EARTH SOLUTIONS NW

Geotechnical Engineering ■ Earthwork Observation & Testing
Environmental Services ■ CESCL & Stormwater Services

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August 5, 2025
Updated August 21, 2025
ES-8157.03

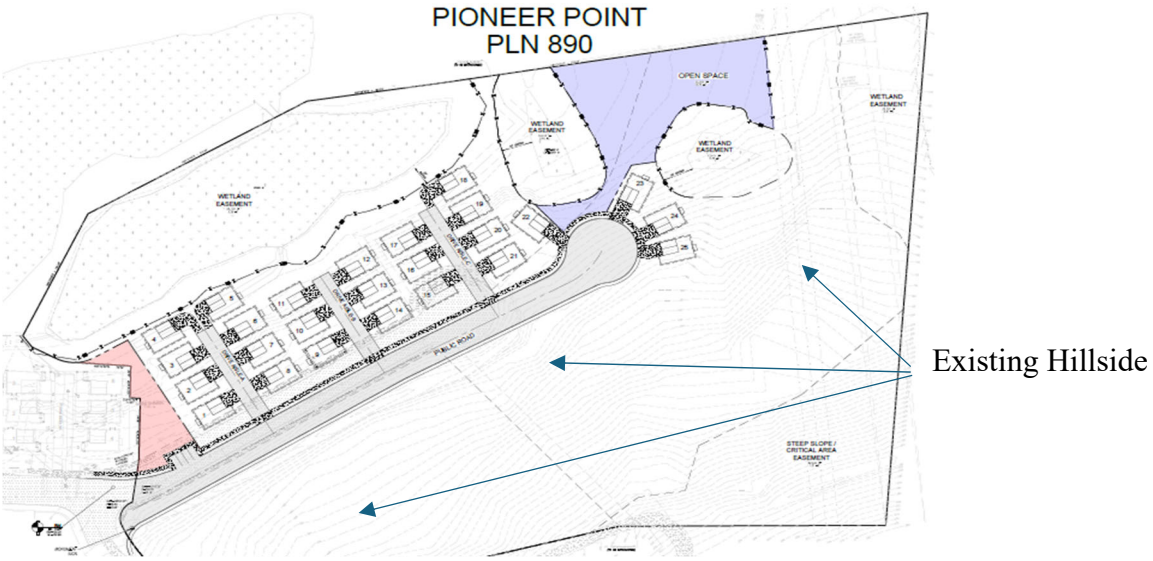
Bay Equity, LLC
502 State Avenue, Suite 101A
Marysville, Washington 98270

Attention: John Murphy

Subject: Geotechnical Evaluation
Site Stabilization
Pioneer Point
Arlington, Washington

Dear John:

As requested, Earth Solutions NW, LLC (ESNW) has reviewed recently revised plans for residential development at the subject site. Specifically, development within existing areas of hillside prone to landside activity is no longer proposed. Instead, the bulk of the proposed development activity will now occur within the relatively flat (northerly) regions of the site where landslide risk is characterized as low. In any case, given the history of landslide activity, measures to stabilize the existing hillside and mitigate the risk of future landslide activity have been proposed. As such, this report intends to provide a method for mitigating the landslide hazard for the new (less aggressive) development proposal. Based on prior discussions with the City of Arlington and their 3rd party consultant, the overall goal with respect to mitigation will be to reach agreement with the City on the intended approach for achieving total site stabilization. Once concurrence with the City and their consultant is attained, preparation of final plans and engineering are expected to begin in earnest. The snippet presented below (extracted from the current civil site plan) illustrates the overall property limits and positioning of the proposed development area relative to the existing hillside.



Proposed Development Area (North of Existing Hillside)

Site History

Earlier proposals for developing the site included residential construction and related infrastructure improvement that intended to occupy almost the entirety of the site and areas of associated hillside. In anticipation of this earlier plan for developing the site, a new road was extended along the base of the hillside and into the site. This work was reported to have occurred in 1994. Previous investigations (by others) had characterized the near surface geologic condition as consisting largely of lacustrine silts (and transitional beds) of moderate plasticity with consistency characterized as stiff to moderately stiff (near surface). Groundwater was identified in discrete layers throughout the hillside and overall soil moisture was found to be elevated. Given the identified geologic and topographic setting, and in response to the 1994 excavation and related road cut, a rotational landslide was initiated along the alignment of the completed roadway.

Based on review of follow up investigative reports and recent observations completed by the undersigned engineer, depth of rotation associated with the 1994 landslide appears to have been relatively shallow. Investigations (by others) conducted subsequent to the landslide reported head scarp features 30 to 40 feet uphill of the road cut. Consistent with the behavior of a classic rotational type rupture zone, uplift (“heave”) of the slide mass is visible at the termination, and is most pronounced at or near the centerline of the existing road alignment. The photograph below depicts the rough boundary (or edge) of the “heave” within the existing roadway.

Existing Road Alignment – Relic "Heave" Condition (1994 Slide)

It should be noted that underground utility installations within the roadway alignment pictured above still exist today. Additionally, it is our understanding that the original sewer alignment below the road reportedly remains intact. Further, it should be noted that continued (significant) displacement of the slide mass since the initial 1994 landslide event has not been detected, although it is likely that small displacements in the form of "creep" have likely occurred. In any case, and based on recent observations, it is the opinion of the undersigned engineer that the landslide likely has not remobilized to any significant extent since 1994, and likely resides currently in a state of near equilibrium (i.e. FS $\geq$ 1.0).

Proposed Mitigation

Development plans currently propose construction of 25 (detached) residential building sites and associated site infrastructure improvements. In contrast to earlier development proposals, the area of proposed construction will avoid the large expanse of hillside that dominates the central and southerly regions of the site. Instead, development will be focused throughout the topographically lower areas of the site located at the base of the hillside. Positioning of the development in this manner is intended to avoid disturbance and modification of the existing hillside to the greatest extent practicable. Also, it should be noted that the old road alignment established in 1994 will be abandoned as part of the new proposal. Access instead will be established along a newly constructed roadway occupying roughly the same alignment, but only after mitigation to support (and buttress) the base of the hillside has been accomplished. Additionally, and notwithstanding the current plans to consolidate and further separate the development area from the hillside, further measures to fully stabilize the site and mitigate the landslide hazard will also be implemented for the project. Such measures for stabilizing the hillside and mitigating the landslide risk will include the following:

Rock Keyway and Drain – At the onset of construction, and during the process of abandoning the existing road alignment, installation of a deep rock keyway and drain is proposed along the base of the existing hillside. The rock keyway and drain installation will serve two purposes:

1) Interruption and related strengthening of the landslide rupture zone through the introduction of high shear strength rock aggregate that will penetrate through the zone of slippage. The keyway should be lined with a filter fabric and filled with 2” to 4” quarry spalls. If approved by the presiding jurisdiction, a recycled concrete aggregate of similar size may also be considered for use.

2) Improved dissipation of excess pore pressure along the slip plane which will help to further improve the current (residual) shear strength characteristics of the relic slide mass.

Grade Modification (Resisting Force) – The current development plan intends to abandon the existing site access road and reestablish a new access positioned roughly along the same alignment. Most importantly, construction of the new road access will also involve abandoning the existing utility alignments and raising the existing site grade roughly 6 feet above the level of the old road surface. Raising the site in this manner will effectively restore the grade previously lost when the base of the hillside was cut to accommodate construction of the old (1994) road access. It should be emphasized that in the opinion of the undersigned engineer, excavation and related cuts executed in 1994 to construct the old road alignment likely provided the catalyst that initiated the rotational landslide at the site. Therefore, filling and restoring the areas of previous cut will effectively serve to reestablish stability of the hillside to its pre-1994 state. With respect to mitigation, the planned fill placement and its associated mass will also provide an added resisting force at the base of the hillside, essentially deriving an increased level of stability to the slope.

Passive Shear Pile (Soldier Pile Wall) – Subsequent to completing the grade modifications described above, a series of passive shear piles (soldier piles) will be installed along the southerly edge of the new road alignment (toe of slope). The soldier pile elements will be sized with sufficient length such that the pile and its encapsulating grouted shaft will penetrate through the landslide rupture zone. The added shear resistance introduced to the zone of rupture through installation of the passive shear piles will further contribute to stabilization of the hillside. Additionally, a small 4-foot segment of each solder pile will extend above-grade along the pile wall alignment to function as a catchment.

Stability Analysis

For purposes of this report and analysis of stability, the reader is directed to Plates 1 and 2 (attached) and the Slope/W limit equilibrium computer output (also attached). As outlined above, the current development plan intends to incorporate three measures of stabilization to ensure that a state of "total stabilization" is achieved for the site. Application of these mitigation measures ("rock keyway", "fill-buttress", and "passive shear piles") were modeled in our slope stability analysis for the "post-mitigation" site condition. As demonstrated based on the results of our analysis along representative Cross Section A-A', stability is satisfied for the post construction ("mitigation") case. To demonstrate the process by which the results of our analysis were obtained, the following models were developed:

Pre-1994 Rd. Cut – This model is intended to represent the natural topographic condition that predates the 1994 road excavation. Combined with the pre-1994 surface topography, subsurface data (acquired by others) were used to develop a representative cross section for the stability analysis. Once developed, this model formed the framework for subsequent model development.

Back Calculation (Post-1994 Rd. Cut) – The Pre-Road Cut (1994) model described above was used as a basis for formulating the "1994 Road-Cut" cross section. Essentially, this cross section presents a representation of the existing road alignment and areas of associated cut. Most importantly, the model provides the cross-sectional geometry necessary to "back-calculate" the intra-slide strength characteristics of the soil units during the time of slope failure. Traditionally, the process of "back-calculation" is iterative, and resolves to establish a reasonable representation of soil strength when stability is diminished to a state of equilibrium (i.e. FS = 1.0).

Post-Construction Mitigated Condition – The applied stabilization techniques described previously in this report are represented in the "Post-Construction Mitigated Condition" slope stability cross section. Specifically, the model geometry portrays the post-construction surface topography that will exist once the site is filled and raised to the level of the future road alignment. The previously described "rock-keyway" and "passive shear piles" are also represented in the model. Most importantly, soil strength characteristics derived from the prior "back-calculation" model are assumed in calculating the static and seismic factors-of-safety for the post-mitigation case.

It is emphasized again that for purposes of this report and analysis of stability, the reader is directed to Plates 1 and 2 and the Slope/W limit equilibrium computer output developed for the three slope stability models outlined above (see attached). With respect to the soil strength parameters input into the Post-Construction Mitigated Condition model geometry, values derived from the "Back Calculation" analysis were selected and assigned to the underlying ("weak" and "strong") native silt deposits. Additionally, for the "Post-Construction Mitigated Condition", strength values were assumed for the "rock keyway" and "new structural fill" layers. For clarity, the strength parameters assumed for all layers in the limit equilibrium analyses are summarized below:

Soil Strength Parameters – Cross Section A-A' Model Geometries

New Structural Fill	Rock Keyway	Silt (Soft / Stiff)*	Silt (Stiff / Hard)**
ϒ = 125 pcf	ϒ = 130 pcf	ϒ = 115 pcf	ϒ = 120 pcf
Φ = 34 deg.	Φ = 42 deg.	Φ = 18 deg.	Φ = 28 deg.
c = 0 psf	c = 0 psf	c = 75 psf*	c = 750 psf

* *Lacustrine (or Transitional Bed) Deposits.*
** *Transitional Bed Deposit.*

It should be noted that for the temporary seismic case, an increased value of cohesion (175 psf) was assumed for the silt (lacustrine) soil unit. Such temporary increase for short-term loading (i.e. seismic force) is considered justified due to "dilation" of the soil structure during sudden loading.

Strength values used in the analysis were largely derived from the "back calculation" model geometry in which strength values in the "weak" mottled silt layer were adjusted sufficiently low such that a state of equilibrium (FS~1.0) was achieved. As such, and based on the above soil strength parameters specified for each soil unit represented in the model geometries, the following factors-of-safety were calculated:

Model Geometry Factors-Of-Safety

Model Geometry	Static Factor-of-Safety	Seismic Factor-of-Safety
Pre-1994 Rd. Cut	FS = 1.40	FS = 0.79
Back Calculation (Post 1994 Rd. Cut)	FS = 0.99	N/A
Mitigated Condition	FS = 3.16	FS = 1.13

It should be noted that for the seismic stability case, a lateral seismic coefficient of 0.255 was assumed for the analysis. This coefficient represents one-half of the modified peak ground acceleration mapped for the site. Further, it is noted that a seismic stability analysis was not developed for the “Back Calculation” case as such analysis was not necessary for estimating soil strength characteristics of the underlying native silt (lacustrine / transitional bed) deposits.

Based on the above, and given that a general range of reasonable factors-of-safety were derived from analysis of the three model geometries, the following can be concluded:

- Prior to the 1994 excavation and removal of toe support along the existing access road alignment, the static stability of the hillside was calculated as moderately stable (approx. FS = 1.40). This assessment of stability was based on the back calculation strength values calculated for the Post 1994 Rd. Cut condition.

- Back calculation (Post 1994 Rd. Cut) to estimate soil strength properties based on the post-failure model geometry produced values of soil friction and cohesion that were reasonable and determined by the undersigned engineer as acceptable for use in the analysis of the mitigated (post-construction “mitigated”) model geometry.

- The addition of the previously described stabilization measures for the post-construction (“mitigated condition”) model geometry improved substantially the static and seismic factors-of-safety for the site.

Conclusions

Model geometry analysis of three representative slope configurations was undertaken for the express purpose of determining the appropriate level of stabilization necessary to mitigate landslide risk for the intended post-construction site configuration. As outlined previously in this report, and as compared to earlier proposals, the owner and project design team have substantially reduced the footprint area within which development is proposed. Specifically, the project development will no longer require significant modification and related impacts to the areas of hillside positioned within the south and central regions of the site. Instead, the majority of planned development will reside throughout topographically lower areas of the site located north of the hillside. Most significant as it relates to the current design concept are plans to raise the existing grade and abandon the current road access positioned along the toe of the hillside. As discussed earlier in this report, the 1994 road cuts and related excavation work along the toe of the hillside created conditions that formed the catalyst for the documented landslide at the site.

In consideration of plans to restore the old road access to its pre-1994 configuration, and as demonstrated through limit equilibrium analysis, the proposed “passive shear pile” and “rock keyway” mitigation measures will further contribute to achieving a state of total stabilization for the completed development. As demonstrated by way of slope stability analysis and related model geometries developed for the site, implementation of the stabilization methods outlined in this report will mitigate the landslide hazard to a level that meets or exceeds the code specified factors-of-safety for slope stability. More importantly, it is the professional opinion of the undersigned engineer that execution of the proposed mitigation, combined with efforts by the owner and design team to significantly reduce the development footprint and area of disturbance, post-construction total stabilization will be achieved for the project. As emphasized at the onset of this report, the goal of the owner and design team is to reach agreement with the City and their 3rd party consultant on the intended approach for achieving total site stabilization. Based on the findings of this report, it is the opinion of the undersigned engineer that stabilization methods proposed for installation at the site will fully mitigate the landslide risk for the project. In any case, it is acknowledged that ownership and the design team must reach concurrence with the City (and their 3rd party consultant) regarding our intended approach for stabilizing the site and future development area. Once such concurrence is obtained, design efforts and final engineering for the project are expected to commence.

We trust this report and geotechnical evaluation of proposed site stabilization methods meet your current needs. If you have questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

08/21/2025

Raymond A. Coglas, P.E.
Senior Principal Engineer

Attachments: Plate 1 – Geotechnical Cross Section Assessment
Plate 2 – Cross Section A-A’
Stability Analysis

cc: Insight Engineering
Attention: Brian Kalab, P.E.

LEGEND

- B-10 — Approximate Location of Cobalt Boring (2019/2022)
- Subject Site
- Proposed Building
- Wetland (Delineated by Others)
- Approximate Area of 1994 Landslide
- Cross Section

Pond B
Wetland Easement
Open Space
Wetland Easement
Wetland Easement
Stream
40' Buffer
25' Buffer
40' Buffer
Drive Aisle-A
Drive Aisle-B
Drive Aisle-C
Existing Power Lines
Mini Park
Proposed Public Road
B-10
B-11
B-8
A
A'
207TH STREET N.E.
Existing Road
Steep Slope / Critical Area Easement
NORTH
1"=100'
0 50 100 200
Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Geotechnical Cross Section Assessment
Proposed (New) Site Layout
Pioneer Point
Arlington, Washington

Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services

EARTH SOLUTIONS NW
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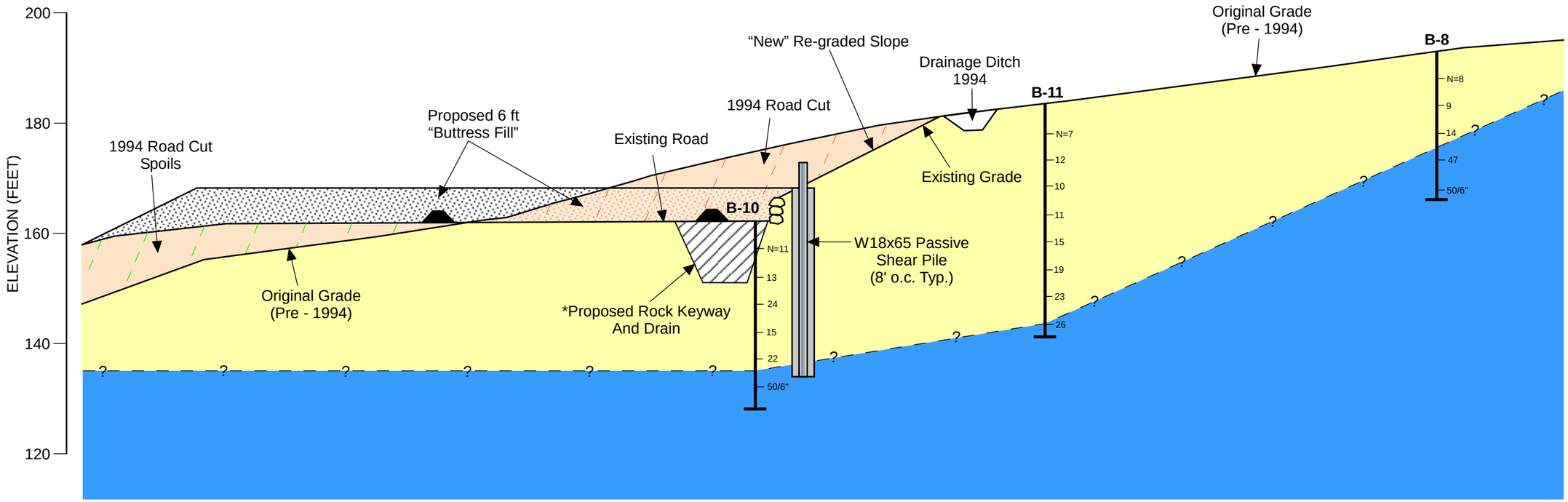
Drawn	CAM
Checked	RAC
Date	08/05/2025
Proj. No.	8157.03
Plate	1



*Rock Keyway and Drain to be Installed Along Edge of Existing Road Alignment Prior to Placement of 6 ft Fill (Buttress).

LEGEND

Silt/Clay Lacustrine (Soft / Stiff) / (Transitional Bed?)

Silt (Stiff / Hard) Transitional Bed

Horizontal Scale 1"=20' — 0 10 20 40 Scale in Feet

Vertical Scale 1"=20' — 0 10 20 40 Scale in Feet

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Cross Section A-A'
Pioneer Point
Arlington, Washington

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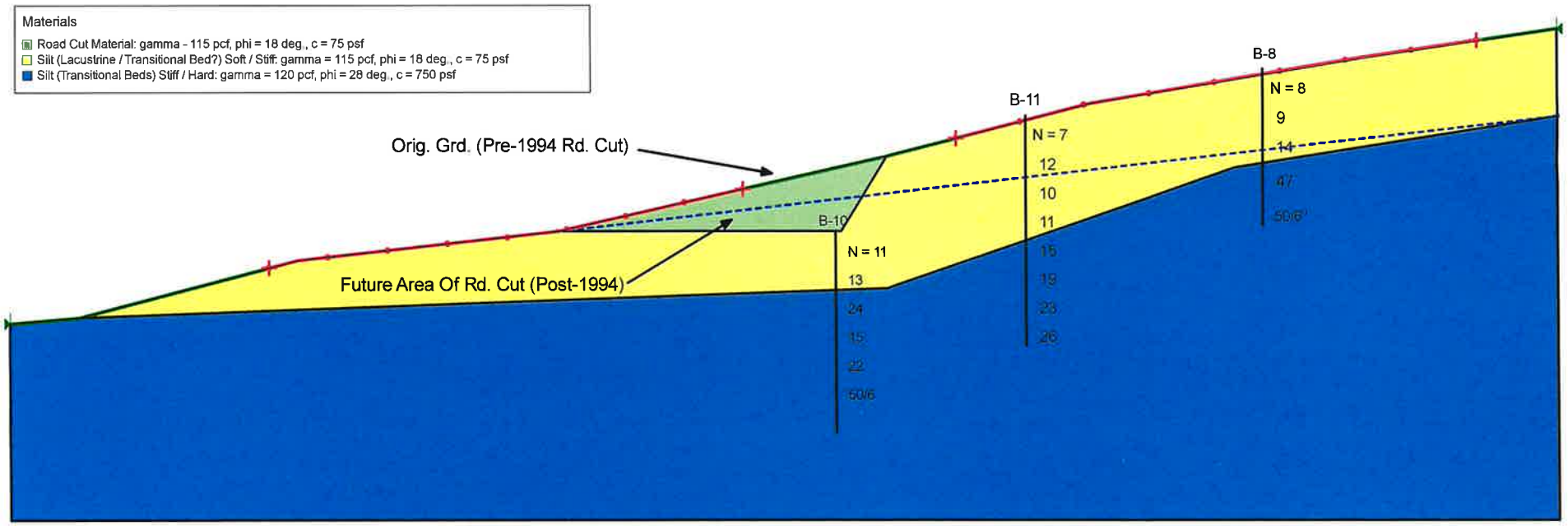
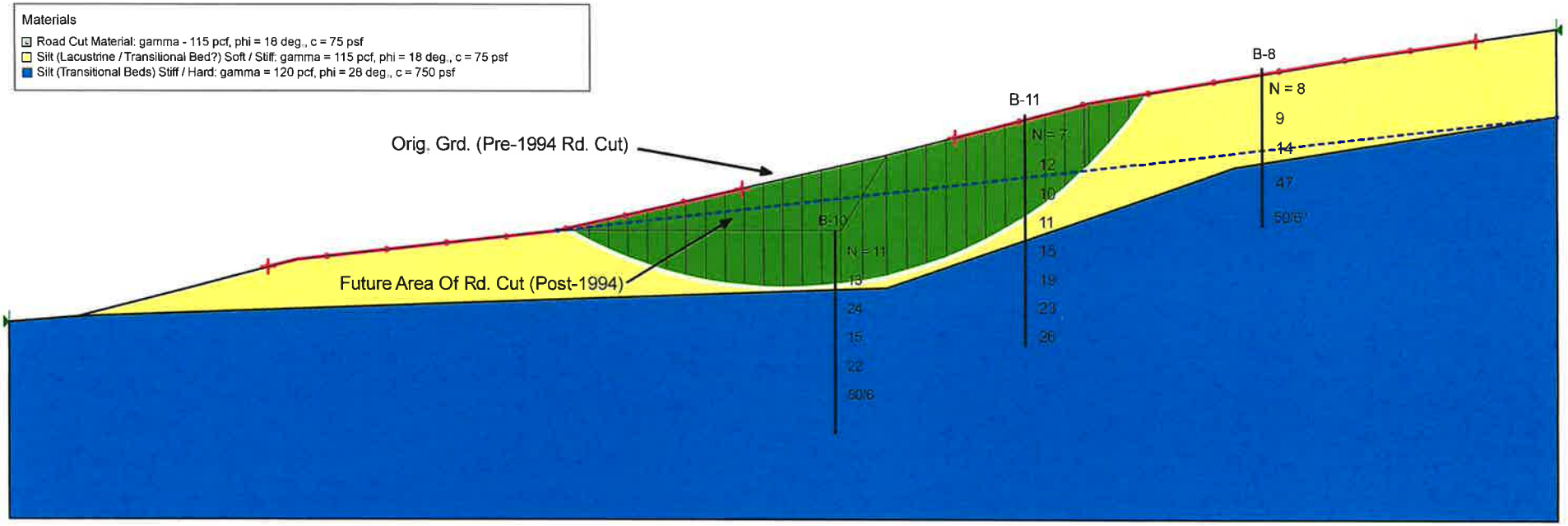
Proj. No.	8157.03
Plate	2

"Model Geometry"
Section A-A'
Pre-1994 Rd. Cut



Section A-A'
Pre-1994 Rd. Cut
FS = 1.40 (Static)



Pre-1994 Rd. Cut (STATIC)

File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Ray Coglas
Last Edited By: Ray Coglas
Revision Number: 45
Date: 08/04/2025
Time: 03:31:32 PM
File Name: Pre 1994 Orig. Grd.gsz
Directory: C:\Users\ray.coglas\Desktop\Pioneer Point 2\New Pre-1994 Orig. Grd\
Last Solved Date: 08/04/2025
Last Solved Time: 03:31:32 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Pre-1994 Rd. Cut

Description: "Existing" Stability
Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: Piezometric Surfaces
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - 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

Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 75 psf

Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Silt (Transitional Beds) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 750 psf
Effective Friction Angle: 28 °
Phi-B: 0 °

Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 75 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 75 psf
Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (45, 156.68421) ft
Left-Zone Right Coordinate: (127, 170.29825) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (163.87656, 179.05397) ft
Right-Zone Right Coordinate: (254, 195.94118) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 147) ft
Right Coordinate: (268, 198) ft

Piezometric Surfaces

Piezometric Surface 1

Coordinates

	X	Y
Coordinate 1	95 ft	163 ft
Coordinate 2	268 ft	183 ft

Seismic Coefficients

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

Geometry

Name: 2D Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	12 ft	148 ft

Point 2	50 ft	158 ft
Point 3	95 ft	163 ft
Point 4	144 ft	163 ft
Point 5	152 ft	176 ft
Point 6	187 ft	185 ft
Point 7	234 ft	193 ft
Point 8	268 ft	198 ft
Point 9	268 ft	183 ft
Point 10	212 ft	174 ft
Point 11	152 ft	153 ft
Point 12	0 ft	147 ft
Point 13	268 ft	113 ft
Point 14	0 ft	113 ft

Regions

	Material	Points	Area
Region 1	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf	1,2,3,4,5,6,7,8,9,10,11	3,351 ft²
Region 2	Silt (Transitional Beds) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf	12,1,11,10,9,13,14	12,362 ft²
Region 3	Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 75 psf	3,5,4	318.5 ft²

Slip Results

Slip Surfaces Analysed: 405 of 405 converged

Current Slip Surface

Slip Surface: 243
Factor of Safety: 1.401
Volume: 1,464.7331 ft³
Weight: 168,444.31 lbf
Resisting Moment: 3,448,339.9 lbf·ft
Activating Moment: 2,460,439.2 lbf·ft
Resisting Force: 41,649.493 lbf
Activating Force: 29,737.998 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (197.38745, 186.76808) ft
Entry: (96.555929, 163.35486) ft
Radius: 75.43111 ft
Center: (134.56028, 228.51253) ft

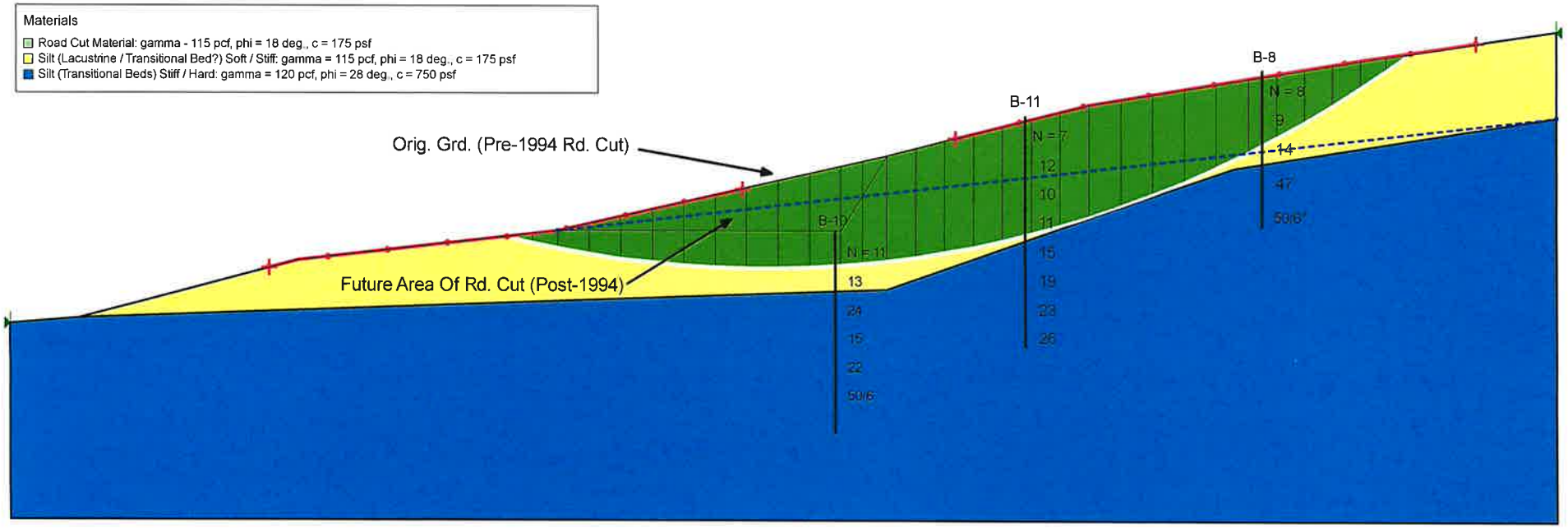
Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	195.65621 ft	184.37183 ft	-607.77522 psf	125.24449 psf	40.6944 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 2	192.19373 ft	179.92215 ft	-354.97063 psf	471.36362 psf	153.15532 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 3	188.73124 ft	176.08007 ft	-140.09855 psf	768.81052 psf	249.80168 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 4	186.60873 ft	173.91840 ft	-20.464062 psf	933.98177 psf	303.46907 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 5	184.50659 ft	172.03242 ft	82.105993 psf	1,074.6294 psf	322.49039 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 6	181.08484 ft	169.17796 ft	235.6144 psf	1,287.4259 psf	341.75427 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

								115 pcf, phi = 18 deg., c = 75 psf
Column 7	177.66310 ft	166.64451 ft	369.08234 psf	1,469.9299 psf	357.68705 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 8	174.24135 ft	164.39375 ft	484.90126 psf	1,628.0548 psf	371.43309 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 9	170.81960 ft	162.39667 ft	584.88358 psf	1,766.0104 psf	383.77136 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 10	167.39786 ft	160.63076 ft	670.43355 psf	1,886.7235 psf	395.19657 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 11	163.97611 ft	159.07832 ft	742.65676 psf	1,992.1015 psf	405.96921 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 12	160.55437 ft	157.72525 ft	802.43311 psf	2,083.2044 psf	416.14781 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 13	157.13262 ft	156.56027 ft	850.46701 psf	2,160.3633 psf	425.6111 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 14	153.71087 ft	155.57435 ft	887.3227 psf	2,223.2695 psf	434.07544 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 15	149.87650 ft	154.68460 ft	915.19549 psf	2,281.3186 psf	443.88029 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 16	145.87650 ft	153.95924 ft	931.61077 psf	2,327.744 psf	453.6312 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 17	142.32753 ft	153.50123 ft	934.59013 psf	2,347.9295 psf	459.22179 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 18	138.98260 ft	153.22980 ft	927.39369 psf	2,346.1706 psf	460.98858 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 19	135.63767 ft	153.10766 ft	910.87743 psf	2,322.5464 psf	458.67905 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 20	132.29274 ft	153.13408 ft	885.08676 psf	2,274.8669 psf	451.56694 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 21	128.94781 ft	153.30920 ft	850.01187 psf	2,201.0791 psf	438.98837 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 22	125.60288 ft	153.63409 ft	805.58751 psf	2,099.4253 psf	420.39338 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 23	122.25795 ft	154.11070 ft	751.69093 psf	1,968.5974 psf	395.39688 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

								115 pcf, phi = 18 deg., c = 75 psf
Column 24	118.91302 ft	154.74199 ft	688.13816 psf	1,807.8731 psf	363.82392 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 25	115.56809 ft	155.53197 ft	614.67807 psf	1,617.2152 psf	325.74406 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 26	112.22315 ft	156.48587 ft	530.98392 psf	1,397.3201 psf	281.48968 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 27	108.87822 ft	157.61034 ft	436.64162 psf	1,149.6023 psf	231.65498 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 28	105.53329 ft	158.91366 ft	331.13365 psf	876.11125 psf	177.07396 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 29	102.18836 ft	160.40613 ft	213.81708 psf	579.38201 psf	118.77924 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 30	98.84343 ft	162.10054 ft	83.893144 psf	262.23368 psf	57.946354 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 31	96.98910 ft	163.10446 ft	7.8343177 psf	81.351199 psf	23.887083 psf	75 psf	0 psf	Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 75 psf
Column 32	96.68158 ft	163.28190 ft	-5.4621674 psf	49.599809 psf	16.115955 psf	75 psf	0 psf	Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 75 psf

Section A-A'
Pre-1994 Rd. Cut
FS = 0.79 (Seismic)



Pre-1994 Rd. Cut (SEISMIC)

File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Ray Coglas
Last Edited By: Ray Coglas
Revision Number: 47
Date: 08/04/2025
Time: 03:35:41 PM
File Name: Pre 1994 Orig. Grd.gsz
Directory: C:\Users\ray.coglas\Desktop\Pioneer Point 2\New Pre-1994 Orig. Grd\
Last Solved Date: 08/04/2025
Last Solved Time: 03:35:41 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Pre-1994 Rd. Cut

Description: "Existing" Stability
Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: Piezometric Surfaces
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - 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

Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 175 psf

Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Silt (Transitional Beds) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 750 psf
Effective Friction Angle: 28 °
Phi-B: 0 °

Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 175 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 175 psf
Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (45, 156.68421) ft
Left-Zone Right Coordinate: (127, 170.29825) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (163.87656, 179.05397) ft
Right-Zone Right Coordinate: (254, 195.94118) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 147) ft
Right Coordinate: (268, 198) ft

Piezometric Surfaces

Piezometric Surface 1

Coordinates

	X	Y
Coordinate 1	95 ft	163 ft
Coordinate 2	268 ft	183 ft

Seismic Coefficients

Horz Seismic Coef.: 0.255
Vert Seismic Coef.: 0

Geometry

Name: 2D Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	12 ft	148 ft

Point 2	50 ft	158 ft
Point 3	95 ft	163 ft
Point 4	144 ft	163 ft
Point 5	152 ft	176 ft
Point 6	187 ft	185 ft
Point 7	234 ft	193 ft
Point 8	268 ft	198 ft
Point 9	268 ft	183 ft
Point 10	212 ft	174 ft
Point 11	152 ft	153 ft
Point 12	0 ft	147 ft
Point 13	268 ft	113 ft
Point 14	0 ft	113 ft

Regions

	Material	Points	Area
Region 1	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf	1,2,3,4,5,6,7,8,9,10,11	3,351 ft^2
Region 2	Silt (Transitional Beds) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf	12,1,11,10,9,13,14	12,362 ft^2
Region 3	Road Cut Material: gamma - 115 pcf, phi = 18 deg., c = 175 psf	3,5,4	318.5 ft^2

Slip Results

Slip Surfaces Analysed: 403 of 405 converged

Current Slip Surface

Slip Surface: 217
Factor of Safety: 0.792
Volume: 2,018.1505 ft^3
Weight: 232,087.31 lbf
Resisting Moment: 14,986,816 lbf·ft
Activating Moment: 18,918,041 lbf·ft
Resisting Force: 76,576.001 lbf
Activating Force: 96,708.826 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (242.65121, 194.27224) ft
Entry: (86.241175, 162.0268) ft
Radius: 187.11154 ft
Center: (130.27878, 343.88229) ft

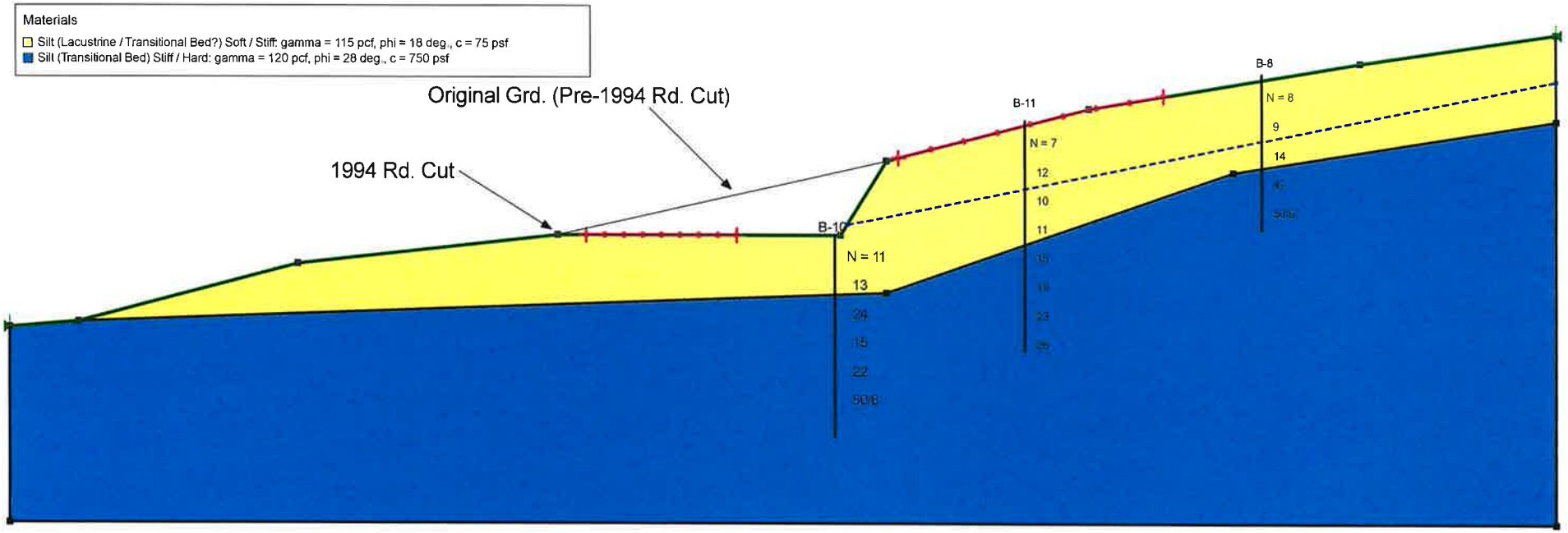
Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	240.48841 ft	192.69563 ft	-803.86125 psf	-6.3592654 psf	-2.0662506 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 2	236.16280 ft	189.63436 ft	-643.96512 psf	221.90771 psf	72.102186 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 3	231.56832 ft	186.58386 ft	-486.68186 psf	435.52021 psf	141.50909 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 4	226.70496 ft	183.55553 ft	-332.72301 psf	635.73694 psf	206.56345 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 5	221.84161 ft	180.72836 ft	-191.32299 psf	817.1991 psf	265.52408 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 6	216.97825 ft	178.09205 ft	-61.838324 psf	983.25954 psf	319.48039 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

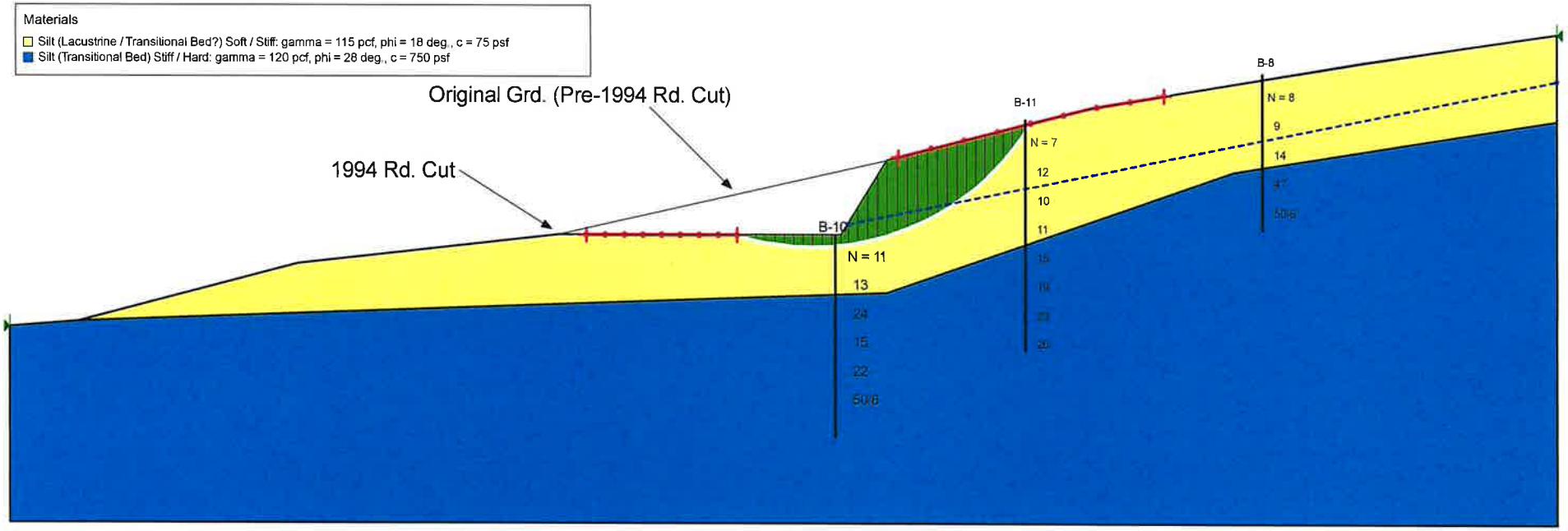
								115 pcf, phi = 18 deg., c = 175 psf
Column 7	211.79191 ft	175.48700 ft	63.36396 psf	1,149.8181 psf	353.01034 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 8	206.28260 ft	172.92890 ft	183.30402 psf	1,312.487 psf	366.89379 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 9	200.77329 ft	170.58367 ft	289.95434 psf	1,457.7761 psf	379.44829 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 10	195.26397 ft	168.44276 ft	383.84862 psf	1,589.8038 psf	391.83857 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 11	189.75466 ft	166.49878 ft	465.44934 psf	1,711.8853 psf	404.99159 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 12	184.50000 ft	164.81815 ft	532.44675 psf	1,801.1384 psf	412.2229 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 13	179.50000 ft	163.37941 ft	586.18024 psf	1,857.8542 psf	413.19192 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 14	174.50000 ft	162.08956 ft	630.61903 psf	1,908.0877 psf	415.07474 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 15	169.50000 ft	160.94544 ft	665.95989 psf	1,951.2223 psf	417.60707 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 16	164.50000 ft	159.94433 ft	692.37275 psf	1,985.9378 psf	420.30475 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 17	159.50000 ft	159.08390 ft	710.00282 psf	2,010.2202 psf	422.46623 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 18	154.50000 ft	158.36219 ft	718.97239 psf	2,021.4207 psf	423.19112 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 19	149.87650 ft	157.81214 ft	719.94278 psf	2,024.883 psf	424.00079 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 20	145.87650 ft	157.43150 ft	714.83655 psf	2,021.9196 psf	424.69704 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 21	141.27778 ft	157.11421 ft	701.45471 psf	1,999.6627 psf	421.81334 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 22	135.83333 ft	156.87304 ft	677.21649 psf	1,947.5324 psf	412.75064 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 23	130.38889 ft	156.79058 ft	643.0698 psf	1,862.0775 psf	396.07961 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

								115 pcf, phi = 18 deg., c = 175 psf
Column 24	124.94444 ft	156.86662 ft	599.02776 psf	1,740.4274 psf	370.86323 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 25	119.50000 ft	157.10137 ft	545.07826 psf	1,581.2347 psf	336.66763 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 26	114.05556 ft	157.49540 ft	481.18384 psf	1,384.9306 psf	293.64512 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 27	108.61111 ft	158.04975 ft	407.28119 psf	1,153.748 psf	242.54175 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 28	103.16667 ft	158.76585 ft	323.28032 psf	891.49057 psf	184.6227 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 29	97.72222 ft	159.64560 ft	229.06337 psf	603.08085 psf	121.52565 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 30	92.81029 ft	160.57422 ft	0 psf	373.9134 psf	121.49183 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf
Column 31	88.43088 ft	161.52430 ft	0 psf	165.16188 psf	53.664346 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 175 psf

"Model Geometry"
Section A-A'
Back Calculation (Post-1994 Rd. Cut)



Section A-A'
Back Calculation (Post-1994 Rd. Cut)
FS = 0.99



Pioneer Point - Post 1994 (RD. CUT) - BACK CALC.

File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Ray Coglas
Last Edited By: Ray Coglas
Revision Number: 30
Date: 08/04/2025
Time: 03:59:11 PM
File Name: 1994 Rd. Cut Back Calculation.gsz
Directory: C:\Users\ray.coglas\Desktop\Pioneer Point 2\New 1994 Rd. Cut\
Last Solved Date: 08/04/2025
Last Solved Time: 03:59:11 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Pioneer Point - Post 1994

Description: Back Calculation
Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Half-Sine
- PWP Conditions from: Piezometric Surfaces
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - 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

Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 75 psf

Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 750 psf
Effective Friction Angle: 28 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (100, 163) ft
Left-Zone Right Coordinate: (126, 163) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (154, 176.51429) ft
Right-Zone Right Coordinate: (200, 187.21277) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 147) ft
Right Coordinate: (268, 198) ft

Piezometric Surfaces

Piezometric Surface 1

Coordinates

	X	Y
Coordinate 1	145.23077 ft	165 ft
Coordinate 2	268 ft	190 ft

Geometry

Name: 2D Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	12 ft	148 ft
Point 2	50 ft	158 ft
Point 3	95 ft	163 ft
Point 4	144 ft	163 ft
Point 5	152 ft	176 ft
Point 6	187 ft	185 ft
Point 7	234 ft	193 ft
Point 8	268 ft	198 ft
Point 9	268 ft	183 ft
Point 10	212 ft	174 ft
Point 11	152 ft	153 ft
Point 12	0 ft	147 ft
Point 13	268 ft	113 ft
Point 14	0 ft	113 ft

Regions

	Material	Points	Area
Region 1	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf	1,2,3,4,5,6,7,8,9,10,11	3,351 ft²
Region 2	Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf	12,1,11,10,9,13,14	12,362 ft²

Slip Results

Slip Surfaces Analysed: 226 of 405 converged

Current Slip Surface

Slip Surface: 383
Factor of Safety: 0.990
Volume: 309.62798 ft³
Weight: 35,607.218 lbf
Resisting Moment: 635,546.94 lbf·ft
Activating Moment: 642,191.43 lbf·ft
Resisting Force: 12,652.305 lbf
Activating Force: 12,786.767 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (176.88575, 182.39919) ft
Entry: (126, 163) ft
Radius: 44.211228 ft
Center: (139.03524, 205.24589) ft

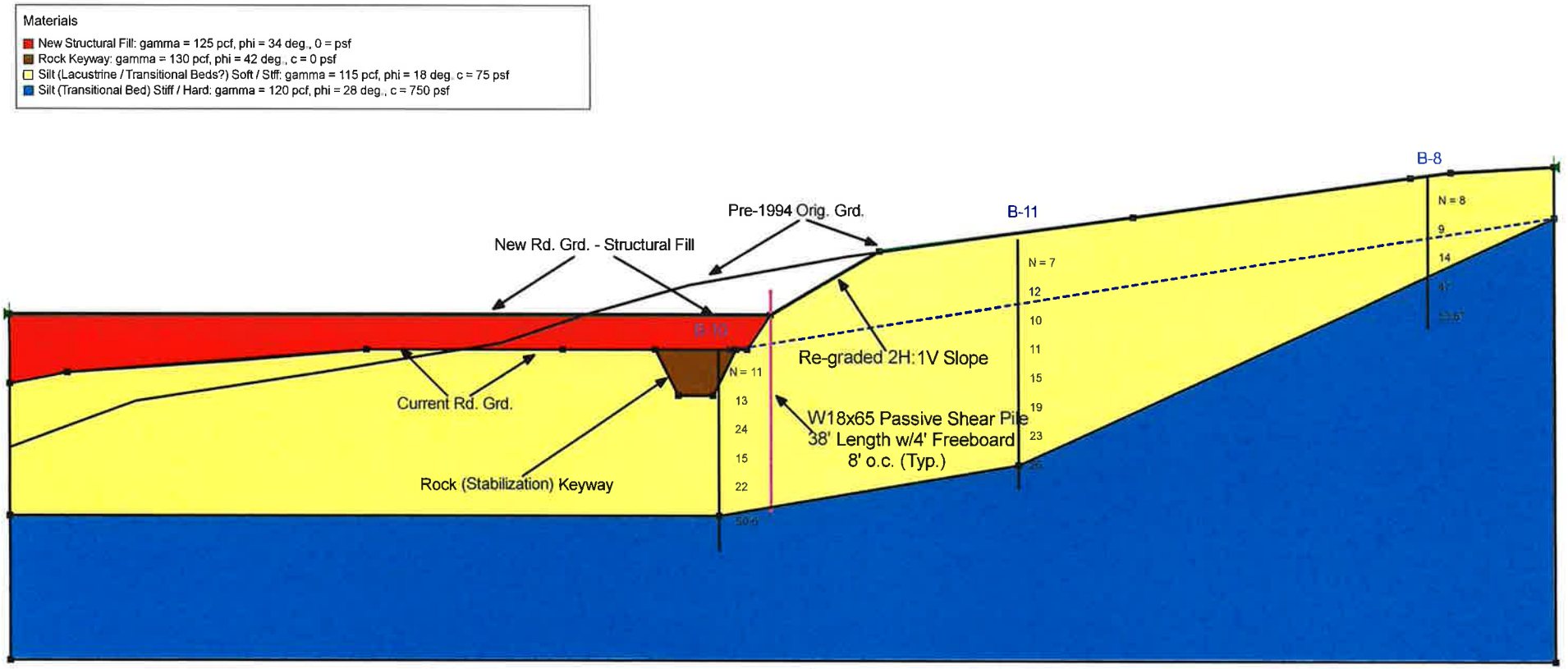
Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	176.08872 ft	181.17242 ft	-617.35288 psf	2.3616199 psf	0.76733682 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 2	174.49467 ft	178.87398 ft	-494.12563 psf	158.97433 psf	51.653893 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 3	172.90062 ft	176.85170 ft	-388.13953 psf	294.44325 psf	95.67041 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 4	171.30656 ft	175.04931 ft	-295.88095 psf	414.07942 psf	134.54256 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 5	169.71251 ft	173.42904 ft	-214.99237 psf	521.7364 psf	169.52243 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 6	168.11846 ft	171.96408 ft	-143.79977 psf	620.27754 psf	201.54039 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 7	166.52440 ft	170.63458 ft	-81.064029 psf	711.85279 psf	231.29499 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 8	164.93035 ft	169.42539 ft	-25.838551 psf	798.0696 psf	259.30853 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 9	163.26666 ft	168.28108 ft	24.450159 psf	885.63513 psf	279.81596 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 10	161.53333 ft	167.20046 ft	69.878011 psf	973.45002 psf	293.58834 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

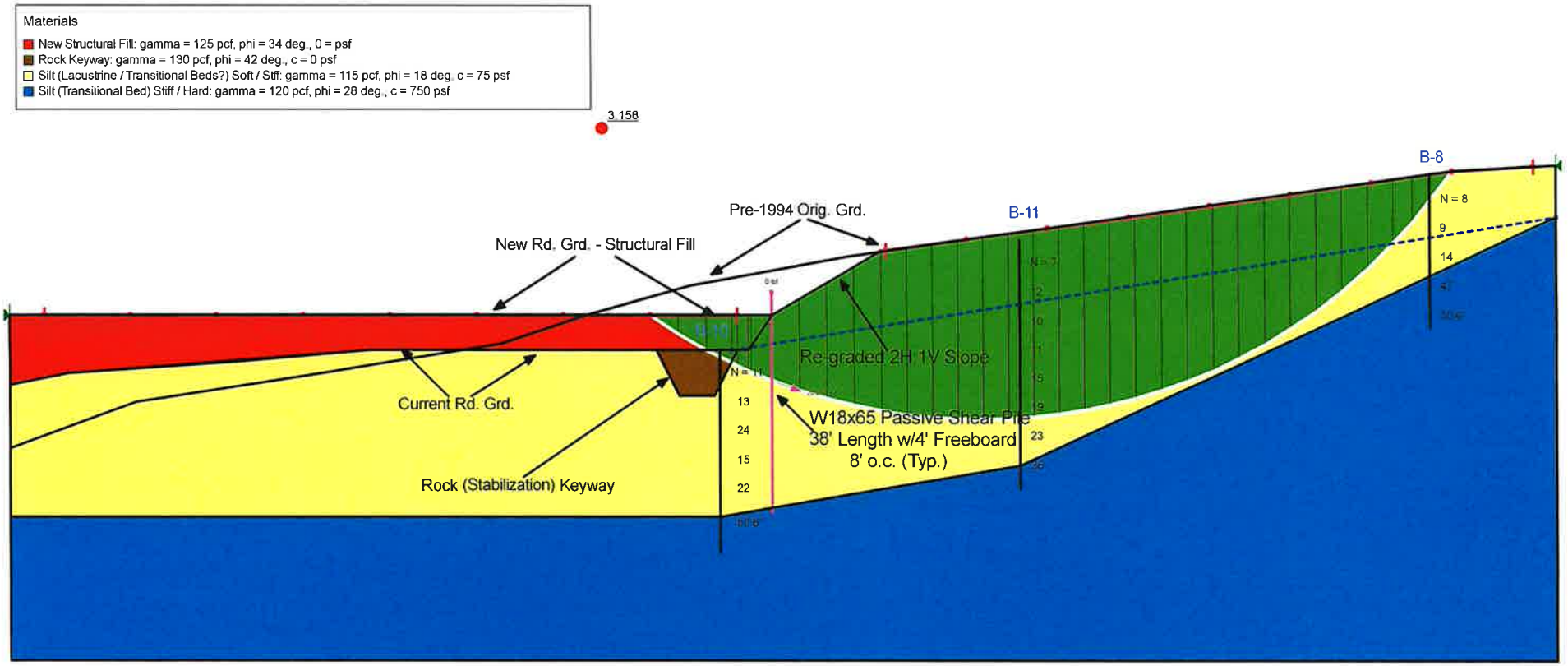
								115 pcf, phi = 18 deg., c = 75 psf
Column 11	159.79999 ft	166.22674 ft	108.63142 psf	1,055.6353 psf	307.70022 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 12	158.06666 ft	165.35209 ft	141.20073 psf	1,133.0481 psf	322.27074 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 13	156.33333 ft	164.57008 ft	167.98603 psf	1,206.0391 psf	337.2839 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 14	154.60000 ft	163.87545 ft	189.31619 psf	1,274.4837 psf	352.5923 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 15	152.86667 ft	163.26385 ft	205.46261 psf	1,337.8015 psf	367.91922 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 16	151.15385 ft	162.73709 ft	216.57327 psf	1,270.8435 psf	342.55317 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 17	149.46154 ft	162.29049 ft	222.94088 psf	1,062.0409 psf	272.64011 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 18	147.76923 ft	161.91455 ft	224.89641 psf	831.00115 psf	196.93537 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 19	146.07692 ft	161.60746 ft	222.55408 psf	577.05675 psf	115.1849 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 20	144.61539 ft	161.39261 ft	0 psf	355.12536 psf	115.38722 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 21	143.18182 ft	161.23722 ft	0 psf	265.23792 psf	86.181024 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 22	141.54545 ft	161.11359 ft	0 psf	289.96539 psf	94.215465 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 23	139.90909 ft	161.05087 ft	0 psf	305.10312 psf	99.134013 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 24	138.27273 ft	161.04881 ft	0 psf	309.98067 psf	100.71882 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 25	136.63636 ft	161.10740 ft	0 psf	304.16279 psf	98.82848 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 26	135.00000 ft	161.22687 ft	0 psf	287.50897 psf	93.417327 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 27	133.36364 ft	161.40772 ft	0 psf	260.20615 psf	84.546103 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma =

								115 pcf, phi = 18 deg., c = 75 psf
Column 28	131.72727 ft	161.65073 ft	0 psf	222.76722 psf	72.381459 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 29	130.09091 ft	161.95693 ft	0 psf	175.99262 psf	57.183469 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 30	128.45455 ft	162.32769 ft	0 psf	120.89769 psf	39.282039 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf
Column 31	126.81818 ft	162.76470 ft	0 psf	58.614182 psf	19.044902 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Bed?) Soft / Stiff: gamma = 115 pcf, phi = 18 deg., c = 75 psf

"Model Geometry"
Section A-A'
Proposed Mitigation Case



Section A-A'
Proposed Mitigation Case
FS = 3.16 (Static)



Proposed Mitigation (STATIC)

File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Ray Coglas
Last Edited By: Ray Coglas
Revision Number: 166
Date: 08/04/2025
Time: 05:58:34 PM
File Name: Proposed Mitigation Case 2.gsz
Directory: C:\Users\ray.coglas\Desktop\Pioneer Point 2\New Mitigation Case\
Last Solved Date: 08/04/2025
Last Solved Time: 05:58:35 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Proposed Mitigation

Description: Mitigation Case
Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Constant
- PWP Conditions from: Piezometric Surfaces
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - 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

Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 75 psf

Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 750 psf
Effective Friction Angle: 28 °
Phi-B: 0 °

New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Rock Keyway: gamma = 130 pcf, phi = 42 deg., c = 0 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 130 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 42 °
Phi-B: 0 °

Reinforcements

Passive Shear Pile

Type: Pile
Shear Force: 162,000 lbf
Shear Force Reduction Factor: 1
Apply Shear: Parallel to Slip
Out-of-Plane Spacing: 8 ft

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (6, 170) ft
Left-Zone Right Coordinate: (126, 170) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (151.83024, 181.11321) ft
Right-Zone Right Coordinate: (264, 195.77778) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 170) ft
Right Coordinate: (268, 196) ft

Piezometric Surfaces

Piezometric Surface 1

Coordinates

	X	Y
Coordinate 1	125 ft	164 ft
Coordinate 2	268 ft	187 ft

Seismic Coefficients

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

Reinforcement Lines

	Assigned Reinforcement	Lock to Ground Surface	Outside Point	Inside Point	Length	Orientation	Slip Surface Intersection	Pullout Force	Pullout Force per Length
Reinforcement Line 1	Passive Shear Pile	No	(132, 174)	(132, 136)	38 ft	-90 °	(132, 158.70588)	0 lbf	0 lbf/ft

Geometry

Name: 2D Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	268 ft	187 ft
Point 2	175 ft	144 ft
Point 3	123 ft	135 ft
Point 4	0 ft	135 ft
Point 5	268 ft	110 ft
Point 6	0 ft	110 ft
Point 7	96 ft	164 ft
Point 8	125 ft	164 ft
Point 9	0 ft	158 ft
Point 10	10 ft	160 ft
Point 11	62 ft	164 ft
Point 12	128 ft	164 ft
Point 13	132 ft	170 ft
Point 14	0 ft	170 ft
Point 15	112 ft	164 ft
Point 16	116 ft	156 ft
Point 17	122 ft	156 ft
Point 18	126 ft	164 ft
Point 19	151 ft	181 ft
Point 20	195 ft	187 ft
Point 21	243 ft	194 ft
Point 22	250 ft	195 ft
Point 23	268 ft	196 ft

Regions

	Material	Points	Area
Region 1	Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf	4,3,2,1,5,6	9,770.5 ft²
Region 2	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf	14,13,12,18,8,15,7,11,10,9	934 ft²
Region 3	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf	9,10,11,7,15,16,17,18,12,13,19,20,21,22,23,1,2,3,4	7,630.5 ft²
Region 4	Rock Keyway: gamma = 130 pcf, phi = 42 deg., c = 0 psf	15,16,17,18,8	80 ft²

Slip Results

Slip Surfaces Analysed: 205 of 405 converged

Current Slip Surface

Slip Surface: 353
Factor of Safety: 3.158
Volume: 3,003.4972 ft³
Weight: 346,350.42 lbf
Resisting Moment: 10,209,533 lbf·ft
Activating Moment: 3,232,698 lbf·ft
Resisting Force: 94,713.606 lbf
Activating Force: 29,986.58 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (249.87663, 194.98238) ft
Entry: (111, 170) ft
Radius: 99.125444 ft
Center: (168.11077, 251.01984) ft

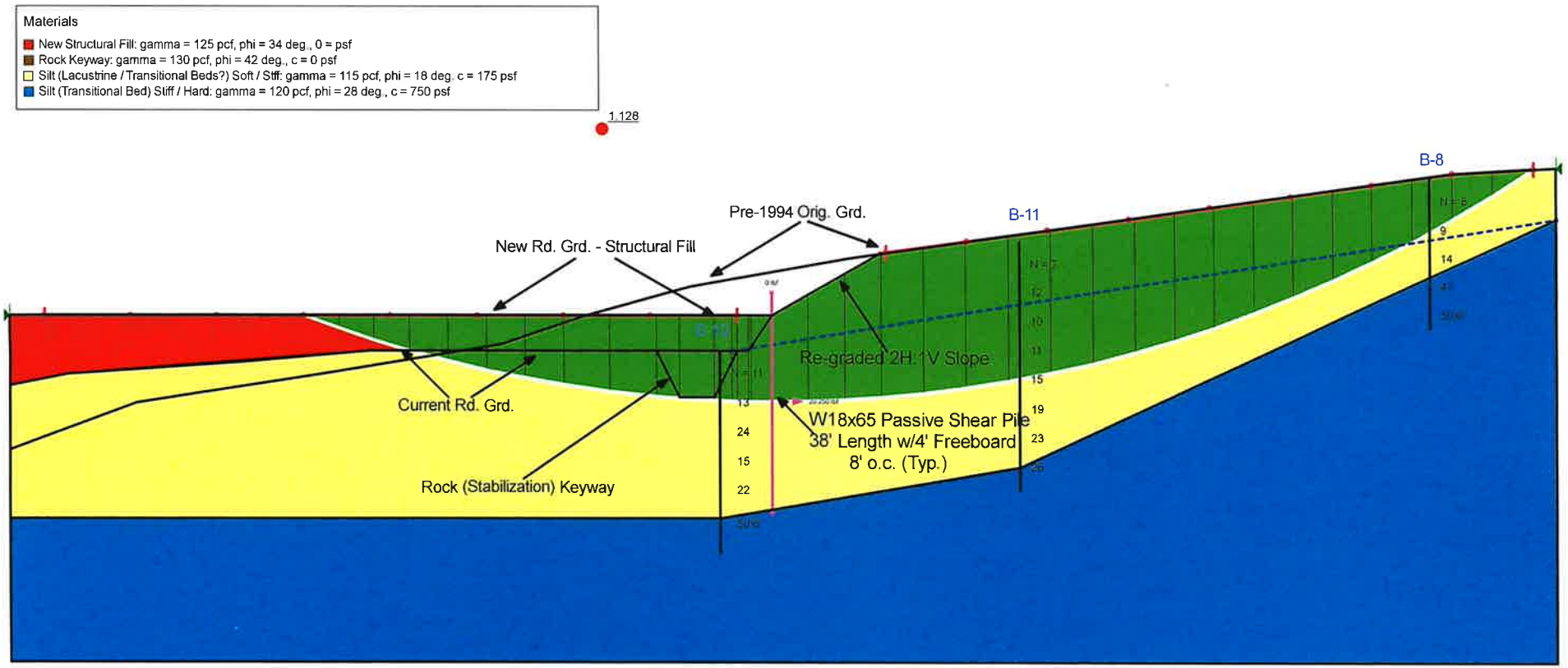
Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	246.43832 ft	190.53013 ft	-436.89246 psf	333.91168 psf	108.49448 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 2	241.34493 ft	184.26226 ft	-96.731482 psf	864.85105 psf	281.00714 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 3	237.45538 ft	180.25692 ft	114.26679 psf	1,221.3628 psf	359.71729 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 4	232.98639 ft	176.13147 ft	326.94496 psf	1,600.3201 psf	413.74465 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 5	228.51740 ft	172.47720 ft	510.20772 psf	1,937.5762 psf	463.78014 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 6	224.04842 ft	169.23044 ft	668.02924 psf	2,237.3967 psf	509.9184 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 7	219.57943 ft	166.34403 ft	803.35478 psf	2,503.0749 psf	552.27256 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 8	215.11044 ft	163.78199 ft	918.42917 psf	2,737.1947 psf	590.95274 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 9	210.64145 ft	161.51635 ft	1,014.9993 psf	2,941.8041 psf	626.05683 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 10	206.17247 ft	159.52501 ft	1,094.4451 psf	3,118.5349 psf	657.66663 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 11	201.70348 ft	157.79032 ft	1,157.8677 psf	3,268.6863 psf	685.84653 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 12	197.23449 ft	156.29815 ft	1,206.1501 psf	3,393.2846 psf	710.64306 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 13	192.80000 ft	155.04518 ft	1,239.8459 psf	3,494.8354 psf	732.69051 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma =

								115 pcf, phi = 18 deg. c = 75 psf
Column 14	188.40000 ft	154.01907 ft	1,259.7247 psf	3,574.3643 psf	752.072 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 15	184.00000 ft	153.20154 ft	1,266.5815 psf	3,630.9694 psf	768.23619 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 16	179.60000 ft	152.58740 ft	1,260.7415 psf	3,664.9002 psf	781.15849 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 17	175.20000 ft	152.17283 ft	1,242.4419 psf	3,676.2624 psf	790.7962 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 18	170.80000 ft	151.95532 ft	1,211.8394 psf	3,665.0212 psf	797.08709 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 19	166.40000 ft	151.93358 ft	1,169.0151 psf	3,631.0005 psf	799.94753 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 20	162.00000 ft	152.10748 ft	1,113.9772 psf	3,573.877 psf	799.26989 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 21	157.60000 ft	152.47806 ft	1,046.6608 psf	3,493.1701 psf	794.91905 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 22	153.20000 ft	153.04754 ft	966.92642 psf	3,388.2258 psf	786.72786 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 23	148.62500 ft	153.85868 ft	870.34854 psf	3,123.628 psf	732.13489 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 24	143.87500 ft	154.93403 ft	755.51808 psf	2,691.1093 psf	628.9117 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 25	139.12500 ft	156.25956 ft	625.06953 psf	2,219.2988 psf	517.99648 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 26	134.37500 ft	157.84596 ft	478.33441 psf	3,857.1207 psf	1,097.8342 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 27	130.18016 ft	159.45979 ft	335.46129 psf	1,380.9404 psf	339.69675 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 28	128.18016 ft	160.29299 ft	263.36218 psf	1,320.2969 psf	343.4189 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 29	127.00000 ft	160.82809 ft	218.10522 psf	1,262.0447 psf	339.19649 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 75 psf
Column 30	125.50000 ft	161.52196 ft	159.72497 psf	1,199.0885 psf	337.70968 psf	75 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma =

								115 pcf, phi = 18 deg. c = 75 psf
Column 31	122.82038 ft	162.88001 ft	0 psf	1,186.9394 psf	1,068.725 psf	0 psf	0 psf	Rock Keyway: gamma = 130 pcf, phi = 42 deg., c = 0 psf
Column 32	118.23057 ft	165.40419 ft	0 psf	739.39283 psf	498.72676 psf	0 psf	0 psf	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf
Column 33	113.41019 ft	168.40419 ft	0 psf	265.92184 psf	179.36655 psf	0 psf	0 psf	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf

Section A-A'
Proposed Mitigation Case
FS = 1.13 (Seismic)



Proposed Mitigation (SEISMIC)

File Information

File Version: 11.07
Product Version: 24.2.1.28
Created By: Ray Coglas
Last Edited By: Ray Coglas
Revision Number: 168
Date: 08/04/2025
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File Name: Proposed Mitigation Case 2.gsz
Directory: C:\Users\ray.coglas\Desktop\Pioneer Point 2\New Mitigation Case\
Last Solved Date: 08/04/2025
Last Solved Time: 06:02:21 PM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Proposed Mitigation

Description: Mitigation Case
Kind: SLOPE/W
Analysis Type: Morgenstern-Price
Settings
- Side Function
  - Intercolumn force function option: Constant
- PWP Conditions from: Piezometric Surfaces
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Convergence
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Columns: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - 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

Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 115 pcf
Effective Cohesion: 175 psf

Effective Friction Angle: 18 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Surface: 1

Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 750 psf
Effective Friction Angle: 28 °
Phi-B: 0 °

New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Rock Keyway: gamma = 130 pcf, phi = 42 deg., c = 0 psf

Slope Stability Material Model: Mohr-Coulomb
Unit Weight: 130 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 42 °
Phi-B: 0 °

Reinforcements

Passive Shear Pile

Type: Pile
Shear Force: 162,000 lbf
Shear Force Reduction Factor: 1
Apply Shear: Parallel to Slip
Out-of-Plane Spacing: 8 ft

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (6, 170) ft
Left-Zone Right Coordinate: (126, 170) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (151.83024, 181.11321) ft
Right-Zone Right Coordinate: (264, 195.77778) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 170) ft
Right Coordinate: (268, 196) ft

Piezometric Surfaces

Piezometric Surface 1

Coordinates

	X	Y
Coordinate 1	125 ft	164 ft
Coordinate 2	268 ft	187 ft

Seismic Coefficients

Horz Seismic Coef.: 0.255
Vert Seismic Coef.: 0

Reinforcement Lines

	Assigned Reinforcement	Lock to Ground Surface	Outside Point	Inside Point	Length	Orientation	Slip Surface Intersection	Pullout Force	Pullout Force per Length
Reinforcement Line 1	Passive Shear Pile	No	(132, 174)	(132, 136)	38 ft	-90 °	(132, 155.2441)	0 lbf	0 lbf/ft

Geometry

Name: 2D Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	268 ft	187 ft
Point 2	175 ft	144 ft
Point 3	123 ft	135 ft
Point 4	0 ft	135 ft
Point 5	268 ft	110 ft
Point 6	0 ft	110 ft
Point 7	96 ft	164 ft
Point 8	125 ft	164 ft
Point 9	0 ft	158 ft
Point 10	10 ft	160 ft
Point 11	62 ft	164 ft
Point 12	128 ft	164 ft
Point 13	132 ft	170 ft
Point 14	0 ft	170 ft
Point 15	112 ft	164 ft
Point 16	116 ft	156 ft
Point 17	122 ft	156 ft
Point 18	126 ft	164 ft
Point 19	151 ft	181 ft
Point 20	195 ft	187 ft
Point 21	243 ft	194 ft
Point 22	250 ft	195 ft
Point 23	268 ft	196 ft

Regions

	Material	Points	Area
Region 1	Silt (Transitional Bed) Stiff / Hard: gamma = 120 pcf, phi = 28 deg., c = 750 psf	4,3,2,1,5,6	9,770.5 ft²
Region 2	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf	14,13,12,18,8,15,7,11,10,9	934 ft²
Region 3	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf	9,10,11,7,15,16,17,18,12,13,19,20,21,22,23,1,2,3,4	7,630.5 ft²
Region 4	Rock Keyway: gamma = 130 pcf, phi = 42 deg., c = 0 psf	15,16,17,18,8	80 ft²

Slip Results

Slip Surfaces Analysed: 246 of 405 converged

Current Slip Surface

Slip Surface: 177
Factor of Safety: 1.128
Volume: 3,265.9975 ft³
Weight: 381,002.58 lbf
Resisting Moment: 32,468,481 lbf·ft
Activating Moment: 28,787,911 lbf·ft
Resisting Force: 134,489.76 lbf
Activating Force: 119,303.27 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (264, 195.77778) ft
Entry: (51, 170) ft
Radius: 233.15085 ft
Center: (132.62926, 388.3941) ft

Slip Columns

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Column Base Material
Column 1	260.50000 ft	193.48163 ft	-479.95861 psf	127.57202 psf	41.450663 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 2	253.50000 ft	189.06315 ft	-274.40034 psf	482.04639 psf	156.62637 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 3	246.50000 ft	184.98150 ft	-89.871073 psf	794.23576 psf	258.06284 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 4	239.52224 ft	181.22776 ft	74.410866 psf	1,065.2483 psf	321.9426 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 5	232.62412 ft	177.80917 ft	218.56797 psf	1,317.0301 psf	356.91199 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 6	225.78337 ft	174.69406 ft	344.35599 psf	1,545.6415 psf	390.32133 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 7	218.94262 ft	171.83980 ft	453.85831 psf	1,753.6541 psf	422.32925 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 8	212.10187 ft	169.23620 ft	547.71208 psf	1,941.2763 psf	452.79645 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 9	205.26112 ft	166.87441 ft	626.46979 psf	2,108.6528 psf	481.59046 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 10	198.42037 ft	164.74675 ft	690.61026 psf	2,255.8671 psf	508.58276 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 11	191.33333 ft	162.78649 ft	741.82748 psf	2,390.218 psf	535.59456 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 12	184.00000 ft	161.00405 ft	779.4697 psf	2,510.4415 psf	562.42684 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 13	176.66667 ft	159.47035 ft	801.58326 psf	2,607.5984 psf	586.80989 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma =

								115 pcf, phi = 18 deg. c = 175 psf
Column 14	169.33333 ft	158.18041 ft	808.47888 psf	2,681.4873 psf	608.57734 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 15	162.00000 ft	157.13014 ft	800.41148 psf	2,731.8231 psf	627.55366 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 16	154.66667 ft	156.31630 ft	777.58441 psf	2,758.2314 psf	643.55123 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 17	147.83333 ft	155.76116 ft	743.62677 psf	2,605.0199 psf	604.80328 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 18	141.50000 ft	155.43362 ft	700.48099 psf	2,267.5241 psf	509.16318 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 19	135.16667 ft	155.27857 ft	646.56638 psf	2,726.1126 psf	675.68552 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 20	130.18016 ft	155.26322 ft	597.45408 psf	1,743.5042 psf	372.37425 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 21	128.18016 ft	155.28577 ft	575.96344 psf	1,781.9498 psf	391.84872 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 22	127.00000 ft	155.31336 ft	562.39078 psf	1,787.9204 psf	398.19872 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 23	125.50000 ft	155.35281 ft	544.86622 psf	1,807.0149 psf	410.09698 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 24	123.50000 ft	155.42689 ft	0 psf	1,919.8569 psf	623.79932 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 25	119.00000 ft	155.66135 ft	0 psf	1,964.4795 psf	638.29809 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 26	114.00000 ft	155.99736 ft	0 psf	1,889.7789 psf	614.02637 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 27	108.00000 ft	156.58267 ft	0 psf	1,788.0908 psf	580.98593 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 28	100.00000 ft	157.57311 ft	0 psf	1,709.0875 psf	555.31618 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 29	92.66644 ft	158.71858 ft	0 psf	1,603.3846 psf	520.97123 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 30	85.99931 ft	159.97915 ft	0 psf	1,475.0288 psf	479.2659 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma =

								115 pcf, phi = 18 deg. c = 175 psf
Column 31	79.33219 ft	161.44253 ft	0 psf	1,314.7828 psf	427.19884 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 32	72.66506 ft	163.11269 ft	0 psf	1,119.9961 psf	363.90879 psf	175 psf	0 psf	Silt (Lacustrine / Transitional Beds?) Soft / Stff: gamma = 115 pcf, phi = 18 deg. c = 175 psf
Column 33	66.27625 ft	164.90710 ft	0 psf	996.23628 psf	671.96985 psf	0 psf	0 psf	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf
Column 34	60.16575 ft	166.81336 ft	0 psf	650.82523 psf	438.98716 psf	0 psf	0 psf	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf
Column 35	54.05525 ft	168.90626 ft	0 psf	233.93605 psf	157.79186 psf	0 psf	0 psf	New Structural Fill: gamma = 125 pcf, phi = 34 deg., 0 = psf