0	1,002.1688	650.816	50
Slice 11	68.113075	3,251.7607	0	1,050.5145	682.21206	50
Slice 12	72.165265	3,250.1947	0	1,091.6	708.89332	50
Slice 13	76.217455	3,248.7202	0	1,125.0845	730.63844	50
Slice 14	80.269645	3,247.335	0	1,150.4604	747.11775	50
Slice 15	84.321835	3,246.0376	0	1,167.0797	757.91044	50
Slice 16	88.374025	3,244.8261	0	1,174.1876	762.52634	50
Slice 17	92.426215	3,243.6992	0	1,170.9637	760.4327	50
Slice 18	96.478405	3,242.6555	0	1,156.5706	751.08574	50
Slice 19	100.5306	3,241.6938	0	1,130.2093	733.96652	50
Slice 20	104.58279	3,240.813	0	1,091.178	708.61931	50
Slice 21	108.63498	3,240.012	0	1,038.9317	674.69016	50

Slice 22	112.68716	3,239.2901	0	973.13703	631.96258	50
Slice 23	116.73936	3,238.6463	0	893.71688	580.38653	50
Slice 24	120.79155	3,238.0801	0	800.87974	520.09738	50
Slice 25	124.84374	3,237.5908	0	695.12843	451.42168	50
Slice 26	128.89593	3,237.1778	0	577.24571	374.86774	50
Slice 27	132.83091	3,236.8485	0	456.65091	296.55257	50
Slice 28	136.64868	3,236.5981	0	335.02365	217.5669	50
Slice 29	140.46645	3,236.4146	0	205.5309	133.47333	50
Slice 30	144.28423	3,236.2979	0	69.236727	44.962856	50

Seismic Safety Factor (D-Cell Direction)

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 33
Date: 9/27/2016
Time: 9:44:18 AM
Tool Version: 8.15
File Name: CWD-15-6INC.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:44:26 AM

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

A3 Seismic FS (D 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 FS: Operational Storage Pool (D 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: 0.001
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)

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-135.63145, 3,238.953) ft
Right Coordinate: (204.69032, 3,232) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-135.63145	3,267
	-20.3055	3,266.9004

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	204.69032	3,229.77
Point 2	116.49817	3,222.7147
Point 3	30.74973	3,215.0072
Point 4	-135.63145	3,215.0072
Point 5	-135.63145	3,198.7254
Point 6	204.69032	3,198.7254
Point 7	36.79714	3,272
Point 8	31.35369	3,274.0073
Point 9	30.74973	3,274.0072
Point 10	30.74973	3,226.5072
Point 11	116.49817	3,234.2147
Point 12	119.49817	3,232.2147
Point 13	169.49817	3,232.2147
Point 14	147.01773	3,236
Point 15	130.92202	3,241
Point 16	0	3,274
Point 17	-7.4365	3,272
Point 18	-22.57759	3,266
Point 19	-37.04604	3,262
Point 20	-54.40225	3,253.5909
Point 21	-73.86149	3,242
Point 22	-80.73899	3,240
Point 23	-53.75339	3,226.5072
Point 24	-135.63145	3,238.953
Point 25	204.69032	3,232
Point 26	57.9826	3,265.0033
Point 27	-57.06291	3,252.0061
Point 28	-135.63145	3,270
Point 29	-12.48353	3,270
Point 30	204.69032	3,267

Point 31	43.00001	3,269.9514
Point 32	-135.63145	3,267
Point 33	204.69032	3,274
Point 34	-20.3055	3,266.9004
Point 35	52.28426	3,266.8852

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock	1,2,3,4,5,6	6,862.4
Region 2	Embankment Fill - Seismic	11,12,13,14,15,26,35,31,7,8,9,16,17,29,34,18,19,20,27,21,22,23,10	6,698.9
Region 3	Foundation Soil - Seismic	2,1,25,13,12,11,10,23,22,24,4,3	4,319.4

Current Slip Surface

Slip Surface: 1
F of S: 1.58
Volume: 849.50529 ft³
Weight: 105,763.41 lbs
Resisting Moment: 12,087,776 lbs-ft
Activating Moment: 7,635,497.4 lbs-ft
Resisting Force: 52,190.138 lbs
Activating Force: 32,985.243 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (146.19311, 3,236.2562) ft
Entry: (26.117103, 3,274.0061) ft
Radius: 219.01305 ft
Center: (149.06934, 3,455.2503) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	28.433416	3,272.4773	0	142.74071	70.857106	40
Slice 2	31.05171	3,270.7553	0	318.42914	158.0696	40
Slice 3	34.075415	3,268.8827	0	404.69481	200.89225	40

Slice 4	38.347858	3,266.2947	0	510.96263	253.64405	40
Slice 5	41.449292	3,264.511	0	586.58374	291.1827	40
Slice 6	45.321073	3,262.3875	0	671.76245	333.46578	40
Slice 7	49.963198	3,259.961	0	764.43195	379.46732	40
Slice 8	55.13343	3,257.4302	0	854.55963	424.20709	40
Slice 9	60.008695	3,255.1753	0	931.02107	462.16287	40
Slice 10	64.060885	3,253.4201	0	986.33261	489.61976	40
Slice 11	68.113075	3,251.7607	0	1,034.8995	513.72857	40
Slice 12	72.165265	3,250.1947	0	1,076.5673	534.41267	40
Slice 13	76.217455	3,248.7202	0	1,110.9799	551.49522	40
Slice 14	80.269645	3,247.335	0	1,137.5975	564.70828	40
Slice 15	84.321835	3,246.0376	0	1,155.7235	573.70613	40
Slice 16	88.374025	3,244.8261	0	1,164.5383	578.08184	40
Slice 17	92.426215	3,243.6992	0	1,163.1437	577.38953	40
Slice 18	96.478405	3,242.6555	0	1,150.6138	571.16965	40
Slice 19	100.5306	3,241.6938	0	1,126.0576	558.97983	40
Slice 20	104.58279	3,240.813	0	1,088.6839	540.42737	40
Slice 21	108.63498	3,240.012	0	1,037.8694	515.20286	40
Slice 22	112.68716	3,239.2901	0	973.21993	483.11057	40
Slice 23	116.73936	3,238.6463	0	894.62157	444.094	40
Slice 24	120.79155	3,238.0801	0	802.27474	398.25264	40

Slice 25	124.84374	3,237.5908	0	696.70315	345.84645	40
Slice 26	128.89593	3,237.1778	0	578.73756	287.28782	40
Slice 27	132.83091	3,236.8485	0	457.8734	227.29033	40
Slice 28	136.64868	3,236.5981	0	335.88067	166.73261	40
Slice 29	140.46645	3,236.4146	0	205.99468	102.25665	40
Slice 30	144.28423	3,236.2979	0	69.347758	34.424526	40

Static Safety Factor: Operational Storage Pool

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 26
Date: 9/27/2016
Time: 9:51:25 AM
Tool Version: 8.15
File Name: D-15-P12.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:51:26 AM

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 FS: Operational 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

Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 27 °
Phi-B: 0 °

Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-42.0434, 3,266.6864) ft
Left-Zone Right Coordinate: (-0, 3,274) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (20.15744, 3,265.4761) ft
Right-Zone Right Coordinate: (40, 3,262.778) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-147.76081, 3,246) ft
Right Coordinate: (49.22879, 3,263.3906) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-147.76081	3,267
	-40.6448	3,267.1463

Points

	X (ft)	Y (ft)
Point 1	23.64818	3,264
Point 2	-0	3,274
Point 3	-1.98905	3,274
Point 4	-1.98905	3,257
Point 5	14.87185	3,259.9017
Point 6	29.82654	3,262.375
Point 7	-22.2226	3,274
Point 8	-26.45519	3,271.8121
Point 9	-87.12824	3,251.8616
Point 10	-74.75964	3,252.8919
Point 11	-52.40133	3,253.971
Point 12	-30.10141	3,254.8933
Point 13	49.22879	3,263.3906
Point 14	34.66228	3,262.4237
Point 15	-94.73826	3,249.3593
Point 16	-99.9228	3,248.05
Point 17	-134.77655	3,247
Point 18	-147.76081	3,246
Point 19	-147.76081	3,229.7776
Point 20	49.22879	3,229.7776
Point 21	-47.17201	3,265
Point 22	-31.96911	3,269.999
Point 23	-147.76081	3,267
Point 24	-147.76081	3,274
Point 25	-40.6448	3,267.1463

Regions

	Material	Points	Area (ft²)

Region 1	Embankment Fill	5,6,1,2,3,7,8,22,25,21,9,10,11,12,4	1,198.1
Region 2	Foundation Soil	13,14,6,5,4,12,11,10,9,15,16,17,18,19,20	4,779

Current Slip Surface

Slip Surface: 620
F of S: 2.09
Volume: 118.06069 ft³
Weight: 14,621.22 lbs
Resisting Moment: 279,459.08 lbs-ft
Activating Moment: 133,395.98 lbs-ft
Resisting Force: 8,966.6937 lbs
Activating Force: 4,280.6018 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (33.223838, 3,262.4092) ft
Entry: (-0, 3,274) ft
Radius: 27.895655 ft
Center: (23.742675, 3,288.6442) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	0.54951928	3,273.176	0	25.657065	16.661893	50
Slice 2	1.6485578	3,271.6382	0	119.62665	77.686454	50
Slice 3	2.7475964	3,270.2955	0	197.05301	127.96772	50
Slice 4	3.8466349	3,269.1071	0	262.31497	170.34934	50
Slice 5	4.9456735	3,268.046	0	318.41433	206.78068	50
Slice 6	6.044712	3,267.0932	0	367.46176	238.63246	50
Slice 7	7.1437506	3,266.2349	0	410.95071	266.87451	50
Slice 8	8.2427891	3,265.4605	0	449.91891	292.18076	50
Slice 9	9.3418277	3,264.7618	0	485.04625	314.99272	50
Slice 10	10.440866	3,264.1322	0	516.71448	335.5583	50
Slice 11	11.539905	3,263.5666	0	545.04377	353.95557	50
Slice 12	12.638943	3,263.0607	0	569.91534	370.10735	50
Slice 13	13.737982	3,262.611	0	590.98676	383.79129	50
Slice 14	14.83702	3,262.2147	0	607.70583	394.64878	50
Slice 15	15.936059	3,261.8693	0	619.32793	402.19626	50
Slice 16	17.035098	3,261.5729	0	624.9424	405.84234	50
Slice 17	18.134136	3,261.3239	0	623.51269	404.91388	50

Slice 18	19.233175	3,261.1211	0	613.93446	398.6937	50
Slice 19	20.332213	3,260.9634	0	595.11373	386.47137	50
Slice 20	21.573344	3,260.8417	0	541.27114	275.79142	0
Slice 21	22.956568	3,260.7682	0	485.67234	247.46242	0
Slice 22	24.163043	3,260.7565	0	435.97305	222.13937	0
Slice 23	25.19277	3,260.791	0	396.79037	202.17479	0
Slice 24	26.222497	3,260.8638	0	349.49749	178.07787	0
Slice 25	27.252223	3,260.9751	0	294.52317	150.06705	0
Slice 26	28.28195	3,261.1253	0	232.58639	118.50868	0
Slice 27	29.311677	3,261.3151	0	164.65565	83.896245	0
Slice 28	30.392756	3,261.5591	0	110.43972	56.27185	0
Slice 29	31.525189	3,261.8626	0	69.750629	35.539721	0
Slice 30	32.657622	3,262.2182	0	23.89303	12.174107	0

Static Safety Factor: Maximum Storage Pool

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 26
Date: 9/27/2016
Time: 9:51:25 AM
Tool Version: 8.15
File Name: D-15-P12.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:51:26 AM

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 FS: Max 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

Foundation Soil

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 27 °
Phi-B: 0 °

Embankment Fill

Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-42.0434, 3,266.6864) ft
Left-Zone Right Coordinate: (-0, 3,274) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (20.15744, 3,265.4761) ft
Right-Zone Right Coordinate: (40, 3,262.778) ft
Right-Zone Increment: 6
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-147.76081, 3,246) ft
Right Coordinate: (49.22879, 3,263.3906) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-147.76081	3,274
	-22.2226	3,274

Points

	X (ft)	Y (ft)
Point 1	23.64818	3,264
Point 2	-0	3,274
Point 3	-1.98905	3,274
Point 4	-1.98905	3,257
Point 5	14.87185	3,259.9017
Point 6	29.82654	3,262.375
Point 7	-22.2226	3,274
Point 8	-26.45519	3,271.8121
Point 9	-87.12824	3,251.8616
Point 10	-74.75964	3,252.8919
Point 11	-52.40133	3,253.971
Point 12	-30.10141	3,254.8933
Point 13	49.22879	3,263.3906
Point 14	34.66228	3,262.4237
Point 15	-94.73826	3,249.3593
Point 16	-99.9228	3,248.05
Point 17	-134.77655	3,247
Point 18	-147.76081	3,246
Point 19	-147.76081	3,229.7776
Point 20	49.22879	3,229.7776
Point 21	-47.17201	3,265
Point 22	-31.96911	3,269.999
Point 23	-147.76081	3,267
Point 24	-147.76081	3,274
Point 25	-40.6448	3,267.1463

Regions

	Material	Points	Area (ft²)

Region 1	Embankment Fill	5,6,1,2,3,7,8,22,25,21,9,10,11,12,4	1,198.1
Region 2	Foundation Soil	13,14,6,5,4,12,11,10,9,15,16,17,18,19,20	4,779

Current Slip Surface

Slip Surface: 620
F of S: 2.09
Volume: 118.06069 ft³
Weight: 14,621.22 lbs
Resisting Moment: 279,459.08 lbs-ft
Activating Moment: 133,395.98 lbs-ft
Resisting Force: 8,966.6937 lbs
Activating Force: 4,280.6018 lbs
F of S Rank (Analysis): 1 of 637 slip surfaces
F of S Rank (Query): 1 of 637 slip surfaces
Exit: (33.223838, 3,262.4092) ft
Entry: (-0, 3,274) ft
Radius: 27.895655 ft
Center: (23.742675, 3,288.6442) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	0.54951928	3,273.176	0	25.657065	16.661893	50
Slice 2	1.6485578	3,271.6382	0	119.62665	77.686454	50
Slice 3	2.7475964	3,270.2955	0	197.05301	127.96772	50
Slice 4	3.8466349	3,269.1071	0	262.31497	170.34934	50
Slice 5	4.9456735	3,268.046	0	318.41433	206.78068	50
Slice 6	6.044712	3,267.0932	0	367.46176	238.63246	50
Slice 7	7.1437506	3,266.2349	0	410.95071	266.87451	50
Slice 8	8.2427891	3,265.4605	0	449.91891	292.18076	50
Slice 9	9.3418277	3,264.7618	0	485.04625	314.99272	50
Slice 10	10.440866	3,264.1322	0	516.71448	335.5583	50
Slice 11	11.539905	3,263.5666	0	545.04377	353.95557	50
Slice 12	12.638943	3,263.0607	0	569.91534	370.10735	50
Slice 13	13.737982	3,262.611	0	590.98676	383.79129	50
Slice 14	14.83702	3,262.2147	0	607.70583	394.64878	50
Slice 15	15.936059	3,261.8693	0	619.32793	402.19626	50
Slice 16	17.035098	3,261.5729	0	624.9424	405.84234	50
Slice 17	18.134136	3,261.3239	0	623.51269	404.91388	50

Slice 18	19.233175	3,261.1211	0	613.93446	398.6937	50
Slice 19	20.332213	3,260.9634	0	595.11373	386.47137	50
Slice 20	21.573344	3,260.8417	0	541.27114	275.79142	0
Slice 21	22.956568	3,260.7682	0	485.67234	247.46242	0
Slice 22	24.163043	3,260.7565	0	435.97305	222.13937	0
Slice 23	25.19277	3,260.791	0	396.79037	202.17479	0
Slice 24	26.222497	3,260.8638	0	349.49749	178.07787	0
Slice 25	27.252223	3,260.9751	0	294.52317	150.06705	0
Slice 26	28.28195	3,261.1253	0	232.58639	118.50868	0
Slice 27	29.311677	3,261.3151	0	164.65565	83.896245	0
Slice 28	30.392756	3,261.5591	0	110.43972	56.27185	0
Slice 29	31.525189	3,261.8626	0	69.750629	35.539721	0
Slice 30	32.657622	3,262.2182	0	23.89303	12.174107	0

Seismic Safety Factor

File Information

File Version: 8.15
Created By: Colter Lane
Last Edited By: Colter Lane
Revision Number: 26
Date: 9/27/2016
Time: 9:51:25 AM
Tool Version: 8.15
File Name: D-15-P12.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Divider Dikes\
Last Solved Date: 9/27/2016
Last Solved Time: 9:51:26 AM

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 FS

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 FS: Operational 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

Embankment Fill - Seismic

Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Foundation Soil - Seismic

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 21.6 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (-147.76081, 3,246) ft
Right Coordinate: (49.22879, 3,263.3906) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	-147.76081	3,267
	-40.6448	3,267.1463

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	23.64818	3,264
Point 2	-0	3,274
Point 3	-1.98905	3,274
Point 4	-1.98905	3,257
Point 5	14.87185	3,259.9017
Point 6	29.82654	3,262.375
Point 7	-22.2226	3,274
Point 8	-26.45519	3,271.8121
Point 9	-87.12824	3,251.8616
Point 10	-74.75964	3,252.8919
Point 11	-52.40133	3,253.971
Point 12	-30.10141	3,254.8933
Point 13	49.22879	3,263.3906
Point 14	34.66228	3,262.4237
Point 15	-94.73826	3,249.3593
Point 16	-99.9228	3,248.05
Point 17	-134.77655	3,247
Point 18	-147.76081	3,246
Point 19	-147.76081	3,229.7776
Point 20	49.22879	3,229.7776
Point 21	-47.17201	3,265
Point 22	-31.96911	3,269.999
Point 23	-147.76081	3,267
Point 24	-147.76081	3,274
Point 25	-40.6448	3,267.1463

Regions

	Material	Points	Area (ft²)
Region 1	Embankment Fill - Seismic	5,6,1,2,3,7,8,22,25,21,9,10,11,12,4	1,198.1
Region 2	Foundation Soil - Seismic	13,14,6,5,4,12,11,10,9,15,16,17,18,19,20	4,779

Current Slip Surface

Slip Surface: 1
F of S: 1.49

Volume: 118.06069 ft³
Weight: 14,621.22 lbs
Resisting Moment: 213,460.99 lbs-ft
Activating Moment: 143,472.97 lbs-ft
Resisting Force: 6,858.0624 lbs
Activating Force: 4,610.1592 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (33.223838, 3,262.4092) ft
Entry: (-0, 3,274) ft
Radius: 27.895655 ft
Center: (23.742675, 3,288.6442) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	0.54951928	3,273.176	0	22.189535	11.014981	40
Slice 2	1.6485578	3,271.6382	0	114.27356	56.72589	40
Slice 3	2.7475964	3,270.2955	0	189.93438	94.284247	40
Slice 4	3.8466349	3,269.1071	0	253.60262	125.88944	40
Slice 5	4.9456735	3,268.046	0	308.32397	153.05335	40
Slice 6	6.044712	3,267.0932	0	356.25043	176.84425	40
Slice 7	7.1437506	3,266.2349	0	398.9141	198.02268	40
Slice 8	8.2427891	3,265.4605	0	437.39113	217.12284	40
Slice 9	9.3418277	3,264.7618	0	472.39565	234.49924	40
Slice 10	10.440866	3,264.1322	0	504.33969	250.3564	40
Slice 11	11.539905	3,263.5666	0	533.36345	264.76392	40
Slice 12	12.638943	3,263.0607	0	559.35692	277.66718	40
Slice 13	13.737982	3,262.611	0	581.96613	288.8905	40
Slice 14	14.83702	3,262.2147	0	600.60307	298.14195	40
Slice 15	15.936059	3,261.8693	0	614.45777	305.01949	40
Slice 16	17.035098	3,261.5729	0	622.52152	309.02237	40
Slice 17	18.134136	3,261.3239	0	623.62258	309.56894	40
Slice 18	19.233175	3,261.1211	0	616.49358	306.03007	40
Slice 19	20.332213	3,260.9634	0	599.85579	297.771	40
Slice 20	21.573344	3,260.8417	0	544.1852	215.45816	0
Slice 21	22.956568	3,260.7682	0	490.24495	194.10171	0
Slice 22	24.163043	3,260.7565	0	441.36473	174.74866	0
Slice 23	25.19277	3,260.791	0	402.43531	159.33541	0

Slice 24	26.222497	3,260.8638	0	354.92784	140.52587	0
Slice 25	27.252223	3,260.9751	0	299.31872	118.50866	0
Slice 26	28.28195	3,261.1253	0	236.42446	93.607067	0
Slice 27	29.311677	3,261.3151	0	167.34955	66.258373	0
Slice 28	30.392756	3,261.5591	0	112.14271	44.400442	0
Slice 29	31.525189	3,261.8626	0	70.684917	27.986138	0
Slice 30	32.657622	3,262.2182	0	24.163158	9.5668711	0

Static Safety Factor: Maximum Storage Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 50
Date: 10/11/2016
Time: 3:37:45 PM
Tool Version: 8.15.1.11236
File Name: 2016 STEP Main Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Main Dam\
Last Solved Date: 10/11/2016
Last Solved Time: 3:37:47 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 FS: 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: 0.01
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

Clay Core
Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

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

Foundation Soil
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Bedrock
Model: Bedrock (Impenetrable)

Foundation Soil - Sat.
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-391, 3,183.1905) ft
Left-Zone Right Coordinate: (-235, 3,208.3333) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (-20, 3,280) ft
Right-Zone Right Coordinate: (69, 3,257) ft
Right-Zone Increment: 12
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (-415, 3,183) ft
Right Coordinate: (284, 3,198) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	39	3,267
	284	3,267

Points

	X (ft)	Y (ft)
Point 1	-295.55497	3,188.1483
Point 2	-20	3,280
Point 3	0	3,280
Point 4	174	3,222
Point 5	189	3,222
Point 6	262.31907	3,197.5603
Point 7	207.76147	3,193.9788
Point 8	60	3,192
Point 9	23.38	3,192
Point 10	-2	3,276.6
Point 11	-12.77985	3,276.6
Point 12	-18	3,276.6

Point 13	-19.38	3,272
Point 14	-24.60015	3,272
Point 15	-48.60015	3,192
Point 16	15	3,162
Point 17	-30	3,162
Point 18	-64.5	3,185
Point 19	-40.25985	3,185
Point 20	-305.55497	3,187.9704
Point 21	-318.15977	3,183.7688
Point 22	-305.89705	3,183.9732
Point 23	-301.50619	3,181.046
Point 24	-299.55497	3,181.0785
Point 25	-294.93463	3,184.1587
Point 26	-79	3,188
Point 27	-40	3,162
Point 28	-43	3,164
Point 29	-415	3,165
Point 30	-415	3,183
Point 31	18	3,164
Point 32	191	3,170
Point 33	284	3,168
Point 34	284	3,198
Point 35	284	3,122
Point 36	-415	3,122
Point 37	30	3,270
Point 38	284	3,270
Point 39	138	3,234
Point 40	284	3,267
Point 41	39	3,267

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment Fill	1,2,3,37,41,39,4,5,6,7,8,9,10,11,12,13,14,15	21,579
Region 2	Clay Core	11,10,9,8,31,16,17,18,19	5,545.3

Region 3	Drain	11,12,13,14,15,1,20,21,22,23,24,25,26,28,27,17,18,19	2,253.3
Region 4	Foundation Soil - Sat.	30,21,22,23,24,25,26,28,29	7,335.1
Region 5	Foundation Soil	31,8,7,6,34,33,32	6,353.2
Region 6	Bedrock	36,29,28,27,17,16,31,32,33,35	30,412

Current Slip Surface

Slip Surface: 830
F of S: 2.11
Volume: 3,805.1973 ft³
Weight: 473,747.06 lbs
Resisting Moment: 1.9894153e+008 lbs-ft
Activating Moment: 94,284,114 lbs-ft
Resisting Force: 292,769.35 lbs
Activating Force: 138,739.14 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (-294.89252, 3,188.3691) ft
Entry: (-12.272301, 3,280) ft
Radius: 642.97736 ft
Center: (-346.52062, 3,829.2704) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-290.15299	3,188.7862	0	141.66738	91.99987	50
Slice 2	-280.67394	3,189.6913	0	422.39114	274.30402	50
Slice 3	-271.19489	3,190.7384	0	688.12933	446.87641	50
Slice 4	-261.71583	3,191.9281	0	936.83037	608.38476	50
Slice 5	-252.23678	3,193.2613	0	1,166.5349	757.55662	50
Slice 6	-242.75773	3,194.739	0	1,375.4947	893.25669	50
Slice 7	-233.27868	3,196.362	0	1,562.2706	1,014.5504	50
Slice 8	-223.79962	3,198.1316	0	1,725.8034	1,120.7498	50
Slice 9	-214.32057	3,200.049	0	1,865.4547	1,211.4404	50
Slice 10	-204.84152	3,202.1154	0	1,981.0159	1,286.4868	50
Slice 11	-195.36247	3,204.3325	0	2,072.6888	1,346.0198	50
Slice 12	-185.88342	3,206.7018	0	2,141.0399	1,390.4076	50
Slice 13	-176.40436	3,209.2251	0	2,186.9357	1,420.2126	50
Slice 14	-166.92531	3,211.9042	0	2,211.4638	1,436.1414	50
Slice 15	-157.44626	3,214.7411	0	2,215.8486	1,438.9889	50

Slice 16	-147.96721	3,217.7382	0	2,201.365	1,429.5831	50
Slice 17	-138.48815	3,220.8977	0	2,169.259	1,408.7333	50
Slice 18	-129.0091	3,224.2222	0	2,120.676	1,377.1831	50
Slice 19	-119.53005	3,227.7145	0	2,056.5997	1,335.5715	50
Slice 20	-110.051	3,231.3774	0	1,977.8034	1,284.4006	50
Slice 21	-100.57194	3,235.2141	0	1,884.811	1,224.0106	50
Slice 22	-91.092892	3,239.2281	0	1,777.8663	1,154.5599	50
Slice 23	-81.61384	3,243.4229	0	1,656.9087	1,076.0091	50
Slice 24	-72.134788	3,247.8025	0	1,521.5521	988.10748	50
Slice 25	-62.655735	3,252.3712	0	1,371.0659	890.38062	50
Slice 26	-53.176683	3,257.1333	0	1,204.3578	782.1191	50
Slice 27	-43.697631	3,262.0938	0	1,019.9594	662.36937	50
Slice 28	-34.218578	3,267.258	0	816.01852	529.92862	50
Slice 29	-24.739526	3,272.6315	0	590.30244	383.34688	50
Slice 30	-18.962303	3,275.9857	0	407.73246	264.78456	50
Slice 31	-15.098454	3,278.3	0	166.04676	107.83202	50

Static Safety Factor: Maximum Surcharge Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 50
Date: 10/11/2016
Time: 3:37:45 PM
Tool Version: 8.15.1.11236
File Name: 2016 STEP Main Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Main Dam\
Last Solved Date: 10/11/2016
Last Solved Time: 3:37:48 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 FS: Max 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: 0.01
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

Clay Core
Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °

Embankment Fill
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 50 psf
Phi': 33 °
Phi-B: 0 °

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

Foundation Soil
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Bedrock
Model: Bedrock (Impenetrable)

Foundation Soil - Sat.
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-391, 3,183.1905) ft
Left-Zone Right Coordinate: (-235, 3,208.3333) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (-20, 3,280) ft
Right-Zone Right Coordinate: (69, 3,257) ft
Right-Zone Increment: 12
Radius Increments: 8

Slip Surface Limits

Left Coordinate: (-415, 3,183) ft
Right Coordinate: (284, 3,198) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	30	3,270
	284	3,270

Points

	X (ft)	Y (ft)
Point 1	-295.55497	3,188.1483
Point 2	-20	3,280
Point 3	0	3,280
Point 4	174	3,222
Point 5	189	3,222
Point 6	262.31907	3,197.5603
Point 7	207.76147	3,193.9788
Point 8	60	3,192
Point 9	23.38	3,192
Point 10	-2	3,276.6
Point 11	-12.77985	3,276.6
Point 12	-18	3,276.6

Point 13	-19.38	3,272
Point 14	-24.60015	3,272
Point 15	-48.60015	3,192
Point 16	15	3,162
Point 17	-30	3,162
Point 18	-64.5	3,185
Point 19	-40.25985	3,185
Point 20	-305.55497	3,187.9704
Point 21	-318.15977	3,183.7688
Point 22	-305.89705	3,183.9732
Point 23	-301.50619	3,181.046
Point 24	-299.55497	3,181.0785
Point 25	-294.93463	3,184.1587
Point 26	-79	3,188
Point 27	-40	3,162
Point 28	-43	3,164
Point 29	-415	3,165
Point 30	-415	3,183
Point 31	18	3,164
Point 32	191	3,170
Point 33	284	3,168
Point 34	284	3,198
Point 35	284	3,122
Point 36	-415	3,122
Point 37	30	3,270
Point 38	284	3,270
Point 39	138	3,234
Point 40	284	3,267
Point 41	39	3,267

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment Fill	1,2,3,37,41,39,4,5,6,7,8,9,10,11,12,13,14,15	21,579
Region 2	Clay Core	11,10,9,8,31,16,17,18,19	5,545.3

Region 3	Drain	11,12,13,14,15,1,20,21,22,23,24,25,26,28,27,17,18,19	2,253.3
Region 4	Foundation Soil - Sat.	30,21,22,23,24,25,26,28,29	7,335.1
Region 5	Foundation Soil	31,8,7,6,34,33,32	6,353.2
Region 6	Bedrock	36,29,28,27,17,16,31,32,33,35	30,412

Current Slip Surface

Slip Surface: 830
F of S: 2.11
Volume: 3,805.1973 ft³
Weight: 473,747.06 lbs
Resisting Moment: 1.9894153e+008 lbs-ft
Activating Moment: 94,284,114 lbs-ft
Resisting Force: 292,769.35 lbs
Activating Force: 138,739.14 lbs
F of S Rank (Analysis): 1 of 1,521 slip surfaces
F of S Rank (Query): 1 of 1,521 slip surfaces
Exit: (-294.89252, 3,188.3691) ft
Entry: (-12.272301, 3,280) ft
Radius: 642.97736 ft
Center: (-346.52062, 3,829.2704) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-290.15299	3,188.7862	0	141.66738	91.99987	50
Slice 2	-280.67394	3,189.6913	0	422.39114	274.30402	50
Slice 3	-271.19489	3,190.7384	0	688.12933	446.87641	50
Slice 4	-261.71583	3,191.9281	0	936.83037	608.38476	50
Slice 5	-252.23678	3,193.2613	0	1,166.5349	757.55662	50
Slice 6	-242.75773	3,194.739	0	1,375.4947	893.25669	50
Slice 7	-233.27868	3,196.362	0	1,562.2706	1,014.5504	50
Slice 8	-223.79962	3,198.1316	0	1,725.8034	1,120.7498	50
Slice 9	-214.32057	3,200.049	0	1,865.4547	1,211.4404	50
Slice 10	-204.84152	3,202.1154	0	1,981.0159	1,286.4868	50
Slice 11	-195.36247	3,204.3325	0	2,072.6888	1,346.0198	50
Slice 12	-185.88342	3,206.7018	0	2,141.0399	1,390.4076	50
Slice 13	-176.40436	3,209.2251	0	2,186.9357	1,420.2126	50
Slice 14	-166.92531	3,211.9042	0	2,211.4638	1,436.1414	50

Slice 15	-157.44626	3,214.7411	0	2,215.8486	1,438.9889	50
Slice 16	-147.96721	3,217.7382	0	2,201.365	1,429.5831	50
Slice 17	-138.48815	3,220.8977	0	2,169.259	1,408.7333	50
Slice 18	-129.0091	3,224.2222	0	2,120.676	1,377.1831	50
Slice 19	-119.53005	3,227.7145	0	2,056.5997	1,335.5715	50
Slice 20	-110.051	3,231.3774	0	1,977.8034	1,284.4006	50
Slice 21	-100.57194	3,235.2141	0	1,884.811	1,224.0106	50
Slice 22	-91.092892	3,239.2281	0	1,777.8663	1,154.5599	50
Slice 23	-81.61384	3,243.4229	0	1,656.9087	1,076.0091	50
Slice 24	-72.134788	3,247.8025	0	1,521.5521	988.10748	50
Slice 25	-62.655735	3,252.3712	0	1,371.0659	890.38062	50
Slice 26	-53.176683	3,257.1333	0	1,204.3578	782.1191	50
Slice 27	-43.697631	3,262.0938	0	1,019.9594	662.36937	50
Slice 28	-34.218578	3,267.258	0	816.01852	529.92862	50
Slice 29	-24.739526	3,272.6315	0	590.30244	383.34688	50
Slice 30	-18.962303	3,275.9857	0	407.73246	264.78456	50
Slice 31	-15.098454	3,278.3	0	166.04676	107.83202	50

Seismic Safety Factor

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 50
Date: 10/11/2016
Time: 3:37:45 PM
Tool Version: 8.15.1.11236
File Name: 2016 STEP Main Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Main Dam\
Last Solved Date: 10/11/2016
Last Solved Time: 3:37:48 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 FS

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 FS: 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: 0.01
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)

Clay Core - Seismic
Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 26.8 °
Phi-B: 0 °

Drain - Seismic
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 28 °
Phi-B: 0 °

Embankment Fill - Seismic
Model: Mohr-Coulomb
Unit Weight: 124.5 pcf
Cohesion': 40 psf
Phi': 26.4 °
Phi-B: 0 °

Foundation Soil - Seismic
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 25.6 °
Phi-B: 0 °

Foundation Soil - Sat. - Seismic
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf

Phi': 25.6 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (-415, 3,183) ft
Right Coordinate: (284, 3,198) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	39	3,267
	284	3,267

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	-295.55497	3,188.1483
Point 2	-20	3,280
Point 3	0	3,280
Point 4	174	3,222
Point 5	189	3,222
Point 6	262.31907	3,197.5603
Point 7	207.76147	3,193.9788
Point 8	60	3,192
Point 9	23.38	3,192
Point 10	-2	3,276.6
Point 11	-12.77985	3,276.6
Point 12	-18	3,276.6
Point 13	-19.38	3,272
Point 14	-24.60015	3,272
Point 15	-48.60015	3,192
Point 16	15	3,162

Point 17	-30	3,162
Point 18	-64.5	3,185
Point 19	-40.25985	3,185
Point 20	-305.55497	3,187.9704
Point 21	-318.15977	3,183.7688
Point 22	-305.89705	3,183.9732
Point 23	-301.50619	3,181.046
Point 24	-299.55497	3,181.0785
Point 25	-294.93463	3,184.1587
Point 26	-79	3,188
Point 27	-40	3,162
Point 28	-43	3,164
Point 29	-415	3,165
Point 30	-415	3,183
Point 31	18	3,164
Point 32	191	3,170
Point 33	284	3,168
Point 34	284	3,198
Point 35	284	3,122
Point 36	-415	3,122
Point 37	30	3,270
Point 38	284	3,270
Point 39	138	3,234
Point 40	284	3,267
Point 41	39	3,267

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment Fill - Seismic	1,2,3,37,41,39,4,5,6,7,8,9,10,11,12,13,14,15	21,579
Region 2	Clay Core - Seismic	11,10,9,8,31,16,17,18,19	5,545.3
Region 3	Drain - Seismic	11,12,13,14,15,1,20,21,22,23,24,25,26,28,27,17,18,19	2,253.3
Region 4	Foundation Soil - Sat. - Seismic	30,21,22,23,24,25,26,28,29	7,335.1

Region 5	Foundation Soil - Seismic	31,8,7,6,34,33,32	6,353.2
Region 6	Bedrock	36,29,28,27,17,16,31,32,33,35	30,412

Current Slip Surface

Slip Surface: 1
F of S: 1.47
Volume: 3,805.1973 ft³
Weight: 473,747.06 lbs
Resisting Moment: 1.5105104e+008 lbs-ft
Activating Moment: 1.0280685e+008 lbs-ft
Resisting Force: 222,385.37 lbs
Activating Force: 151,334.03 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-294.89252, 3,188.3691) ft
Entry: (-12.272301, 3,280) ft
Radius: 642.97736 ft
Center: (-346.52062, 3,829.2704) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-290.15299	3,188.7862	0	141.65517	70.318238	40
Slice 2	-280.67394	3,189.6913	0	423.07471	210.01611	40
Slice 3	-271.19489	3,190.7384	0	689.66674	342.35354	40
Slice 4	-261.71583	3,191.9281	0	939.17361	466.20983	40
Slice 5	-252.23678	3,193.2613	0	1,169.4356	580.51287	40
Slice 6	-242.75773	3,194.739	0	1,378.5277	684.30709	40
Slice 7	-233.27868	3,196.362	0	1,564.8738	776.81011	40
Slice 8	-223.79962	3,198.1316	0	1,727.3275	857.45283	40
Slice 9	-214.32057	3,200.049	0	1,865.2208	925.90365	40
Slice 10	-204.84152	3,202.1154	0	1,978.3728	982.07281	40
Slice 11	-195.36247	3,204.3325	0	2,067.068	1,026.1015	40
Slice 12	-185.88342	3,206.7018	0	2,132	1,058.334	40
Slice 13	-176.40436	3,209.2251	0	2,174.1976	1,079.2811	40
Slice 14	-166.92531	3,211.9042	0	2,194.9301	1,089.5728	40
Slice 15	-157.44626	3,214.7411	0	2,195.6105	1,089.9105	40
Slice 16	-147.96721	3,217.7382	0	2,177.6947	1,081.017	40
Slice 17	-138.48815	3,220.8977	0	2,142.5918	1,063.5918	40

Slice 18	-129.0091	3,224.2222	0	2,091.5823	1,038.2705	40
Slice 19	-119.53005	3,227.7145	0	2,025.7523	1,005.5922	40
Slice 20	-110.051	3,231.3774	0	1,945.9434	965.9747	40
Slice 21	-100.57194	3,235.2141	0	1,852.7114	919.69393	40
Slice 22	-91.092892	3,239.2281	0	1,746.3015	866.8716	40
Slice 23	-81.61384	3,243.4229	0	1,626.6253	807.46382	40
Slice 24	-72.134788	3,247.8025	0	1,493.2457	741.2536	40
Slice 25	-62.655735	3,252.3712	0	1,345.3615	667.84323	40
Slice 26	-53.176683	3,257.1333	0	1,181.793	586.64713	40
Slice 27	-43.697631	3,262.0938	0	1,000.9705	496.88608	40
Slice 28	-34.218578	3,267.258	0	800.92667	397.58345	40
Slice 29	-24.739526	3,272.6315	0	579.29988	287.56696	40
Slice 30	-18.962303	3,275.9857	0	399.7969	198.4609	40
Slice 31	-15.098454	3,278.3	0	161.81226	80.324302	40

Static Safety Factor: Maximum Storage Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 122
Date: 10/12/2016
Time: 8:39:58 AM
Tool Version: 8.15
File Name: Bottom Ash Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Bottom Ash\
Last Solved Date: 10/12/2016
Last Solved Time: 8:40:00 AM

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 FS: 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: 0.01
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: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °

Shell

Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 372.9 psf
Phi': 30.9 °
Phi-B: 0 °

Bedrock Foundation

Model: Bedrock (Impenetrable)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-70.89315, 3,240.0014) ft
Left-Zone Right Coordinate: (-38.99992, 3,247.5012) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (0, 3,267) ft
Right-Zone Right Coordinate: (45.06846, 3,254.4581) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-105, 3,240.0014) ft
Right Coordinate: (91, 3,242) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Normal

Coordinates

	X (ft)	Y (ft)
	33.97787	3,260
	91	3,260

Seismic Coefficients

Horz Seismic Coef.: 0
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	29.98157	3,233.0037
Point 2	20	3,267
Point 3	73.99718	3,240.0014
Point 4	-10.00943	3,232.9997
Point 5	0	3,267
Point 6	-54.00039	3,240.0014
Point 7	-105	3,207
Point 8	90.99944	3,207
Point 9	90.99944	3,239.9694
Point 10	86.03201	3,239.99
Point 11	-105	3,240.0014
Point 12	20	3,207
Point 13	0	3,207
Point 14	-32	3,243.9897
Point 15	-21	3,241
Point 16	20.58721	3,265
Point 17	71	3,239.5249
Point 18	70	3,242
Point 19	91	3,242
Point 20	91	3,262
Point 21	29.97341	3,262.001
Point 22	91	3,263
Point 23	28.00002	3,262.9901
Point 24	33.97787	3,260

Point 25	28.97784	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock Foundation	7,11,6,14,15,4,1,17,3,10,9,8,12,13	6,072.5
Region 2	Shell	1,17,16	686.85
Region 3	Shell	6,14,15,4,5	590.58
Region 4	Core	5,4,1,16,2	1,019.8
Region 5	Core	2,23,25,21,24,18,19,9,10,3,17,16	134.1

Current Slip Surface

Slip Surface: 843
F of S: 2.41
Volume: 456.88488 ft³
Weight: 58,024.38 lbs
Resisting Moment: 3,578,513 lbs-ft
Activating Moment: 1,486,896.4 lbs-ft
Resisting Force: 47,308.77 lbs
Activating Force: 19,656.259 lbs
F of S Rank (Analysis): 1 of 1,183 slip surfaces
F of S Rank (Query): 1 of 1,183 slip surfaces
Exit: (-46.527416, 3,243.7377) ft
Entry: (12.007707, 3,267) ft
Radius: 70.034527 ft
Center: (-40.361757, 3,313.5003) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-45.515548	3,243.663	0	96.279071	57.621835	372.9
Slice 2	-43.491813	3,243.543	0	259.65044	155.39758	372.9
Slice 3	-41.468078	3,243.4818	0	417.5177	249.87919	372.9
Slice 4	-39.444342	3,243.4791	0	567.02337	339.35649	372.9
Slice 5	-37.420607	3,243.5348	0	705.42734	422.18955	372.9
Slice 6	-35.396872	3,243.6493	0	830.3312	496.94297	372.9
Slice 7	-33.373137	3,243.8227	0	939.86087	562.49512	372.9
Slice 8	-32.180634	3,243.957	0	951.05419	569.19419	372.9
Slice 9	-30.969818	3,244.1176	0	1,055.3686	631.62505	372.9
Slice 10	-28.938754	3,244.411	0	1,121.1624	671.00186	372.9
Slice 11	-26.93699	3,244.772	0	1,176.2332	703.96103	372.9

Slice 12	-24.935226	3,245.1936	0	1,215.5437	727.48792	372.9
Slice 13	-22.933462	3,245.6768	0	1,240.3015	742.30515	372.9
Slice 14	-20.931698	3,246.2231	0	1,251.9929	749.30227	372.9
Slice 15	-18.929934	3,246.8339	0	1,252.2453	749.45335	372.9
Slice 16	-16.928169	3,247.5111	0	1,242.7047	743.7434	372.9
Slice 17	-14.926405	3,248.2567	0	1,224.9346	733.10823	372.9
Slice 18	-12.924641	3,249.0731	0	1,200.3399	718.38861	372.9
Slice 19	-10.922877	3,249.9631	0	1,170.1116	700.29732	372.9
Slice 20	-8.9211134	3,250.9298	0	1,135.1878	679.39591	372.9
Slice 21	-6.9193494	3,251.9767	0	1,096.2263	656.07789	372.9
Slice 22	-4.9175854	3,253.1082	0	1,053.5816	630.55558	372.9
Slice 23	-2.9375275	3,254.3148	0	1,039.3459	687.92803	0
Slice 24	-0.97917584	3,255.6	0	1,002.768	663.71767	0
Slice 25	1.0006422	3,256.9985	0	914.43135	605.24891	0
Slice 26	3.0019266	3,258.5202	0	773.40129	511.90315	0
Slice 27	5.0032111	3,260.1605	0	625.5909	414.06959	0
Slice 28	7.0044955	3,261.9306	0	467.58362	309.48685	0
Slice 29	9.0057799	3,263.8445	0	295.0981	195.32117	0
Slice 30	11.007064	3,265.9197	0	102.63694	67.933909	0

Static Safety Factor: Maximum Surcharge Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 122
Date: 10/12/2016
Time: 8:39:58 AM
Tool Version: 8.15
File Name: Bottom Ash Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Bottom Ash\
Last Solved Date: 10/12/2016
Last Solved Time: 8:40:00 AM

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 FS: Max 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: 0.01
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: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °

Shell

Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 372.9 psf
Phi': 30.9 °
Phi-B: 0 °

Bedrock Foundation

Model: Bedrock (Impenetrable)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-70.89315, 3,240.0014) ft
Left-Zone Right Coordinate: (-38.99992, 3,247.5012) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (0, 3,267) ft
Right-Zone Right Coordinate: (45.06846, 3,254.4581) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (-105, 3,240.0014) ft
Right Coordinate: (91, 3,242) ft

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf

Direction: Normal

Coordinates

	X (ft)	Y (ft)
	28.97784	3,262.5
	91	3,262.5

Seismic Coefficients

Horz Seismic Coef.: 0
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	29.98157	3,233.0037
Point 2	20	3,267
Point 3	73.99718	3,240.0014
Point 4	-10.00943	3,232.9997
Point 5	0	3,267
Point 6	-54.00039	3,240.0014
Point 7	-105	3,207
Point 8	90.99944	3,207
Point 9	90.99944	3,239.9694
Point 10	86.03201	3,239.99
Point 11	-105	3,240.0014
Point 12	20	3,207
Point 13	0	3,207
Point 14	-32	3,243.9897
Point 15	-21	3,241
Point 16	20.58721	3,265
Point 17	71	3,239.5249
Point 18	70	3,242
Point 19	91	3,242
Point 20	91	3,262
Point 21	29.97341	3,262.001
Point 22	91	3,263
Point 23	28.00002	3,262.9901
Point 24	33.97787	3,260

Point 25	28.97784	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock Foundation	7,11,6,14,15,4,1,17,3,10,9,8,12,13	6,072.5
Region 2	Shell	1,17,16	686.85
Region 3	Shell	6,14,15,4,5	590.58
Region 4	Core	5,4,1,16,2	1,019.8
Region 5	Core	2,23,25,21,24,18,19,9,10,3,17,16	134.1

Current Slip Surface

Slip Surface: 843
F of S: 2.41
Volume: 456.88488 ft³
Weight: 58,024.38 lbs
Resisting Moment: 3,578,513 lbs-ft
Activating Moment: 1,486,896.4 lbs-ft
Resisting Force: 47,308.77 lbs
Activating Force: 19,656.259 lbs
F of S Rank (Analysis): 1 of 1,183 slip surfaces
F of S Rank (Query): 1 of 1,183 slip surfaces
Exit: (-46.527416, 3,243.7377) ft
Entry: (12.007707, 3,267) ft
Radius: 70.034527 ft
Center: (-40.361757, 3,313.5003) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-45.515548	3,243.663	0	96.279071	57.621835	372.9
Slice 2	-43.491813	3,243.543	0	259.65044	155.39758	372.9
Slice 3	-41.468078	3,243.4818	0	417.5177	249.87919	372.9
Slice 4	-39.444342	3,243.4791	0	567.02337	339.35649	372.9
Slice 5	-37.420607	3,243.5348	0	705.42734	422.18955	372.9
Slice 6	-35.396872	3,243.6493	0	830.3312	496.94297	372.9
Slice 7	-33.373137	3,243.8227	0	939.86087	562.49512	372.9
Slice 8	-32.180634	3,243.957	0	951.05419	569.19419	372.9
Slice 9	-30.969818	3,244.1176	0	1,055.3686	631.62505	372.9
Slice 10	-28.938754	3,244.411	0	1,121.1624	671.00186	372.9
Slice 11	-26.93699	3,244.772	0	1,176.2332	703.96103	372.9

Slice 12	-24.935226	3,245.1936	0	1,215.5437	727.48792	372.9
Slice 13	-22.933462	3,245.6768	0	1,240.3015	742.30515	372.9
Slice 14	-20.931698	3,246.2231	0	1,251.9929	749.30227	372.9
Slice 15	-18.929934	3,246.8339	0	1,252.2453	749.45335	372.9
Slice 16	-16.928169	3,247.5111	0	1,242.7047	743.7434	372.9
Slice 17	-14.926405	3,248.2567	0	1,224.9346	733.10823	372.9
Slice 18	-12.924641	3,249.0731	0	1,200.3399	718.38861	372.9
Slice 19	-10.922877	3,249.9631	0	1,170.1116	700.29732	372.9
Slice 20	-8.9211134	3,250.9298	0	1,135.1878	679.39591	372.9
Slice 21	-6.9193494	3,251.9767	0	1,096.2263	656.07789	372.9
Slice 22	-4.9175854	3,253.1082	0	1,053.5816	630.55558	372.9
Slice 23	-2.9375275	3,254.3148	0	1,039.3459	687.92803	0
Slice 24	-0.97917584	3,255.6	0	1,002.768	663.71767	0
Slice 25	1.0006422	3,256.9985	0	914.43135	605.24891	0
Slice 26	3.0019266	3,258.5202	0	773.40129	511.90315	0
Slice 27	5.0032111	3,260.1605	0	625.5909	414.06959	0
Slice 28	7.0044955	3,261.9306	0	467.58362	309.48685	0
Slice 29	9.0057799	3,263.8445	0	295.0981	195.32117	0
Slice 30	11.007064	3,265.9197	0	102.63694	67.933909	0

Seismic Safety Factor

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 122
Date: 10/12/2016
Time: 8:39:58 AM
Tool Version: 8.15
File Name: Bottom Ash Dam.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Bottom Ash\
Last Solved Date: 10/12/2016
Last Solved Time: 8:40:06 AM

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 FS

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 FS: 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: 0.01
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: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °

Bedrock Foundation
Model: Bedrock (Impenetrable)

Core - Seismic
Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 26.8 °
Phi-B: 0 °

Shell - Seismic
Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 298.32 psf
Phi': 24.72 °
Phi-B: 0 °

Slip Surface Limits
Left Coordinate: (-105, 3,240.0014) ft
Right Coordinate: (91, 3,242) ft

Surcharge Loads

Surcharge Load 1
Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	33.97787	3,260
	91	3,260

Seismic Coefficients

Horz Seismic Coef.: 0.03
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	29.98157	3,233.0037
Point 2	20	3,267
Point 3	73.99718	3,240.0014
Point 4	-10.00943	3,232.9997
Point 5	0	3,267
Point 6	-54.00039	3,240.0014
Point 7	-105	3,207
Point 8	90.99944	3,207
Point 9	90.99944	3,239.9694
Point 10	86.03201	3,239.99
Point 11	-105	3,240.0014
Point 12	20	3,207
Point 13	0	3,207
Point 14	-32	3,243.9897
Point 15	-21	3,241
Point 16	20.58721	3,265
Point 17	71	3,239.5249
Point 18	70	3,242
Point 19	91	3,242
Point 20	91	3,262
Point 21	29.97341	3,262.001
Point 22	91	3,263
Point 23	28.00002	3,262.9901
Point 24	33.97787	3,260
Point 25	28.97784	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Bedrock Foundation	7,11,6,14,15,4,1,17,3,10,9,8,12,13	6,072.5
Region 2	Shell - Seismic	1,17,16	686.85
Region 3	Shell - Seismic	6,14,15,4,5	590.58
Region 4	Core - Seismic	5,4,1,16,2	1,019.8
Region 5	Core	2,23,25,21,24,18,19,9,10,3,17,16	134.1

Current Slip Surface

Slip Surface: 1
F of S: 1.74
Volume: 456.88489 ft³
Weight: 58,024.38 lbs
Resisting Moment: 2,768,122.3 lbs-ft
Activating Moment: 1,589,391.9 lbs-ft
Resisting Force: 36,646.638 lbs
Activating Force: 20,991.923 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (-46.527416, 3,243.7377) ft
Entry: (12.007707, 3,267) ft
Radius: 70.034527 ft
Center: (-40.361757, 3,313.5003) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-45.515548	3,243.663	0	100.24816	46.151403	298.32
Slice 2	-43.491813	3,243.543	0	268.37538	123.5524	298.32
Slice 3	-41.468078	3,243.4818	0	430.49423	198.18731	298.32
Slice 4	-39.444342	3,243.4791	0	583.45764	268.60732	298.32
Slice 5	-37.420607	3,243.5348	0	724.30583	333.44983	298.32
Slice 6	-35.396872	3,243.6493	0	850.49609	391.54424	298.32
Slice 7	-33.373137	3,243.8227	0	960.08289	441.99489	298.32
Slice 8	-32.180634	3,243.957	0	966.16648	444.7956	298.32
Slice 9	-30.969818	3,244.1176	0	1,074.9154	494.86051	298.32
Slice 10	-28.938754	3,244.411	0	1,137.3059	523.58332	298.32

Slice 11	-26.93699	3,244.772	0	1,188.8631	547.31879	298.32
Slice 12	-24.935226	3,245.1936	0	1,223.8616	563.43111	298.32
Slice 13	-22.933462	3,245.6768	0	1,243.7385	572.58186	298.32
Slice 14	-20.931698	3,246.2231	0	1,250.2306	575.57067	298.32
Slice 15	-18.929934	3,246.8339	0	1,245.2176	573.26281	298.32
Slice 16	-16.928169	3,247.5111	0	1,230.5631	566.51628	298.32
Slice 17	-14.926405	3,248.2567	0	1,207.9995	556.12864	298.32
Slice 18	-12.924641	3,249.0731	0	1,179.0317	542.79268	298.32
Slice 19	-10.922877	3,249.9631	0	1,144.8887	527.07423	298.32
Slice 20	-8.9211134	3,250.9298	0	1,106.5072	509.40447	298.32
Slice 21	-6.9193494	3,251.9767	0	1,064.5364	490.08232	298.32
Slice 22	-4.9175854	3,253.1082	0	1,019.3552	469.28215	298.32
Slice 23	-2.9375275	3,254.3148	0	1,003.8904	507.10154	0
Slice 24	-0.97917584	3,255.6	0	968.41427	489.18125	0
Slice 25	1.0006422	3,256.9985	0	883.43203	446.25363	0
Slice 26	3.0019266	3,258.5202	0	747.97769	377.83072	0
Slice 27	5.0032111	3,260.1605	0	606.50694	306.3687	0
Slice 28	7.0044955	3,261.9306	0	455.08864	229.88181	0

Slice 29	9.0057799	3,263.8445	0	288.67383	145.81964	0
Slice 30	11.007064	3,265.9197	0	100.9177	50.9772	0

Static Safety Factor: Maximum Storage Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 38
Date: 10/12/2016
Time: 8:21:56 AM
Tool Version: 8.15
File Name: Pond A Dam_Section B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Pond A\
Last Solved Date: 10/12/2016
Last Solved Time: 8:21:56 AM

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 FS: Maximum Storage Pool

Description: Pond A Steady State @ deepest section
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

Core

Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 204.2 psf
Phi': 31.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Bedrock

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

Foundation

Model: Mohr-Coulomb
Unit Weight: 118.2 pcf
Cohesion': 107.8 psf
Phi': 29.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Foundation - Sat.

Model: Mohr-Coulomb

Unit Weight: 123.8 pcf
Cohesion': 107.8 psf
Phi': 29.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell - Sat.

Model: Mohr-Coulomb
Unit Weight: 126.8 pcf
Cohesion': 204.2 psf
Phi': 31.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Core - Sat.

Model: Mohr-Coulomb
Unit Weight: 140.4 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (35.35662, 3,238) ft
Left-Zone Right Coordinate: (65, 3,245) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (105, 3,265) ft
Right-Zone Right Coordinate: (143.06896, 3,255.9655) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (0, 3,238) ft
Right Coordinate: (300, 3,233.8589) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	3,225

Coordinate 2	300	3,225

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	134.99999	3,260
	300	3,260

Points

	X (ft)	Y (ft)
Point 1	125	3,265
Point 2	200.30571	3,227.3471
Point 3	201.48928	3,226.7319
Point 4	151.01803	3,221.2797
Point 5	149.41949	3,221.2797
Point 6	140	3,215
Point 7	134	3,210.0315
Point 8	97.98425	3,210.0315
Point 9	90	3,215
Point 10	105	3,265
Point 11	51	3,238
Point 12	53.94094	3,235.0236
Point 13	0	3,238
Point 14	0	3,160
Point 15	300	3,160
Point 16	300	3,233.8589
Point 17	271.32044	3,234.2756
Point 18	0	3,205
Point 19	300	3,205
Point 20	105	3,210
Point 21	131	3,262
Point 22	300	3,262

Point 23	0	3,225
Point 24	72	3,224.9954
Point 25	300	3,225
Point 26	92.99875	3,224.9958
Point 27	137.00099	3,224.9967
Point 28	185.43561	3,224.9977
Point 29	300	3,263
Point 30	128.97407	3,263.013
Point 31	134.99999	3,260
Point 32	130.00001	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Shell	1,30,32,21,31,2,3,28,27	1,343.2
Region 2	Core	1,27,26,10	1,280.2
Region 3	Shell	10,11,12,24,26	1,066.8
Region 4	Bedrock	14,18,8,7,19,15	14,345
Region 5	Foundation - Sat.	18,23,24,9,8	1,523.3
Region 6	Foundation - Sat.	7,6,5,4,28,25,19	2,692.7
Region 7	Foundation	13,11,12,24,23	787.49
Region 8	Shell - Sat.	9,26,24	104.95
Region 9	Core - Sat.	6,7,8,9,26,27	683.52
Region 10	Shell - Sat.	4,5,6,27,28	149.49
Region 11	Foundation	3,2,17,16,25,28	684.34

Current Slip Surface

Slip Surface: 570
F of S: 1.99
Volume: 513.2986 ft³
Weight: 62,083.782 lbs
Resisting Moment: 3,760,534.9 lbs-ft
Activating Moment: 1,894,470.5 lbs-ft
Resisting Force: 43,523.96 lbs
Activating Force: 21,872.782 lbs
F of S Rank (Analysis): 1 of 1,183 slip surfaces
F of S Rank (Query): 1 of 1,183 slip surfaces
Exit: (51.004068, 3,238.002) ft
Entry: (115.05043, 3,265) ft
Radius: 78.840275 ft

Center: (55.538432, 3,316.7118) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	52.050667	3,237.9557	-808.43472	81.574981	49.989213	204.2
Slice 2	54.143866	3,237.8908	-804.38704	231.91769	142.11934	204.2
Slice 3	56.237065	3,237.8816	-803.81035	377.95615	231.61183	204.2
Slice 4	58.330264	3,237.9279	-806.70343	517.22183	316.95395	204.2
Slice 5	60.423463	3,238.03	-813.07241	647.30129	396.66674	204.2
Slice 6	62.516662	3,238.188	-822.93086	766.01167	469.41255	204.2
Slice 7	64.609861	3,238.4022	-836.29991	871.54849	534.0856	204.2
Slice 8	66.70306	3,238.6732	-853.2085	962.59393	589.87832	204.2
Slice 9	68.796259	3,239.0015	-873.69368	1,038.3785	636.31918	204.2
Slice 10	70.889458	3,239.3878	-897.80104	1,098.6944	673.28078	204.2
Slice 11	72.982657	3,239.8331	-925.58523	1,143.8623	700.95973	204.2
Slice 12	75.075856	3,240.3383	-957.11061	1,174.6605	719.83288	204.2
Slice 13	77.169055	3,240.9047	-992.45205	1,192.2243	730.59598	204.2
Slice 14	79.262254	3,241.5336	-1,031.6959	1,197.9297	734.09227	204.2
Slice 15	81.355453	3,242.2266	-1,074.941	1,193.2733	731.2388	204.2
Slice 16	83.448651	3,242.9856	-1,122.3004	1,179.7595	722.95754	204.2
Slice 17	85.54185	3,243.8125	-1,173.9026	1,158.8059	710.11716	204.2
Slice 18	87.635049	3,244.7098	-1,229.8941	1,131.6715	693.48916	204.2
Slice 19	89.728248	3,245.6802	-1,290.4414	1,099.4109	673.71988	204.2
Slice 20	91.821447	3,246.7265	-1,355.7342	1,062.8531	651.31719	204.2
Slice 21	93.914646	3,247.8524	-1,425.9891	1,022.5976	626.64864	204.2
Slice 22	96.007845	3,249.0618	-1,501.4542	979.022	599.94545	204.2
Slice 23	98.101044	3,250.3592	-1,582.4148	932.28692	571.30616	204.2
Slice 24	100.19424	3,251.75	-1,669.2009	882.33015	540.69261	204.2
Slice 25	102.18063	3,253.1592	-1,757.1335	872.09077	577.22429	0
Slice 26	104.06021	3,254.5829	-1,845.9715	853.82594	565.13506	0
Slice 27	106.00504	3,256.1544	-1,944.0351	770.41032	509.92347	0
Slice 28	108.01513	3,257.8886	-2,052.2479	620.46912	410.67955	0
Slice 29	110.02522	3,259.7465	-2,168.1822	461.63484	305.54944	0
Slice 30	112.0353	3,261.7408	-2,292.6237	289.89077	191.87452	0

Slice 31	114.04539	3,263.8869	-2,426.5396	100.34274	66.415411	0

Static Safety Factor: Maximum Surcharge Pool

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 38
Date: 10/12/2016
Time: 8:21:56 AM
Tool Version: 8.15
File Name: Pond A Dam_Section B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Pond A\
Last Solved Date: 10/12/2016
Last Solved Time: 8:21:58 AM

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 FS: Max Surcharge Pool

Description: Pond A Steady State @ deepest section
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

Core

Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 204.2 psf
Phi': 31.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Bedrock

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

Foundation

Model: Mohr-Coulomb
Unit Weight: 118.2 pcf
Cohesion': 107.8 psf
Phi': 29.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Foundation - Sat.

Model: Mohr-Coulomb

Unit Weight: 123.8 pcf
Cohesion': 107.8 psf
Phi': 29.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell - Sat.

Model: Mohr-Coulomb
Unit Weight: 126.8 pcf
Cohesion': 204.2 psf
Phi': 31.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Core - Sat.

Model: Mohr-Coulomb
Unit Weight: 140.4 pcf
Cohesion': 0 psf
Phi': 33.5 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (35.35662, 3,238) ft
Left-Zone Right Coordinate: (65, 3,245) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (105, 3,265) ft
Right-Zone Right Coordinate: (143.06896, 3,255.9655) ft
Right-Zone Increment: 12
Radius Increments: 6

Slip Surface Limits

Left Coordinate: (0, 3,238) ft
Right Coordinate: (300, 3,233.8589) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	3,225

Coordinate 2	300	3,225

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	130.00001	3,262.5
	300	3,262.5

Points

	X (ft)	Y (ft)
Point 1	125	3,265
Point 2	200.30571	3,227.3471
Point 3	201.48928	3,226.7319
Point 4	151.01803	3,221.2797
Point 5	149.41949	3,221.2797
Point 6	140	3,215
Point 7	134	3,210.0315
Point 8	97.98425	3,210.0315
Point 9	90	3,215
Point 10	105	3,265
Point 11	51	3,238
Point 12	53.94094	3,235.0236
Point 13	0	3,238
Point 14	0	3,160
Point 15	300	3,160
Point 16	300	3,233.8589
Point 17	271.32044	3,234.2756
Point 18	0	3,205
Point 19	300	3,205
Point 20	105	3,210
Point 21	131	3,262
Point 22	300	3,262

Point 23	0	3,225
Point 24	72	3,224.9954
Point 25	300	3,225
Point 26	92.99875	3,224.9958
Point 27	137.00099	3,224.9967
Point 28	185.43561	3,224.9977
Point 29	300	3,263
Point 30	128.97407	3,263.013
Point 31	134.99999	3,260
Point 32	130.00001	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Shell	1,30,32,21,31,2,3,28,27	1,343.2
Region 2	Core	1,27,26,10	1,280.2
Region 3	Shell	10,11,12,24,26	1,066.8
Region 4	Bedrock	14,18,8,7,19,15	14,345
Region 5	Foundation - Sat.	18,23,24,9,8	1,523.3
Region 6	Foundation - Sat.	7,6,5,4,28,25,19	2,692.7
Region 7	Foundation	13,11,12,24,23	787.49
Region 8	Shell - Sat.	9,26,24	104.95
Region 9	Core - Sat.	6,7,8,9,26,27	683.52
Region 10	Shell - Sat.	4,5,6,27,28	149.49
Region 11	Foundation	3,2,17,16,25,28	684.34

Current Slip Surface

Slip Surface: 570
F of S: 1.99
Volume: 513.2986 ft³
Weight: 62,083.782 lbs
Resisting Moment: 3,760,534.9 lbs-ft
Activating Moment: 1,894,470.5 lbs-ft
Resisting Force: 43,523.96 lbs
Activating Force: 21,872.782 lbs
F of S Rank (Analysis): 1 of 1,183 slip surfaces
F of S Rank (Query): 1 of 1,183 slip surfaces
Exit: (51.004068, 3,238.002) ft
Entry: (115.05043, 3,265) ft
Radius: 78.840275 ft

Center: (55.538432, 3,316.7118) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	52.050667	3,237.9557	-808.43472	81.574981	49.989213	204.2
Slice 2	54.143866	3,237.8908	-804.38704	231.91769	142.11934	204.2
Slice 3	56.237065	3,237.8816	-803.81035	377.95615	231.61183	204.2
Slice 4	58.330264	3,237.9279	-806.70343	517.22183	316.95395	204.2
Slice 5	60.423463	3,238.03	-813.07241	647.30129	396.66674	204.2
Slice 6	62.516662	3,238.188	-822.93086	766.01167	469.41255	204.2
Slice 7	64.609861	3,238.4022	-836.29991	871.54849	534.0856	204.2
Slice 8	66.70306	3,238.6732	-853.2085	962.59393	589.87832	204.2
Slice 9	68.796259	3,239.0015	-873.69368	1,038.3785	636.31918	204.2
Slice 10	70.889458	3,239.3878	-897.80104	1,098.6944	673.28078	204.2
Slice 11	72.982657	3,239.8331	-925.58523	1,143.8623	700.95973	204.2
Slice 12	75.075856	3,240.3383	-957.11061	1,174.6605	719.83288	204.2
Slice 13	77.169055	3,240.9047	-992.45205	1,192.2243	730.59598	204.2
Slice 14	79.262254	3,241.5336	-1,031.6959	1,197.9297	734.09227	204.2
Slice 15	81.355453	3,242.2266	-1,074.941	1,193.2733	731.2388	204.2
Slice 16	83.448651	3,242.9856	-1,122.3004	1,179.7595	722.95754	204.2
Slice 17	85.54185	3,243.8125	-1,173.9026	1,158.8059	710.11716	204.2
Slice 18	87.635049	3,244.7098	-1,229.8941	1,131.6715	693.48916	204.2
Slice 19	89.728248	3,245.6802	-1,290.4414	1,099.4109	673.71988	204.2
Slice 20	91.821447	3,246.7265	-1,355.7342	1,062.8531	651.31719	204.2
Slice 21	93.914646	3,247.8524	-1,425.9891	1,022.5976	626.64864	204.2
Slice 22	96.007845	3,249.0618	-1,501.4542	979.022	599.94545	204.2
Slice 23	98.101044	3,250.3592	-1,582.4148	932.28692	571.30616	204.2
Slice 24	100.19424	3,251.75	-1,669.2009	882.33015	540.69261	204.2
Slice 25	102.18063	3,253.1592	-1,757.1335	872.09077	577.22429	0
Slice 26	104.06021	3,254.5829	-1,845.9715	853.82594	565.13506	0
Slice 27	106.00504	3,256.1544	-1,944.0351	770.41032	509.92347	0
Slice 28	108.01513	3,257.8886	-2,052.2479	620.46912	410.67955	0
Slice 29	110.02522	3,259.7465	-2,168.1822	461.63484	305.54944	0
Slice 30	112.0353	3,261.7408	-2,292.6237	289.89077	191.87452	0

Slice 31	114.04539	3,263.8869	-2,426.5396	100.34274	66.415411	0

Seismic Safety Factor

File Information

File Version: 8.15
Last Edited By: Colter Lane
Revision Number: 38
Date: 10/12/2016
Time: 8:21:56 AM
Tool Version: 8.15
File Name: Pond A Dam_Section B.gsz
Directory: H:\2016\16419 Talen\32-33 Safety Factor Assessments\Docs\Geostudio\12 STEP\Pond A\
Last Solved Date: 10/12/2016
Last Solved Time: 8:21:58 AM

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 FS

Description: Pond A Steady State @ deepest section
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: 1 Static FS: 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: 0.01
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

Core - Seismic

Model: Mohr-Coulomb
Unit Weight: 127 pcf
Cohesion': 0 psf
Phi': 26.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Foundation - Seismic

Model: Mohr-Coulomb
Unit Weight: 118.2 pcf
Cohesion': 86.24 psf
Phi': 23.36 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell - Seismic

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 163.36 psf
Phi': 25.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Foundation - Seismic - Sat.

Model: Mohr-Coulomb
Unit Weight: 123.8 pcf
Cohesion': 86.24 psf
Phi': 23.36 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shell - Seismic - Sat.

Model: Mohr-Coulomb
Unit Weight: 126.8 pcf
Cohesion': 163.36 psf
Phi': 25.2 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Core - Seismic - Sat.

Model: Mohr-Coulomb
Unit Weight: 140.4 pcf
Cohesion': 0 psf
Phi': 26.8 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (0, 3,238) ft
Right Coordinate: (300, 3,233.8589) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	3,225
Coordinate 2	300	3,225

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 62.4 pcf
Direction: Normal

Coordinates

	X (ft)	Y (ft)
	134.99999	3,260
	300	3,260

Seismic Coefficients

Horz Seismic Coef.: 0.03

Points

	X (ft)	Y (ft)
Point 1	125	3,265
Point 2	200.30571	3,227.3471
Point 3	201.48928	3,226.7319
Point 4	151.01803	3,221.2797
Point 5	149.41949	3,221.2797
Point 6	140	3,215
Point 7	134	3,210.0315
Point 8	97.98425	3,210.0315
Point 9	90	3,215
Point 10	105	3,265
Point 11	51	3,238
Point 12	53.94094	3,235.0236
Point 13	0	3,238
Point 14	0	3,160
Point 15	300	3,160
Point 16	300	3,233.8589
Point 17	271.32044	3,234.2756
Point 18	0	3,205
Point 19	300	3,205
Point 20	105	3,210
Point 21	131	3,262
Point 22	300	3,262
Point 23	0	3,225
Point 24	72	3,224.9954
Point 25	300	3,225

Point 26	92.99875	3,224.9958
Point 27	137.00099	3,224.9967
Point 28	185.43561	3,224.9977
Point 29	300	3,263
Point 30	128.97407	3,263.013
Point 31	134.99999	3,260
Point 32	130.00001	3,262.5

Regions

	Material	Points	Area (ft²)
Region 1	Shell - Seismic	1,30,32,21,31,2,3,28,27	1,343.2
Region 2	Core - Seismic	1,27,26,10	1,280.2
Region 3	Shell - Seismic	10,11,12,24,26	1,066.8
Region 4	Bedrock	14,18,8,7,19,15	14,345
Region 5	Foundation - Seismic - Sat.	18,23,24,9,8	1,523.3
Region 6	Foundation - Seismic - Sat.	7,6,5,4,28,25,19	2,692.7
Region 7	Foundation - Seismic	13,11,12,24,23	787.49
Region 8	Shell - Seismic - Sat.	9,26,24	104.95
Region 9	Core - Seismic - Sat.	6,7,8,9,26,27	683.52
Region 10	Shell - Seismic - Sat.	4,5,6,27,28	149.49
Region 11	Foundation - Seismic	3,2,17,16,25,28	684.34

Current Slip Surface

Slip Surface: 1
F of S: 1.43
Volume: 513.2986 ft³
Weight: 62,083.783 lbs
Resisting Moment: 2,890,494.7 lbs-ft
Activating Moment: 2,017,649.3 lbs-ft
Resisting Force: 33,515.716 lbs
Activating Force: 23,336.747 lbs
F of S Rank (Analysis): 1 of 1 slip surfaces
F of S Rank (Query): 1 of 1 slip surfaces
Exit: (51.004068, 3,238.002) ft
Entry: (115.05043, 3,265) ft
Radius: 78.840275 ft
Center: (55.538432, 3,316.7118) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	52.050667	3,237.9557	-808.43471	83.715436	39.393494	163.36
Slice 2	54.143866	3,237.8908	-804.38704	237.12582	111.58294	163.36
Slice 3	56.237065	3,237.8816	-803.81037	386.22553	181.74394	163.36
Slice 4	58.330264	3,237.9279	-806.70342	528.27358	248.58668	163.36
Slice 5	60.423463	3,238.03	-813.07241	660.59331	310.85162	163.36
Slice 6	62.516662	3,238.188	-822.93086	780.77818	367.40632	163.36
Slice 7	64.609861	3,238.4022	-836.2999	886.8562	417.32285	163.36
Slice 8	66.70306	3,238.6732	-853.20849	977.41924	459.93858	163.36
Slice 9	68.796259	3,239.0015	-873.69366	1,051.6851	494.88542	163.36
Slice 10	70.889458	3,239.3878	-897.80103	1,109.5137	522.09751	163.36
Slice 11	72.982657	3,239.8331	-925.58522	1,151.3615	541.7896	163.36
Slice 12	75.075856	3,240.3383	-957.11061	1,178.196	554.41696	163.36
Slice 13	77.169055	3,240.9047	-992.45203	1,191.3755	560.61875	163.36
Slice 14	79.262254	3,241.5336	-1,031.6959	1,192.5102	561.15269	163.36
Slice 15	81.355453	3,242.2266	-1,074.941	1,183.3261	556.83099	163.36
Slice 16	83.448651	3,242.9856	-1,122.3003	1,165.5277	548.45571	163.36
Slice 17	85.54185	3,243.8125	-1,173.9026	1,140.697	536.77125	163.36
Slice 18	87.635049	3,244.7098	-1,229.8941	1,110.2124	522.42631	163.36
Slice 19	89.728248	3,245.6802	-1,290.4414	1,075.1999	505.95069	163.36
Slice 20	91.821447	3,246.7265	-1,355.7342	1,036.5181	487.7484	163.36
Slice 21	93.914646	3,247.8524	-1,425.9891	994.76064	468.09882	163.36
Slice 22	96.007845	3,249.0618	-1,501.4542	950.27513	447.16553	163.36
Slice 23	98.101044	3,250.3592	-1,582.4148	903.1774	425.00303	163.36
Slice 24	100.19424	3,251.75	-1,669.2009	853.35594	401.55882	163.36
Slice 25	102.18063	3,253.1592	-1,757.1335	845.41748	427.0511	0
Slice 26	104.06021	3,254.5829	-1,845.9715	828.92558	418.72044	0
Slice 27	106.00504	3,256.1544	-1,944.0351	749.15199	378.4239	0
Slice 28	108.01513	3,257.8886	-2,052.2479	604.44035	305.32479	0
Slice 29	110.02522	3,259.7465	-2,168.1822	450.75186	227.69115	0
Slice 30	112.0353	3,261.7408	-2,292.6237	283.83949	143.37764	0
Slice 31	114.04539	3,263.8869	-2,426.5396	98.522591	49.767342	0