J&T Consulting, Inc.

April 15, 2025

Mr. Patrick Lennberg
Environmental Protection Specialist
State of Colorado
Division of Reclamation, Mining, & Safety
Physical Address:
1313 Sherman Street, Room 215
Denver, CO 80203
Mailing Address:
Division of Reclamation, Mining and Safety, Room 215
1001 East 62nd Avenue
Denver, CO 80216

RE: Northern Colorado Constructors, Inc. – Bennett Pit – Technical Revision No. 3 Request
File No. M-2016-085

Dear Mr. Lennberg,

Northern Colorado Constructors, Inc. (NCCI) requests a revision to their existing permit to address the following items:

Revised Mining and Reclamation Plans: Revision of the existing mining and reclamation plans to update spillway location for the North Cell, mining slope on the north side of the south cell, reclamation slope on the north side of the south cell and east side of the south cell. The South Cell would then have a 400 foot setback from the South Platte River eliminating the need for a spillway that was previously proposed.

This letter will serve as notice to the DRMS that NCCI requests a technical revision to update the pre-mining and mining plan maps as well as the reclamation maps. Slope stability analysis is also provided for the north side of the South Cell and the east side of the South Cell.

NCCI appreciates your consideration of this revision request and looks forward to your response.

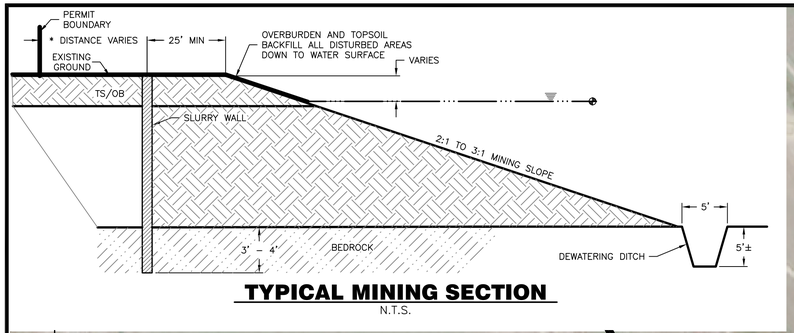
Please feel free to contact me with any questions or comments.

Sincerely,

J.C. York, P.E.
J&T Consulting, Inc.

Attachments:
Pre-Mining and Mining Plan Maps
Reclamation Maps
Slope Stability Report

cc: NCCI
File



TYPICAL MINING SECTION

N.T.S.

LEGEND:

- EXISTING CONTOURS
- EXISTING WETLAND
- EXISTING PROPERTY BOUNDARY
- EXISTING XCEL & KERR McGEE / ANADARKO GAS
- EXISTING UNITED POWER ELECTRIC
- EXISTING CENTURYLINK TELEPHONE
- EXISTING UNITED POWER OVERHEAD ELECTRIC
- EXISTING EASEMENT
- B2 BORING LOCATION
- MINING LIMIT
- SLURRY WALL
- PERMIT BOUNDARY
- 100 YR FLOODPLAIN

TOTAL PERMIT AREA = 163.32 AC

AREA TO BE MINED = 106.28 AC

TOTAL DISTURBED AREA = 125.09 AC

NOTES:

1. ALL AREAS NOT DISTURBED BY CURRENT MINING OR RECLAMATION WILL REMAIN AS AGRICULTURAL AND NATURAL.
2. INTERNAL HAUL ROADS WILL BE WATERED TO CONTROL DUST.
3. BASE MAP BY AMERICAN WEST LAND SURVEYING COMPANY AND MAPWORKS AERIAL TOPOGRAPHY.
4. THE SOUTH PLATTE RIVER ALLUVIAL AQUIFER AND LARAMIE-FOX HILLS AQUIFER ARE THE KNOWN AQUIFERS PRESENT AT THE SITE.
5. 100 YR. FLOODPLAIN SHOWN PER WELD COUNTY, COLORADO FEMA FIRM PANEL 080266-1915E.

PROPERTY OWNERS WITHIN 500 FEET:

	NAME	ASSESSORS I.D. NO.
A	PIONEER LAND COMPANY, LLC 4409 CORIOLIS WAY FORT LUPTON, CO 80504	131112200004 131112200041 131112200042
B	MAGNESS LAND HOLDINGS, LLC C/O MAGNESS INVESTMENT GROUP, LLC 1200 17TH ST., STE. 660 DENVER, CO 80202	131101000017
C	VERONICA J, & HOWARD W. CANTRELL 11016 COUNTY ROAD 23 FORT LUPTON, CO 80621	131101000020
D	ANN E. CARRINGTON & WILLIAM M LEWIS JR. 11446 COUNTY ROAD 23 FORT LUPTON, CO 80621	131101000023
E	ROSEMARY J. CLINE & STEVEN S. McWILLIAMS 11256 COUNTY ROAD 23 FORT LUPTON, CO 80621	131102200009
F	MARY E. & JAMES V. CARLSON JR. 10777 COUNTY ROAD 23 FORT LUPTON, CO 80621	131111000024
G	CHARLES EDWIN BRUGGER 11223 COUNTY ROAD 22.5 FORT LUPTON, CO 80621	131112000001
H	MILLER FAMILY FARM, LLC 12251 COUNTY ROAD 22.5 FORT LUPTON, CO 80621	131112000021
I	FRED M. KARLIK 11170 COUNTY ROAD 22.5 FORT LUPTON, CO 80621	131112000030
J	ROBERT S. LOUSBERG 10658 COUNTY ROAD 23 FORT LUPTON, CO 80621	131112200043
K	HEIDI G. & BRADLEY T. HYNES-WINDELL TRUST 11044 COUNTY ROAD 22.5 FORT LUPTON, CO 80621	131112400035 131112400036
L	GEORGE W. & PATRICIA SAGNER 11097 COUNTY ROAD 22.5 FORT LUPTON, CO 80621	131112200008

200 100 0 200 400 600

SCALE IN FEET

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Ph: 303-857-6222 Fax: 303-857-6224
www.jtconsulting.com

Bennett Gravel Pit

Exhibit C1

Pre-Mining/Mining Plan Map

Northern Colorado Constructors, Inc.

M-2016-085

REVISIONS

No	Date	By	Chk	Description
1	4.4.25	TPY	JCY	Technical Revision 3

J&T CONSULTING, INC.

Job #	16116
Date	7.27.17
Drawn By	WSS
Designed By	TPY
Checked By	JCY
File	JT-Mining
Scale	1" = 200'

Sheet: 1 Of: 3

LEGEND:

- EXISTING PROPERTY BOUNDARY
- EXISTING XCEL & KERR McGEE / ANADARKO GAS
- EXISTING UNITED POWER ELECTRIC
- EXISTING CENTURYLINK TELEPHONE
- EXISTING UNITED POWER OVERHEAD ELECTRIC
- EXISTING EASEMENT
- MINING LIMIT
- SLURRY WALL
- PERMIT BOUNDARY
- ROTATIONAL CROP FARM LAND

TYPE OF VEGETATION COVERING THE AFFECTED LANDS:

Most of the area is rotational crop farm land and the areas that are not farmed are rangeland grass west of the farmed ground. Rangeland grass also occurs on the east side of the farmed ground with cottonwood trees and willows near the South Platte River. Specific species that exist in the rangeland grass areas and forested areas are as follows:

Scientific Name	Common Name
Ambrosia artemisiifolia	Annual Ragweed
Apocynum cannabinum	Indian-Hemp
Asclepias speciosa	Showy Milkweed
Bassia scoparia	Mexican-fireweed
Bromus inermis	Smooth brome
Bromus tectorum	Cheatgrass
Chenopodium fremontii	Fremont's Goosefoot
Cirsium arvense	Canada thistle
Cirsium undulatum	Wavy-Leaf Thistle
Conium maculatum	Poison-Hemlock
Convolvulus arvensis	Field Bindweed
Conyza canadensis	Canadian Horseweed
Descurainia incana	Mountain Tansy-Mustard
Echinochloa crus-galli	Large Barnyard Grass
Elaeagnus angustifolia	Russian-Olive
Eleocharis palustris	Common Spike-Rush
Euphorbia esula	Leafy Spurge
Glycyrrhiza lepidota	American Licorice
Grindelia squarrosa	Curly-Cup Gumweed
Helianthus annuus	Common Sunflower
Hordeum jubatum	Fox-Tail Barley
Lactuca serriola	Prickly Lettuce
Muhlenbergia asperifolia	Alkali Muhly
Pascopyrum smithii	Western-Wheat Grass
Persicaria lapathifolia	Dock-Leaf Smartweed
Persicaria maculosa	Spotted Ladysthumb
Phalaris arundinacea	Reed Canary Grass
Populus deltoides	Eastern Cottonwood
Populus tremuloides	Quaking Aspen
Portulaca oleracea	Little-Hogweed
Rumex crispus	Curly Dock
Salix amygdaloides	Peachleaf Willow
Salix exigua	Narrow-Leaf Willow
Schoenoplectus pungens	Three-Square
Spartina pectinata	Freshwater Cord Grass
Triticum aestivum	Common Wheat
Typha latifolia	Broad-Leaf Cat-Tail
Verbena bracteata	Carpet Vervain
Xanthium strumarium	Rough Cockleburr

N

200 100 0 200 400 600

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Bennett Gravel Pit

Exhibit C2

Pre-Mining/Mining Plan Map

Northern Colorado Constructors, Inc.

M-2016-085

REVISIONS

No	Date	By	Chk	Description
1	4.4.25	TPY	JCY	Technical Revision 3

J&T CONSULTING, INC.

Job #	16116
Date	7.27.17
Drawn By	WSS
Designed By	TPY
Checked By	JCY
File	JT-Mining
Scale	1" = 200'

Sheet: 2 Of: 3

LEGEND:

- EXISTING PROPERTY BOUNDARY
- EXISTING XCEL & KERR McGEE / ANADARKO GAS
- EXISTING UNITED POWER ELECTRIC
- EXISTING CENTURYLINK TELEPHONE
- EXISTING UNITED POWER OVERHEAD ELECTRIC
- EXISTING EASEMENT
- MINING LIMIT
- SLURRY WALL
- PERMIT BOUNDARY
- 5280 MINING CONTOURS

200 100 0 200 400 600

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Bennett Gravel Pit

Exhibit C3

Pre-Mining/Mining Plan Map

Northern Colorado Constructors, Inc.

M-2016-085

REVISIONS

No	Date	By	Chk	Description

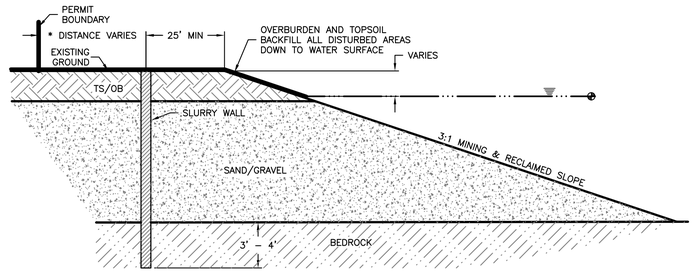
J&T CONSULTING, INC.

Job #	16116
Date	4.4.25
Drawn By	WSS
Designed By	TPY
Checked By	JCY
File	JT-Mining
Scale	1" = 200'

Sheet: 3 Of: 3

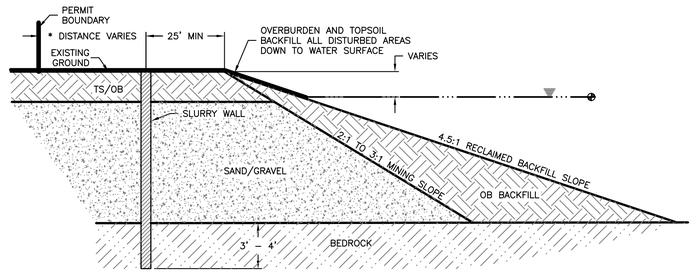
LEGEND:

- EXISTING CONTOURS
- EXISTING WETLAND
- EXISTING PROPERTY BOUNDARY
- EXISTING GAS
- EXISTING ELECTRIC
- EXISTING TELEPHONE
- EXISTING OVERHEAD ELECTRIC
- EXISTING EASEMENT
- SLURRY WALL
- PERMIT BOUNDARY
- 100 YR FLOODPLAIN
- PROPOSED CONTOURS
- SEEDED AREAS



TYPICAL RECLAIMED SECTION

N.T.S.



TYPICAL RECLAIMED BACKFILL SECTION

N.T.S.

200 100 0 200 400 600

SCALE IN FEET

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Bennett Gravel Pit

Exhibit F1

Reclamation Plan Map

Northern Colorado Constructors, Inc.

M-2016-085

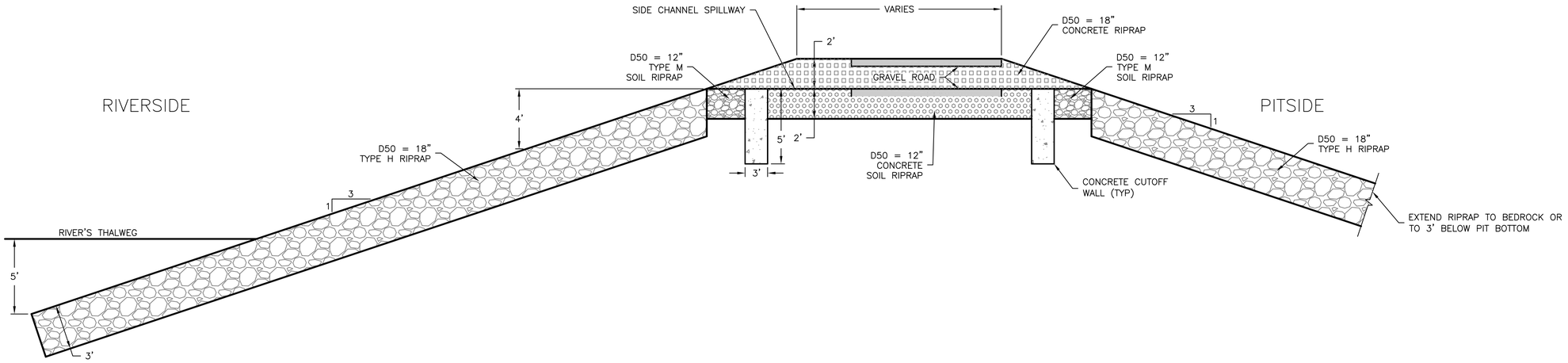
REVISIONS

No	Date	By	Chk	Description
1	4.4.25	TPY	JCY	Technical Revision 3

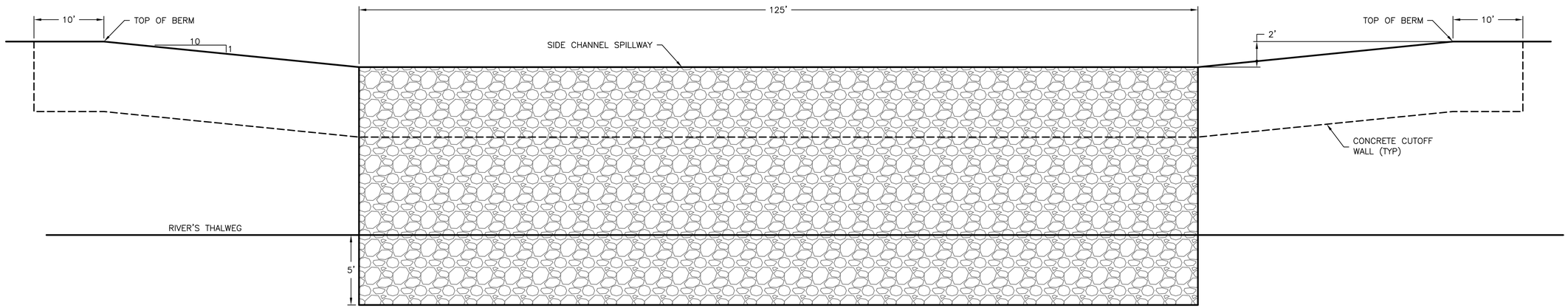
J&T CONSULTING, INC.

Job #	16116
Date	5.15.17
Drawn By	WSS
Designed By	TPY
Checked By	JCY
File	JT-Reclamation
Scale	1" = 200'

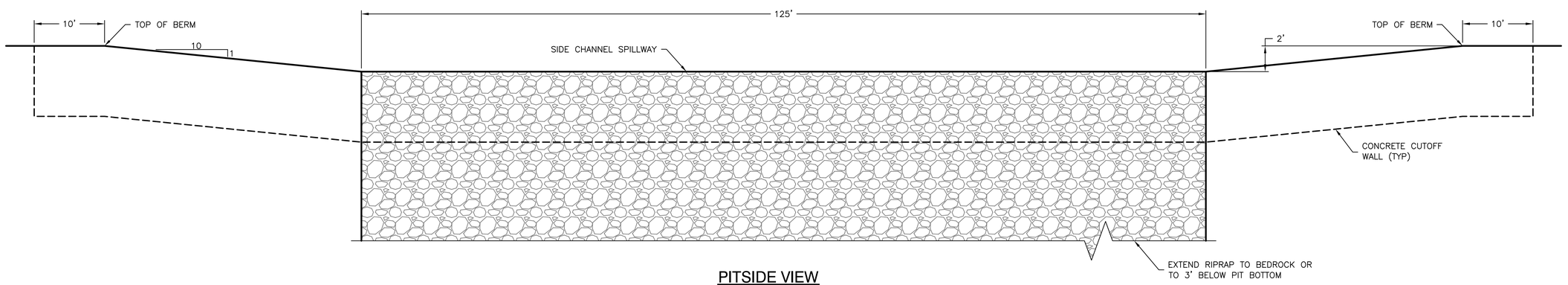
Sheet: 1 Of: 2



SECTION VIEW



RIVERSIDE VIEW



PITSIDE VIEW

RIPRAP LINED SIDE CHANNEL SPILLWAY

N.T.S.

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Bennett Gravel Pit

Exhibit F2

Side Channel Spillway

Northern Colorado Constructors, Inc.

M-2016-085

REVISIONS

No	Date	By	Chk	Description
1	4.4.25	TPY	JCY	Technical Revision 3

J&T CONSULTING, INC.

Job #	16116
Date	5.15.17
Drawn By	WSS
Designed By	TPY
Checked By	JCY
File	JT-Reclamation
Scale	1" = 200'

Sheet: 2 Of: 2

SLOPE STABILITY REPORT

FOR THE
BENNETT PIT
WELD COUNTY, COLORADO

TECHNICAL REVISION NO. 3

APRIL 2025

PREPARED FOR:

NORTHERN COLORADO CONSTRUCTORS, INC.

NORTHERN COLORADO CONSTRUCTORS, INC.
9075 WCR 10
FORT LUPTON, CO 80621

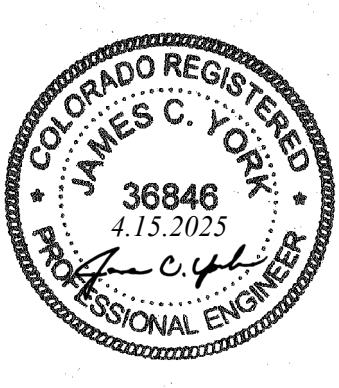
PREPARED BY:

J&T Consulting, Inc.

305 DENVER AVENUE – SUITE D
FORT LUPTON, CO 80621
PHONE: 303-857-6222

CERTIFICATION:

I hereby certify this slope stability analysis for Northern Colorado Constructors, Inc., the Bennett Pit, located in Weld County, Colorado was prepared by me or under my direct supervision.



James C. York
Registered Professional Engineer
State of Colorado No. 36846

Table of Contents

INTRODUCTION

Northern Colorado Constructors, Inc. proposes to mine the property located in the Southeast quarter of Section 1 and North half of Section 12, Township 2 North, Range 67 West, Sixth P.M. in Weld County, Colorado. The property is bounded by the South Platte River on the east, WCR 23 on the west, WCR 22.5 to the south, and private property on the north. The proposed mining operation will extract gravel reserves from locations adjacent to man-made structures. The rules and regulations of the Division of Reclamation, Mining, and Safety (DRMS) require that any mining within a 200-foot setback of a man-made structure show thorough engineering analysis that the proposed mining will not cause damage. The accepted method of demonstrating this is through a slope stability analysis. This report contains an overview of the methodology used in the analysis of the mining slopes and their estimated affect on all man-made structures. Recommendations regarding acceptable setbacks from man-made structures have also been included.

OVERVIEW

The DRMS mining plan proposes that the property will be mined in 2 pits. The mining will occur at 2H:1V and 3H:1V slopes. Concurrent reclamation is planned such that the reclamation embankment will be constructed as the mining progresses. An area along the north boundary of the south cell will be mined at a 2H:1V slope. This area will be reclaimed with overburden materials at a 4.5H:1V slope. There will also be an area that will be backfilled with a 4.5H:1V slope along the east side of the south cell. The reservoir will cover an estimated 94.5 surface acres when full. The actual surface area of the reservoir will depend on the final configuration of the reservoir after reclamation is complete.

GEOTECHNICAL DATA

A geotechnical investigation has been performed by Cesare, Inc. for the site. J&T Consulting, Inc. (JT) estimated soil strength parameters based on the information from the geotechnical investigation and other stability analyses that have been performed on gravel mining operations along the Front Range. Table 1, on the following page, represents a summary of the soil strength parameters that were used in this stability analysis. The geotechnical investigation letter report is included in Appendix D.

Table 1 - Soil Properties

Description	Max dry density (pcf)	Saturated Density (pcf)	Cohesion (psf)	Internal Friction Angle
Overburden	110	131	150	22
Sand and Gravel	110	125	0	35
Weathered Bedrock	125	141	100	18
Stable Bedrock	125	141	2000	20
Slurry Wall	100	110	0	45

DESIGN ANALYSIS AND CRITERIA

The proposed mining slopes were analyzed using Clover Technologies Galena Slope Stability Analysis System, version 7.2. Galena was designed to analyze the slope stability of earth embankments subjected to several critical situations that may occur during the life of the embankment. For this technical revision, two cases were analyzed for the changes to the mining and reclamation geometry of the pit slopes along the north and east sides of the south cell. Static and pseudo-static conditions were analyzed for each case, for both mining and reclamation conditions.

Pseudo-static peak acceleration factors (peak horizontal acceleration, or PHA) were taken from USGS information for the western United States. The 2% probability of exceedance in 50 years (the most conservative) was used. The USGS peak acceleration map is included in Appendix E. A peak acceleration factor of 0.10 x gravity was taken from this data. A conservative earthquake loading coefficient of 0.50 x PHA is often used for slope stability analyses (50% of PHA). We used an even more conservative approach and used 70% of the PHA for this area for our earthquake loading coefficient. Hence, 0.70 x 0.10 = 0.07.

The mining slope along the north side of the south cell will be 2H:1V. This slope will be reclaimed with a 4.5H:1V slope using overburden materials. The mining slope along the east side of the south cell will be 3H:1V. A portion of this slope will be reclaimed with a 4.5H:1V slope using overburden materials so the entire east slope of the south cell will have a setback of at least 400 feet from the bank of the South Platte River to the east.

The locations of the cases are shown on the case location maps included in Appendix A.

Case South A – North Slope of the South Cell.

The south cell is adjacent to the north cell along on the north side of the south cell. The slope is proposed to be mined at 2H:1V, and reclaimed at 4.5H:1V. The proposed setback for mining is 50 feet from the top of the north cell embankment. The proposed setback after reclamation is 250 feet from the top of the north cell embankment. The mining depth was assumed to be 44 feet in this area based on bore log information in the geotechnical report.

Case South B – East Slope of the South Cell.

The mining operation is adjacent to a pipeline easement along the east side of the south cell. The slope is proposed to be mined at 3H:1V, and a portion of it reclaimed at 4.5H:1V. The proposed setback for mining is 60 feet from the pipeline easement. The proposed setback after reclamation is 239 feet from the pipeline easement. The mining depth was assumed to be 43 feet in this area based on bore log information in the geotechnical report.

The cross-sections located in Appendix B show the geometry used in the mining and reclamation, and the locations of the man-made structures adjacent to the mining and reclamation slopes.

METHODOLOGY

The mining embankment configuration shown in the computer analysis represents the estimated conditions for this site. If mining conditions differ from the estimated conditions, the slope stability will need to be re-evaluated on a case-by-case basis. The Bishop Method was used in the computer analysis for determining safety factors. The procedure searches for circular shear failures and automatically searches for the lowest safety factor. 20,000 separate failure surfaces were analyzed for each case. The required minimum safety factors are based on the policy of the Mined Land Reclamation Board (MLRD) for Factors of Safety for Slope Stability / Geotechnical Analyses.

All cases were analyzed using both mining condition and reclamation condition geometry to determine the factor of safety for each case. The mining condition analyses assumed the mine is fully dewatered (dry mined). The reclamation condition analyses include both full reservoir and rapid drawdown conditions.

SLOPE STABILITY RESULTS

When estimated soil strength parameters are used, the MLRB requires minimum safety factors of 1.50 for static condition analyses and 1.30 for pseudo-static (earthquake loading) condition analyses for embankments adjacent to critical structures. The calculated factors of safety are within the design criteria specified for this project and can be considered indicators of the mining slope performance under the various conditions. The results of the static condition and pseudo-static condition slope stability analyses are shown in Tables 2 and 3 below.

Table 2: Mining Conditions Slope Stability Analysis Results

Description	Calculated Factor of Safety	Required Minimum Factor of Safety
Case South A Top of North Cell Embankment North of South Cell – Static	1.84	1.50
Case South A Top of North Cell Embankment North of South Cell – Pseudostatic	1.49	1.30
Case South B Pipeline Easement East of South Cell – Static	2.40	1.50
Case South B Pipeline Easement East of South Cell – Pseudostatic	1.82	1.30

Table 3: Reclamation Conditions Slope Stability Analysis Results

Description	Calculated Factor of Safety	Required Minimum Factor of Safety
Case South A Top of North Cell Embankment North of South Cell – Full Reservoir - Static	4.90	1.50
Case South A Top of North Cell Embankment North of South Cell – Full Reservoir – Pseudostatic	2.11	1.30
Case South A Top of North Cell Embankment North of South Cell – Rapid Drawdown - Static	2.79	1.50
Case South A Top of North Cell Embankment North of South Cell – Rapid Drawdown - Pseudostatic	1.58	1.30
Case South B Pipeline Easement East of South Cell – Full Reservoir - Static	5.24	1.50
Case South B Pipeline Easement East of South Cell – Full Reservoir - Pseudostatic	2.27	1.30
Case South B Pipeline Easement East of South Cell – Rapid Drawdown - Static	2.96	1.50
Case South B Pipeline Easement East of South Cell – Rapid Drawdown - Pseudostatic	1.69	1.30

The Galena analysis output files are included in Appendix C for all cases.

CONCLUSIONS AND RECOMMENDATIONS

Mining Conditions:

Case South A:
At a setback of 50 feet, the lowest resulting static condition safety factor of 1.84 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 1.49 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure subject to earthquake loading. The proposed setback of 50 feet from the top of the north cell embankment is satisfactory.

Case South B:
At a setback of 60 feet, the lowest resulting static condition safety factor of 2.40 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 1.82 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure subject to earthquake loading. The proposed setback of 60 feet from the pipeline easement is satisfactory.

Reclaimed Conditions:

Case South A:
Full Reservoir Condition
At a setback of 250 feet, the lowest resulting static condition safety factor of 4.90 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 2.11 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure subject to earthquake loading. The proposed setback of 250 feet from the top of the north cell embankment is satisfactory.

Rapid Drawdown Condition
At a setback of 250 feet, the lowest resulting static condition safety factor of 2.79 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 1.58 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure subject to earthquake loading. The proposed setback of 250 feet from the top of the north cell embankment is satisfactory.

Case South B:
Full Reservoir Condition
At a setback of 239 feet, the lowest resulting static condition safety factor of 5.24 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 2.27 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure

subject to earthquake loading. The proposed setback of 239 feet from the pipeline easement is satisfactory.

Rapid Drawdown Condition

At a setback of 239 feet, the lowest resulting static condition safety factor of 2.96 exceeds the MLRB minimum requirement of 1.50 for an embankment adjacent to a critical structure. The lowest resulting pseudo-static condition safety factor of 1.69 exceeds the MLRB minimum requirement of 1.30 for an embankment adjacent to a critical structure subject to earthquake loading. The proposed setback of 239 feet from the pipeline easement is satisfactory.

The following recommendations for monitoring of slope stability should be followed:

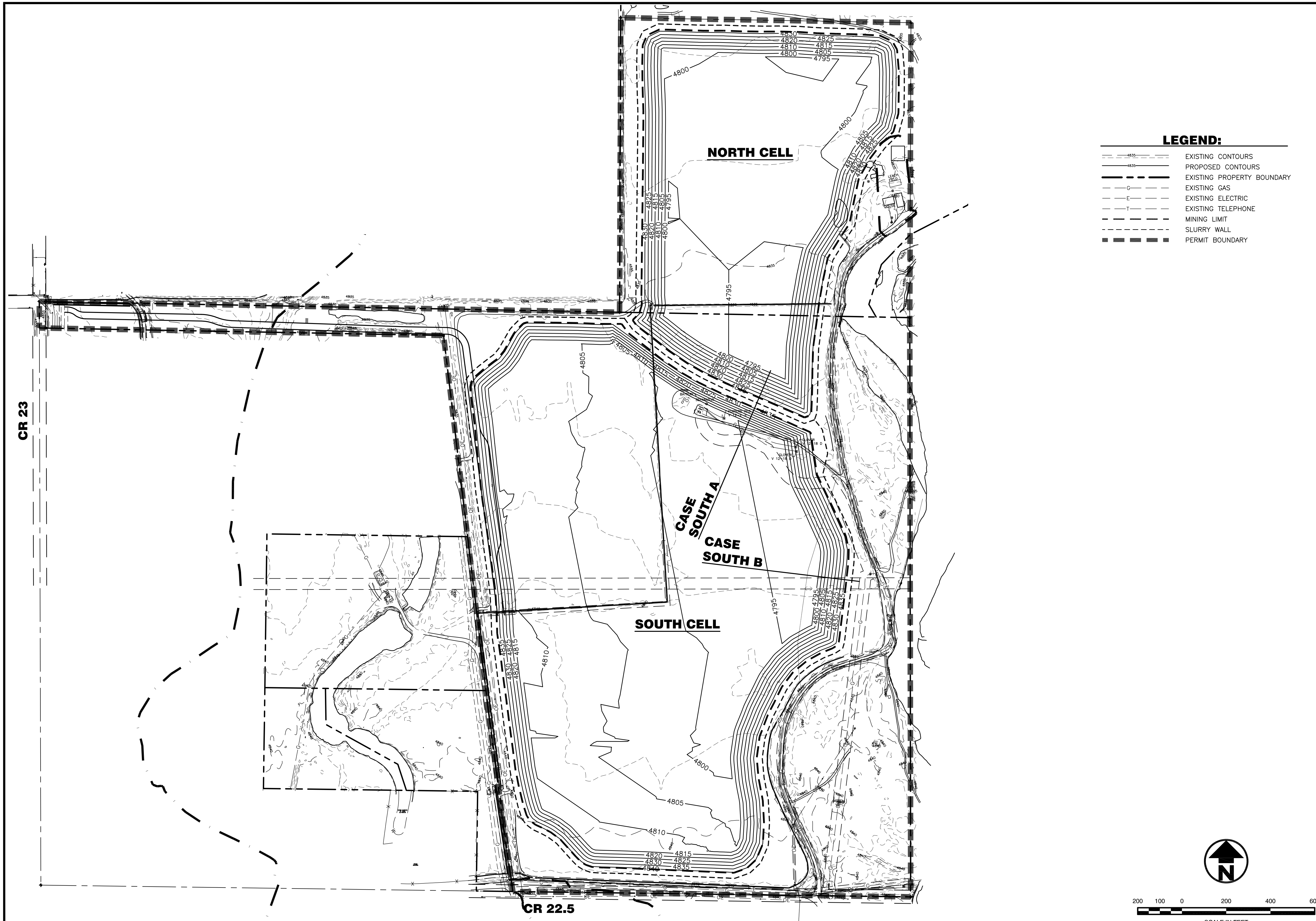
1. A visual inspection of the excavated slopes should be done on a weekly basis for the duration of mining. This inspection should consist of walking the existing ground and looking for any signs of stress cracks or other potential signs of slope failure. Some minor sloughing of slopes is expected on any mine site. The intent of this inspection is to locate potential major slope failures that could potentially extend back into a structure.

2. A visual inspection should be done after a major precipitation event that has saturated the ground using the same procedures. A major precipitation event would be defined as a storm that produces an intensity level reached once in 50 years on the average.

3. If a visual inspection detects signs of a potential slope failure, qualified personnel should be contacted to evaluate and recommend remediation work to stabilize the area.

4. If no visible signs of slope failure are detected during mining, then the inspection period could be reduced to once per 6 months after mining completion, or after every major precipitation event.

APPENDIX A



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Bennett Gravel Pit

Appendix A1 - Mining Conditions

Slope Stability Case Location Map

Northern Colorado Constructors, Inc.

REVISIONS

No	Date	By	Chk	Description

Job #	16116
Date	4.14.25
Drawn By	TPY
Designed By	TPY
Checked By	JCY
File	JT-SlopeStability
Scale	1" = 200'

Sheet: 1 Of: 2

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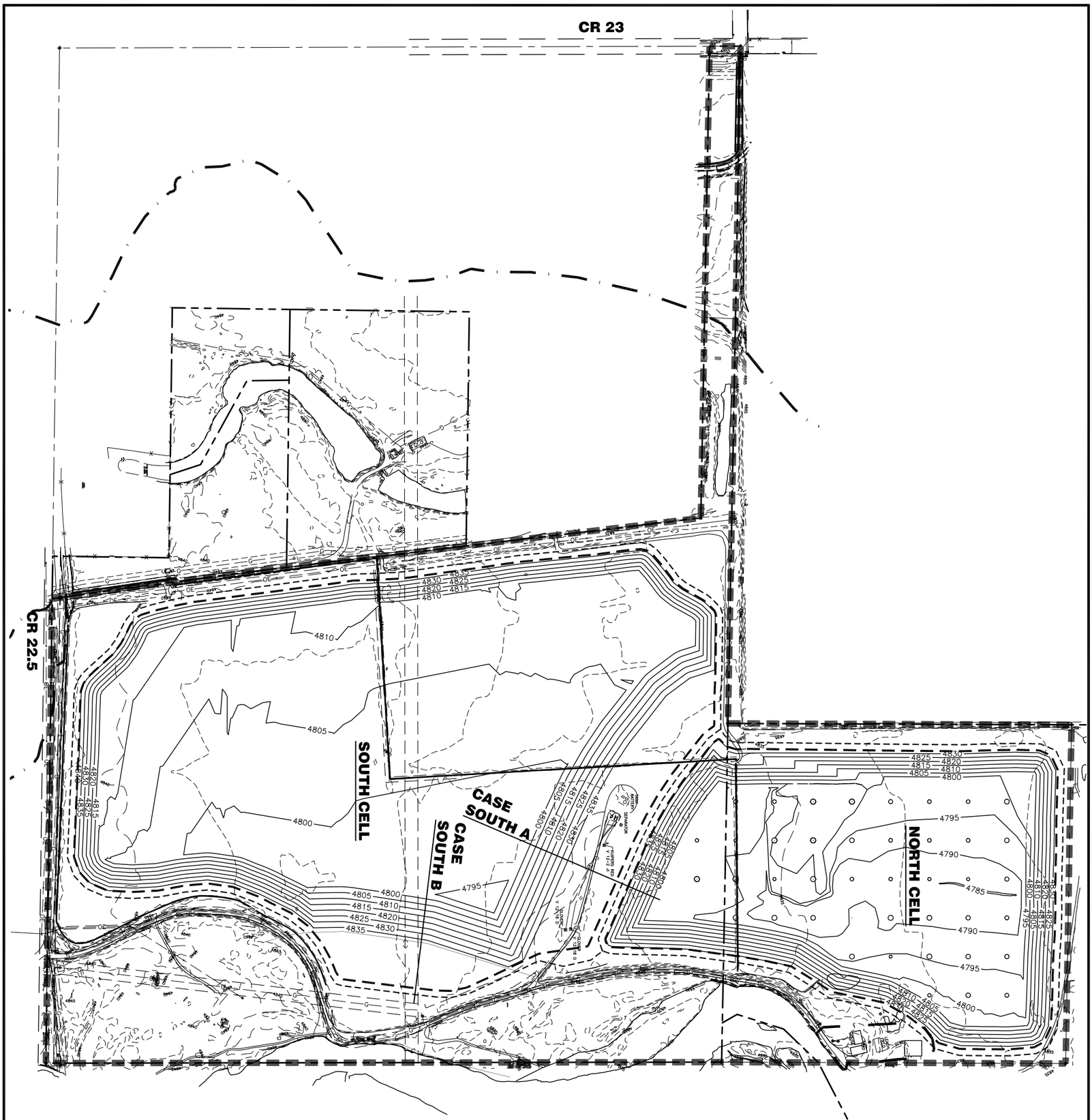


LEGEND:

- EXISTING CONTOURS
- PROPOSED CONTOURS
- EXISTING PROPERTY BOUNDARY
- EXISTING GAS
- EXISTING ELECTRIC
- EXISTING TELEPHONE
- MINING LIMIT
- SLURRY WALL
- PERMIT BOUNDARY

SCALE IN FEET: 200 100 0 200 400 600

N

REVISIONS				
No.	Date	By	Chk	Description

Northern Colorado Constructors, Inc.

Bennett Gravel Pit

Appendix A2 - Reclamation Conditions

Slope Stability Case Location Map

J&T Consulting, Inc.

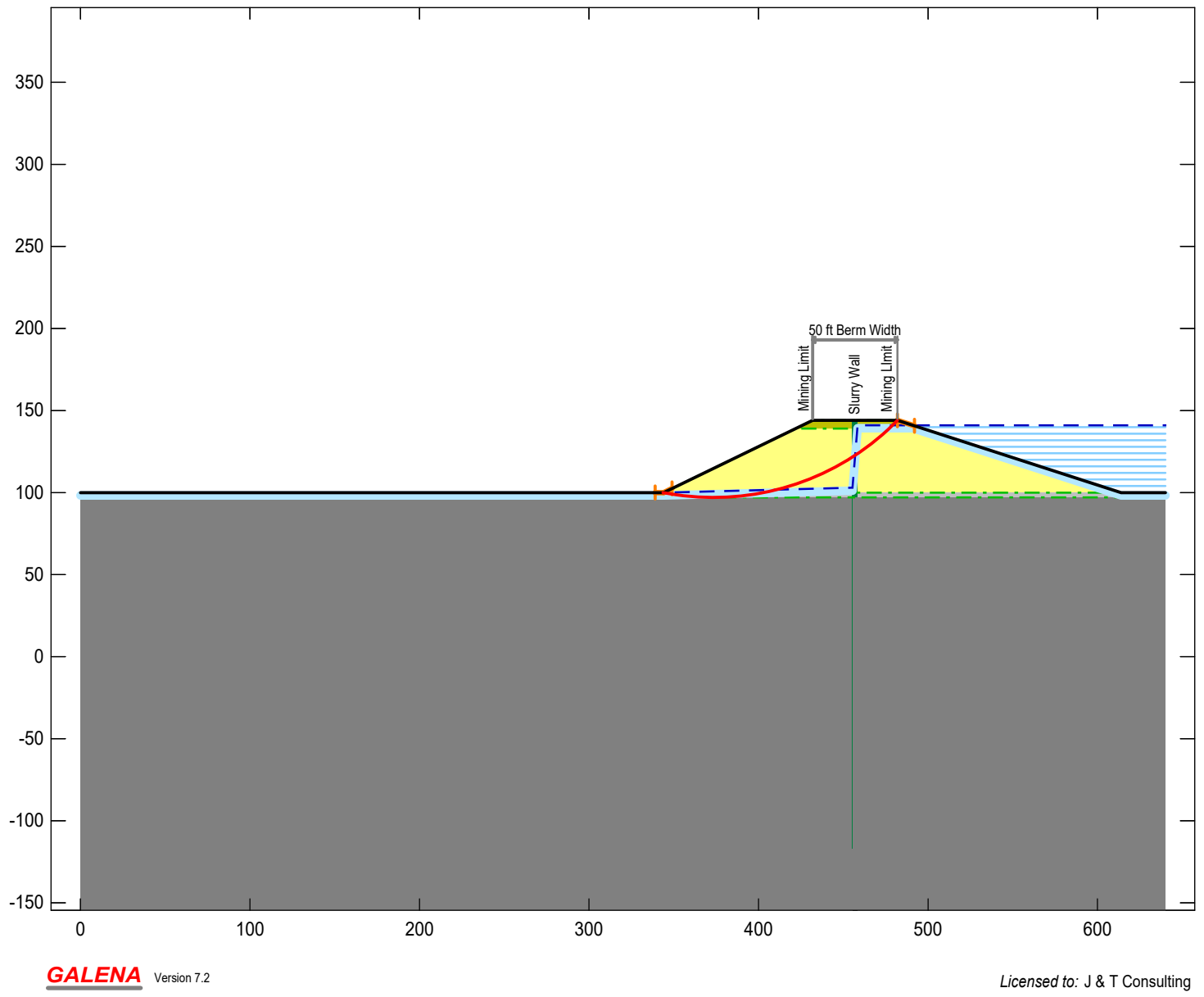
305 N Denver Avenue - Suite D
Fort Lupton, CO 80621
Ph: 303-857-6222 Fax: 303-857-6224
www.j-tconsulting.com

Job # 16116
Date 4.14.25
Drawn By TPY
Designed By TPY
Checked By JCY
File JT-SlopeStability
Scale 1" = 200'

Sheet: 2 Of: 2

APPENDIX B

Mining Conditions



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ

2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ

3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ

4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ

5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

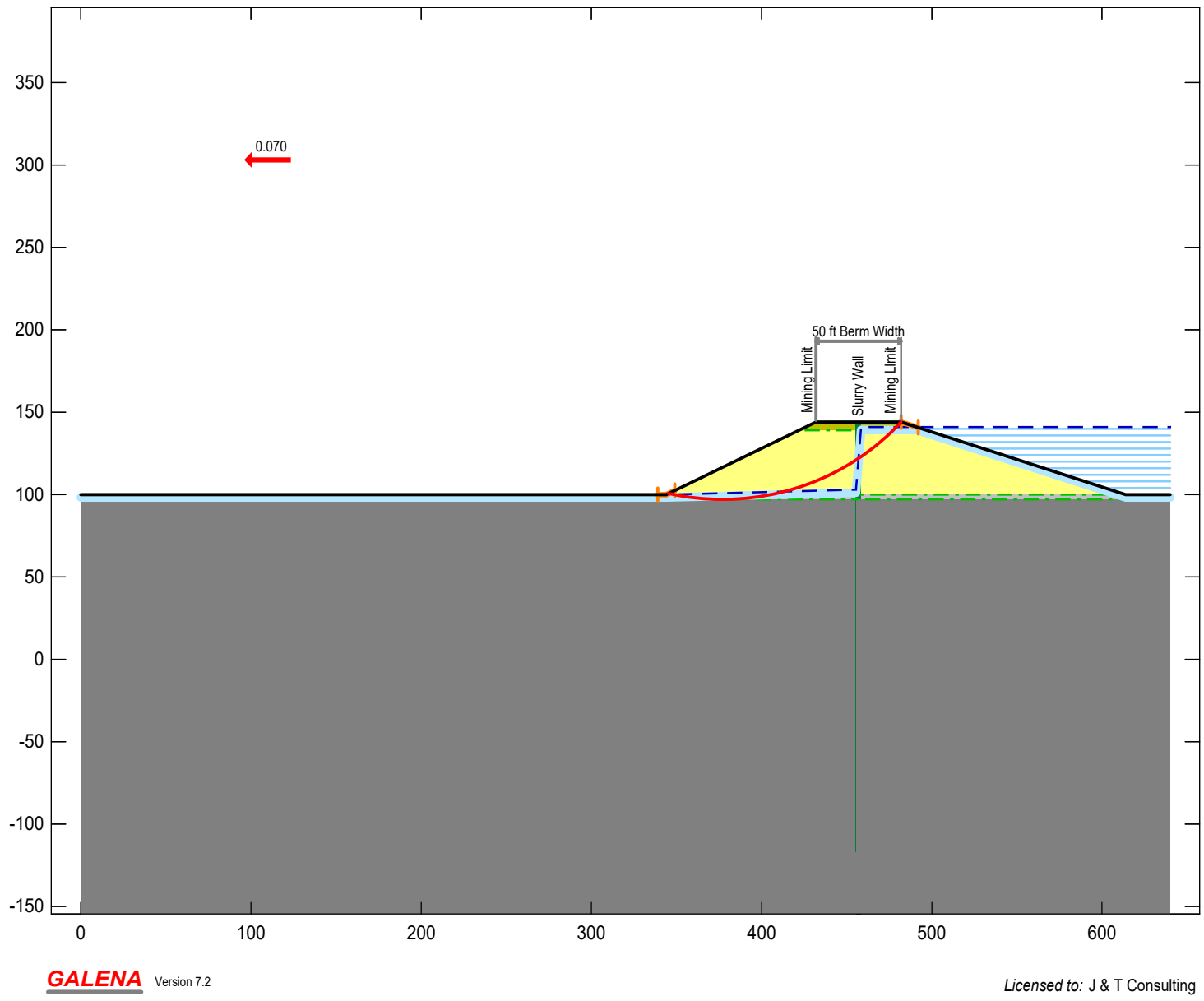
Critical Factor of Safety: 1.84

Project Bennett Pit
Case South A - Mining

File: C:\Galena Models\Bennett Case South A Mining.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

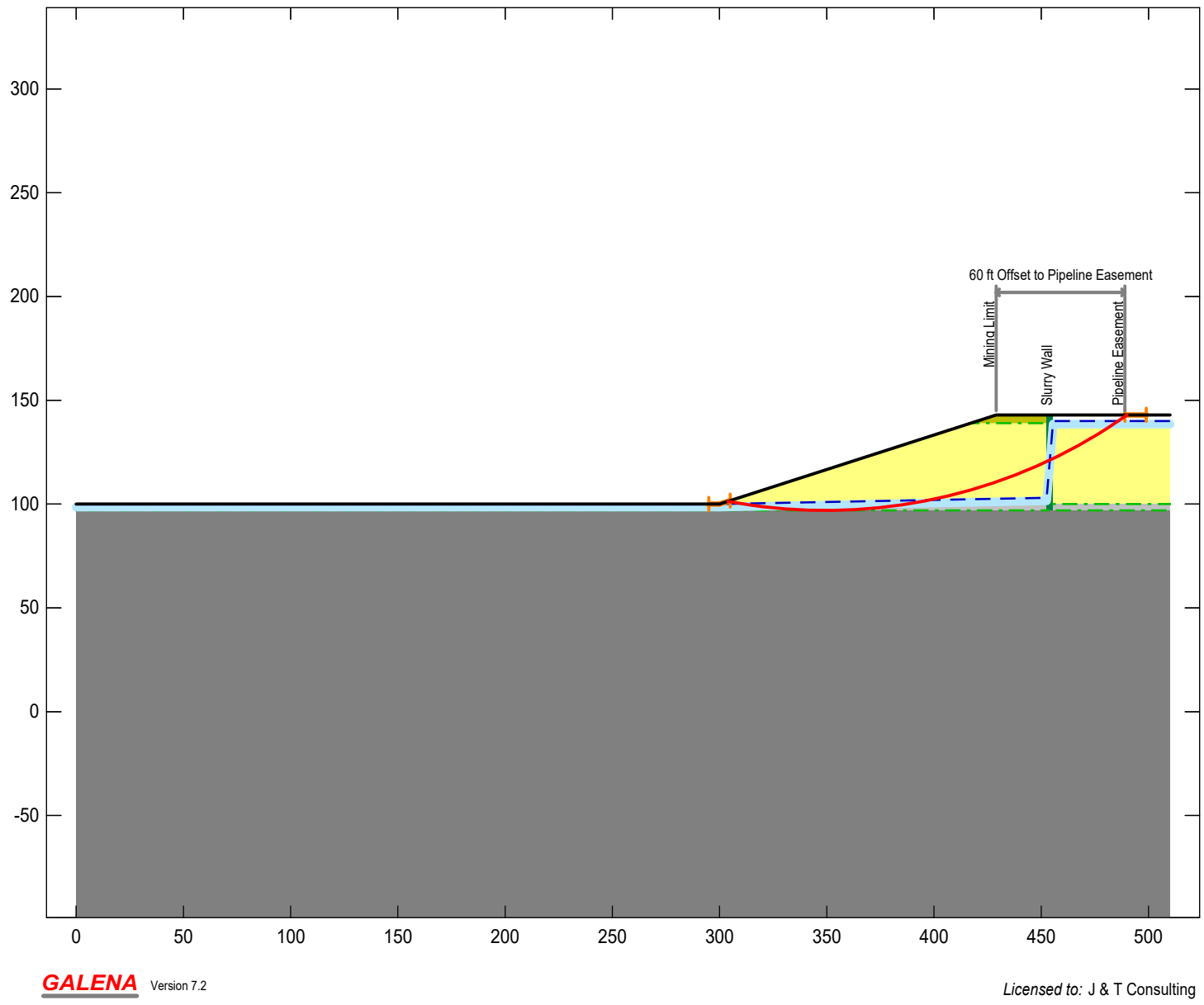
Critical Factor of Safety: 1.49

Project Bennett Pit
Case South A - Mining - Pseudostatic

File: C:\Galena Models\Bennett Case South A Mining-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ

2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ

3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ

4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ

5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

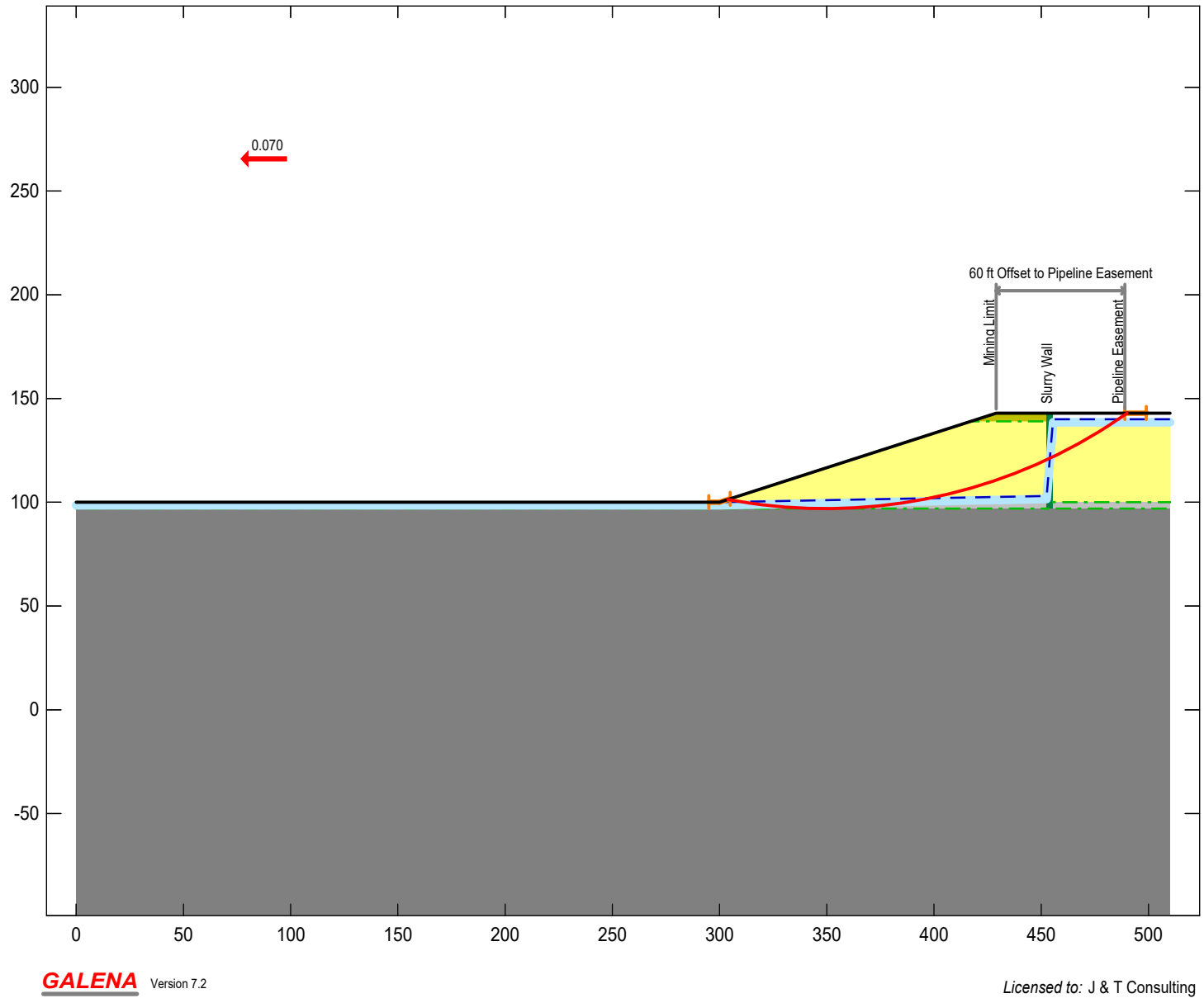
Critical Factor of Safety: 2.40

Project Bennett Pit
Case South B - Mining

File: C:\Galena Models\Bennett Case South B Mining.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

Critical Factor of Safety: 1.82

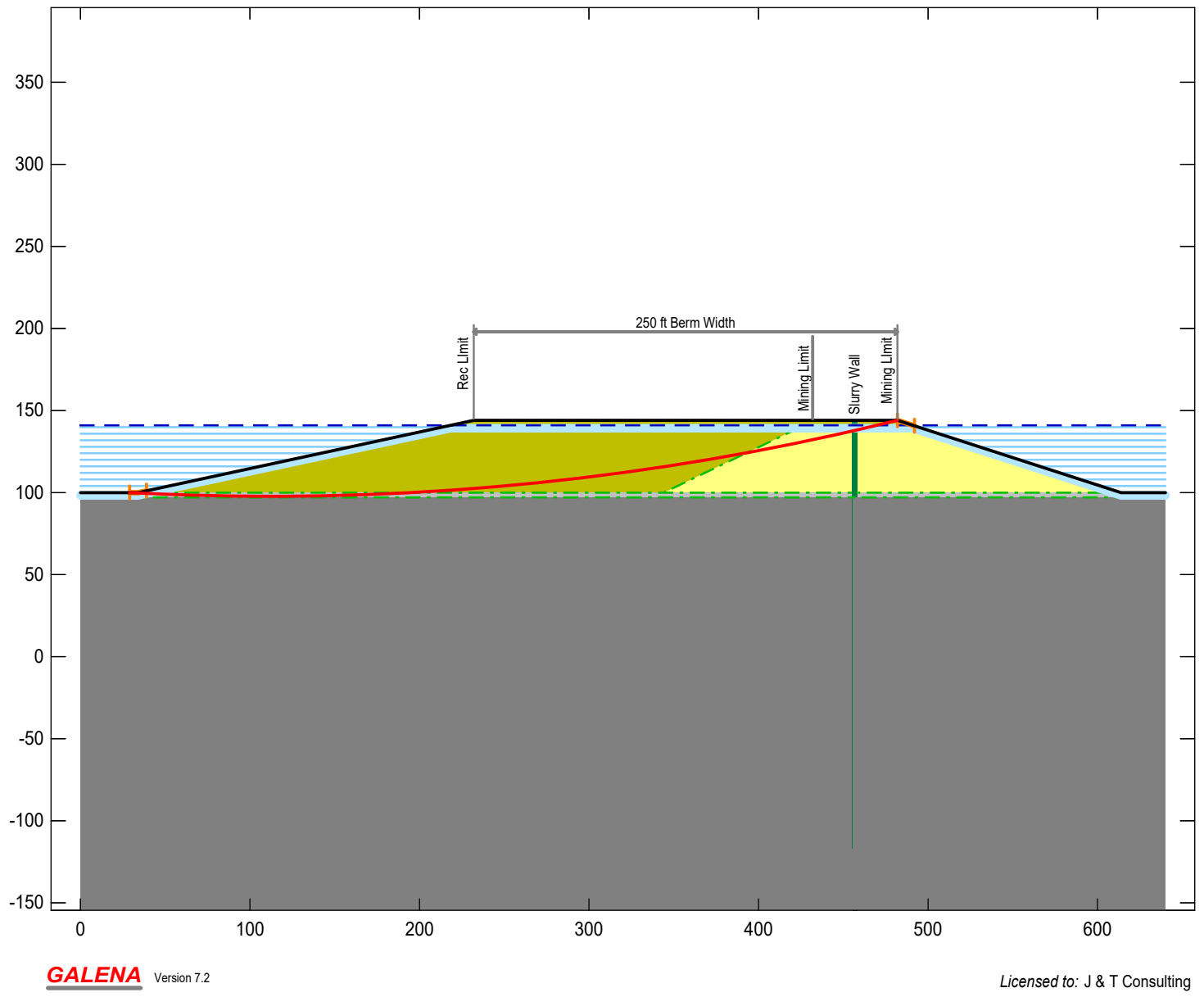
Project Bennett Pit
Case South B - Mining - Pseudostatic

File: C:\Galena Models\Bennett Case South B Mining-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.

Reclamation Conditions



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ

2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ

3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ

4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ

5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 4.90

Project Bennett Pit

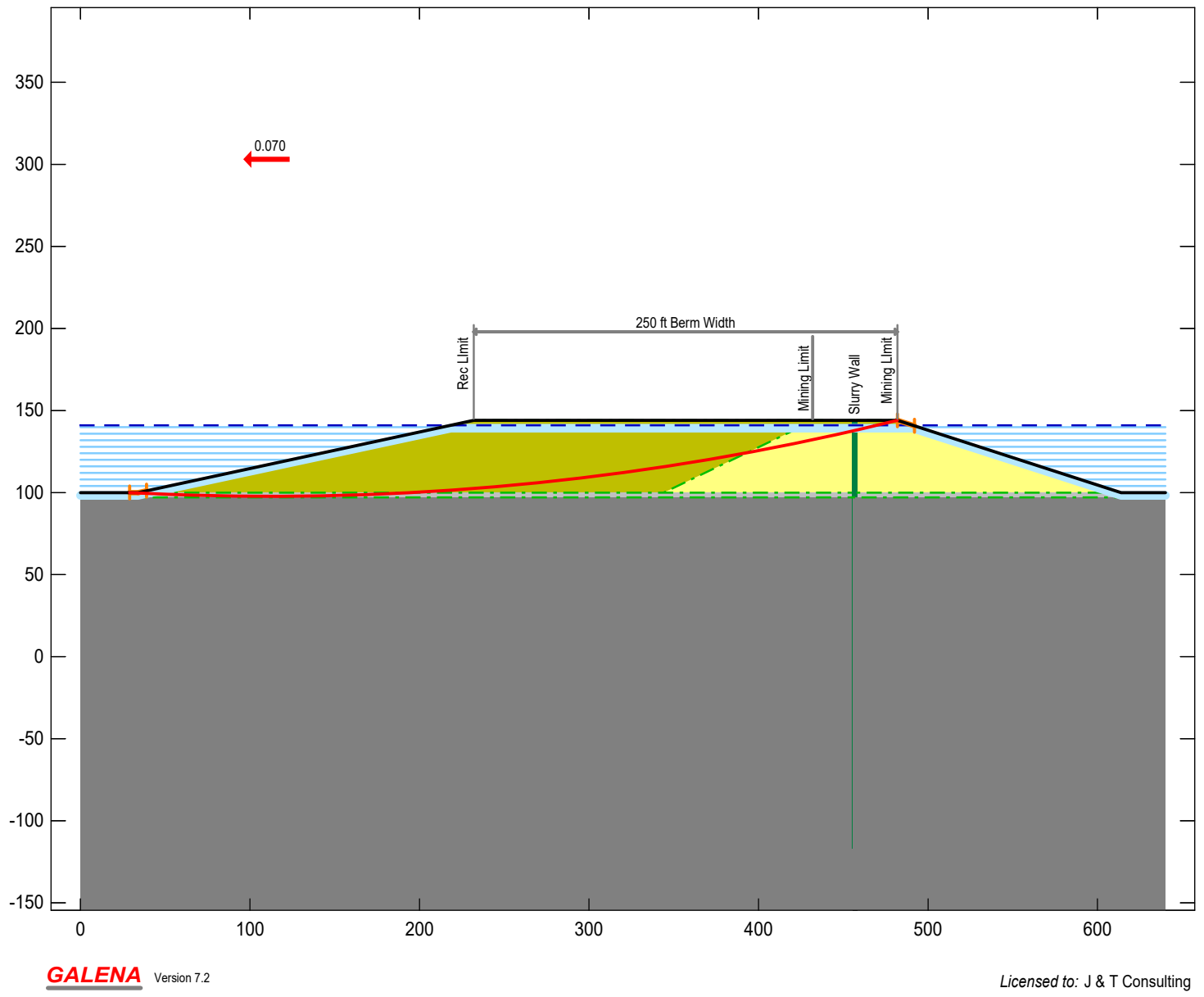
Case South A - Reclamation - Full Reservoir

File: C:\Galena Models\Bennett Case South A Rec Full.gmf

Edited: 15 Apr 2025

Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

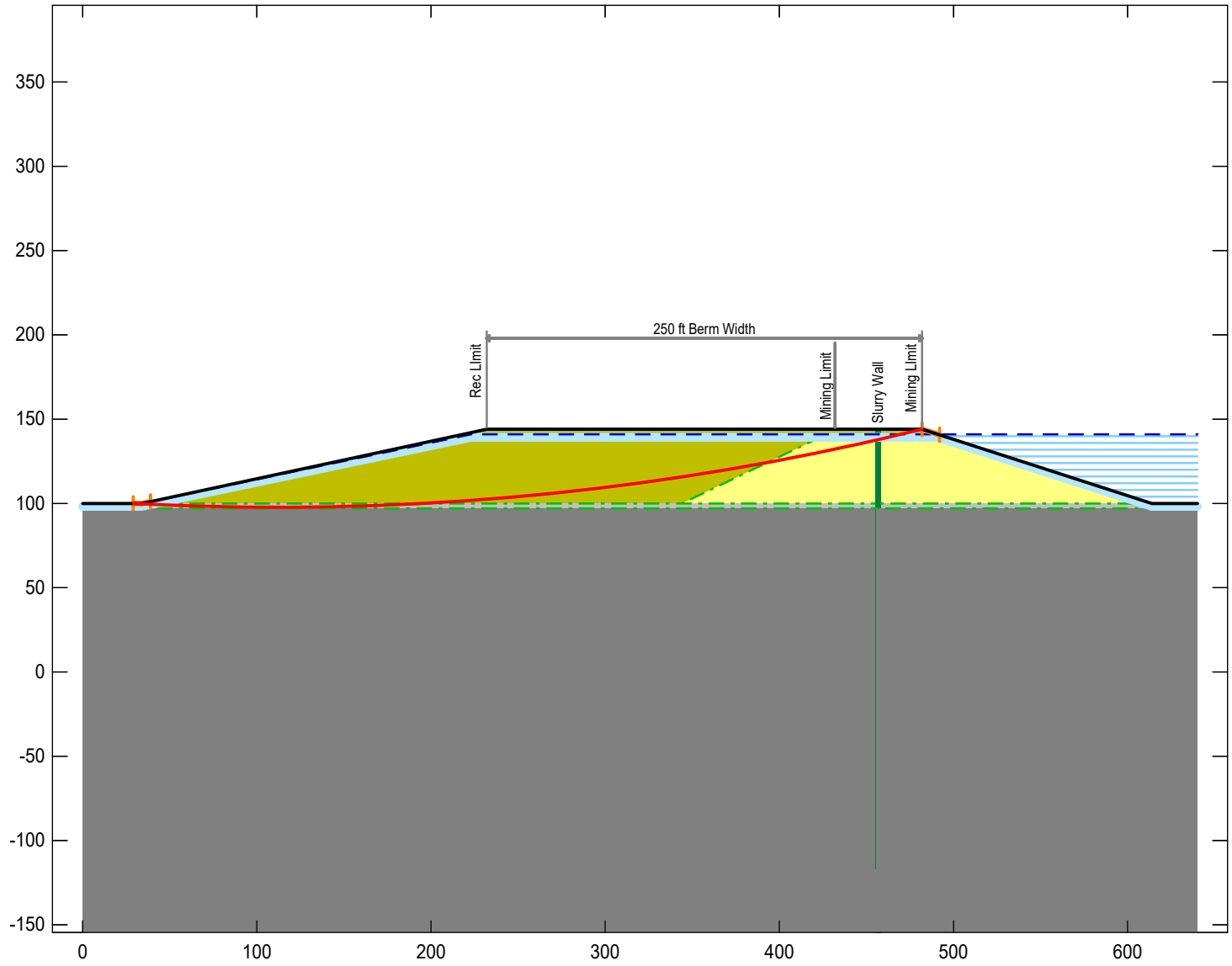
Critical Factor of Safety: 2.11

Project Bennett Pit
Case South A - Reclamation - Full Reservoir - Pseudostatic

File: C:\Galena Models\Bennett Case South A Rec Full-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ

2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ

3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ

4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ

5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 2.79

Project Bennett Pit

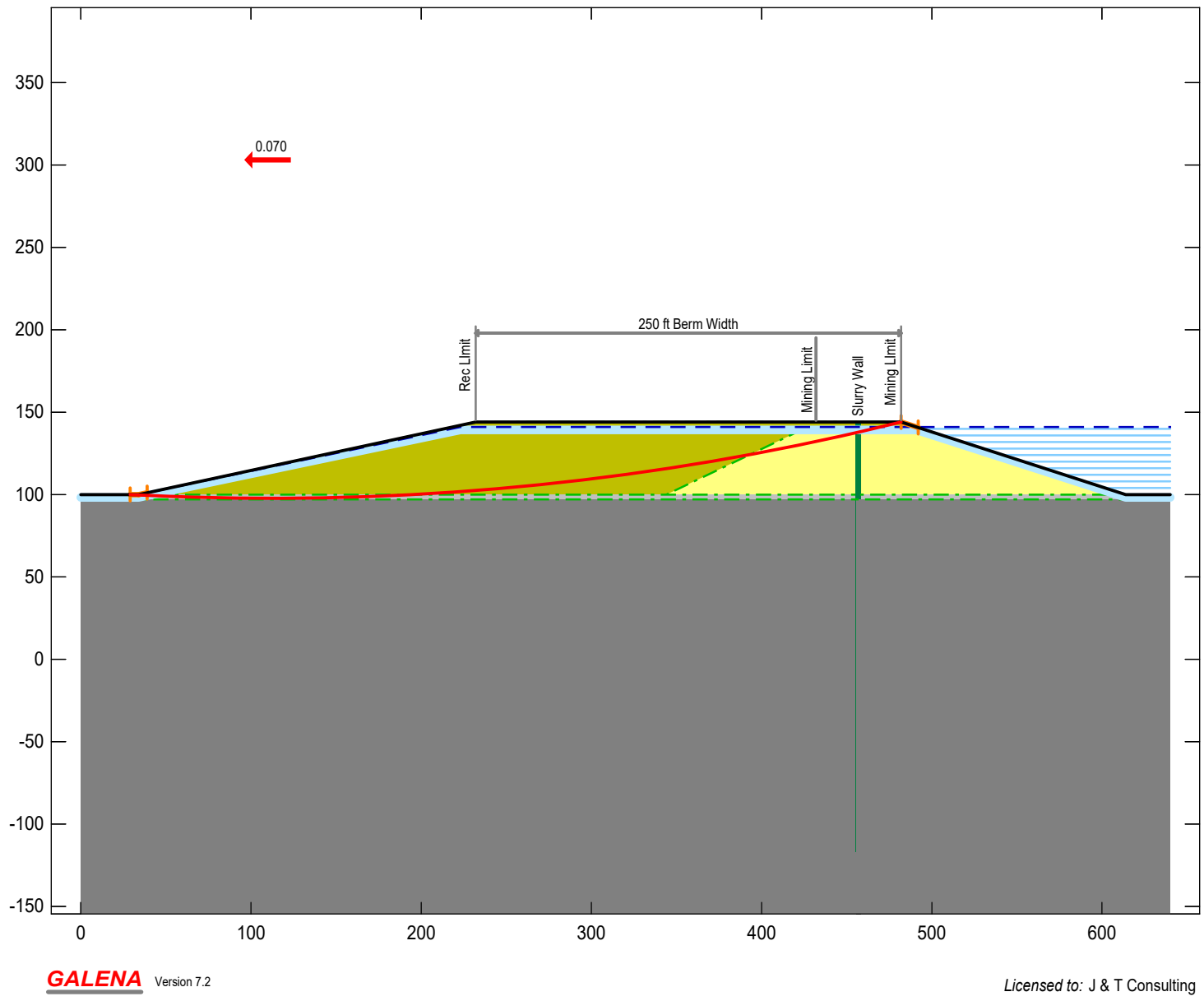
Case South A - Reclamation - Rapid Drawdown

File: C:\Galena Models\Bennett Case South A Rec Rapid Drawdown.gmf

Edited: 15 Apr 2025

Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

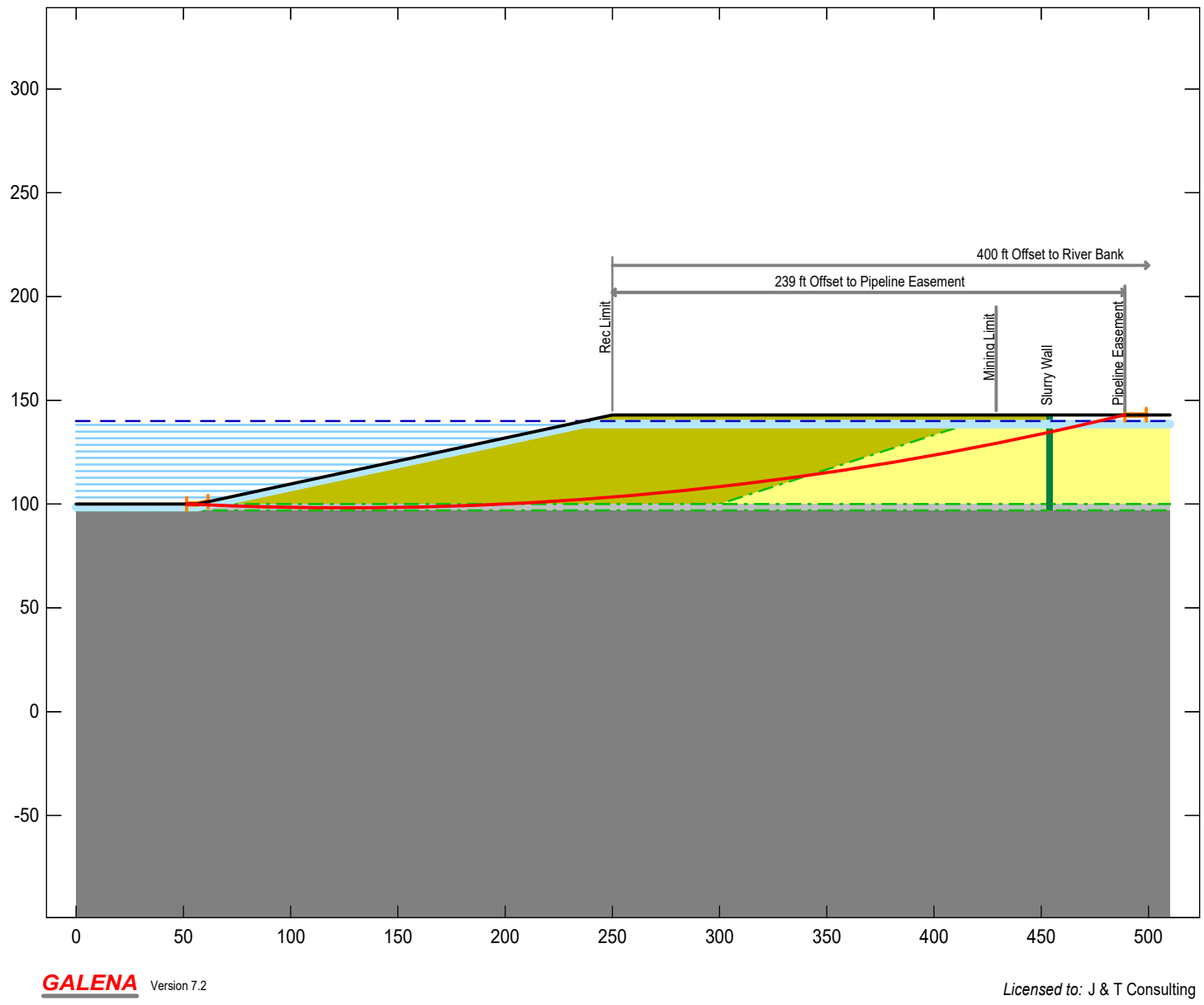
Critical Factor of Safety: 1.58

Project Bennett Pit
Case South A - Reclamation - Rapid Drawdown - Pseudostatic

File: C:\Galena Models\Bennett Case South A Rec Rapid Drawdown-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

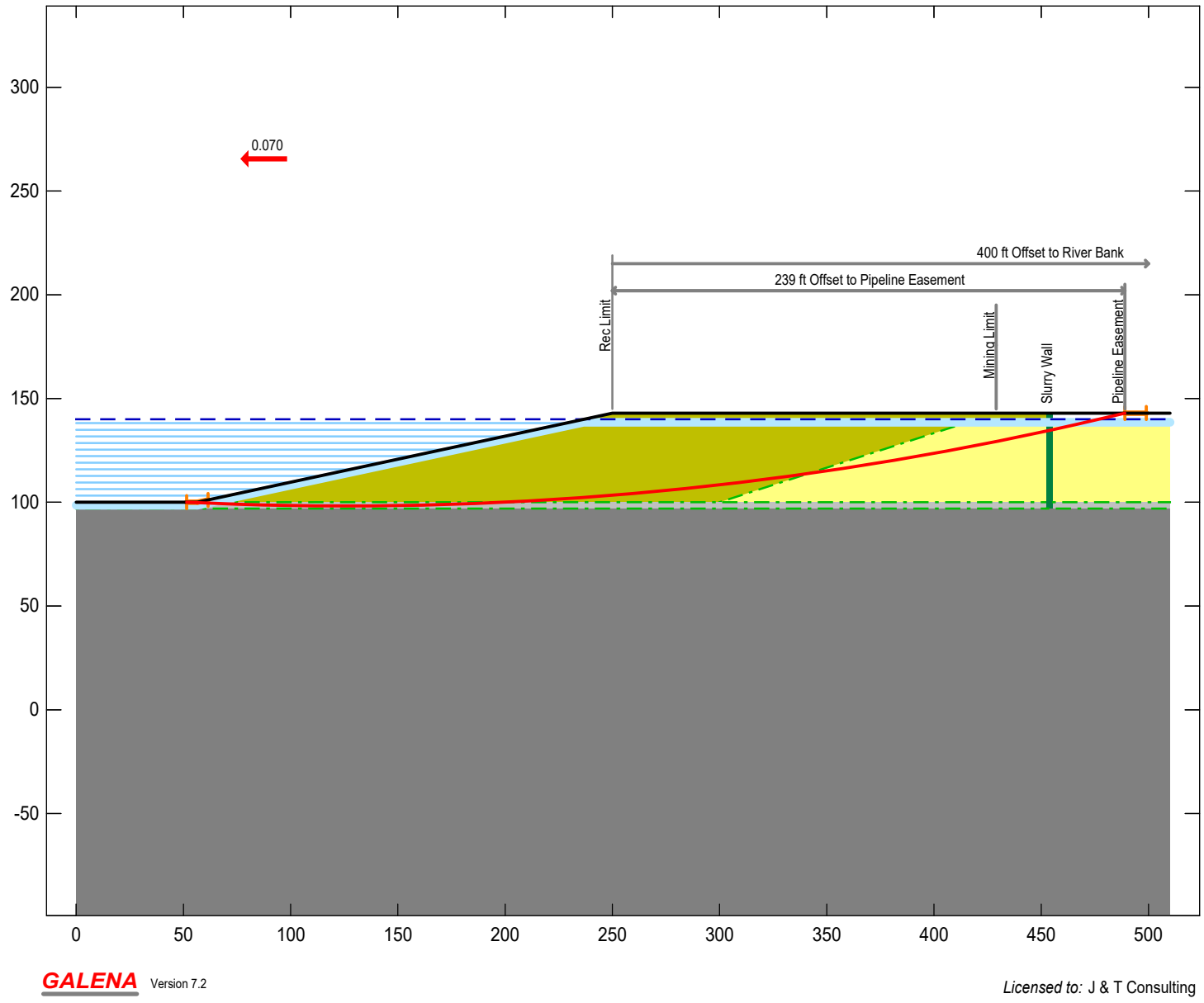
Critical Factor of Safety: 5.24

Project Bennett Pit
Case South B - Reclamation - Full Reservoir

File: C:\Galena Models\Bennett Case South B Rec Full.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

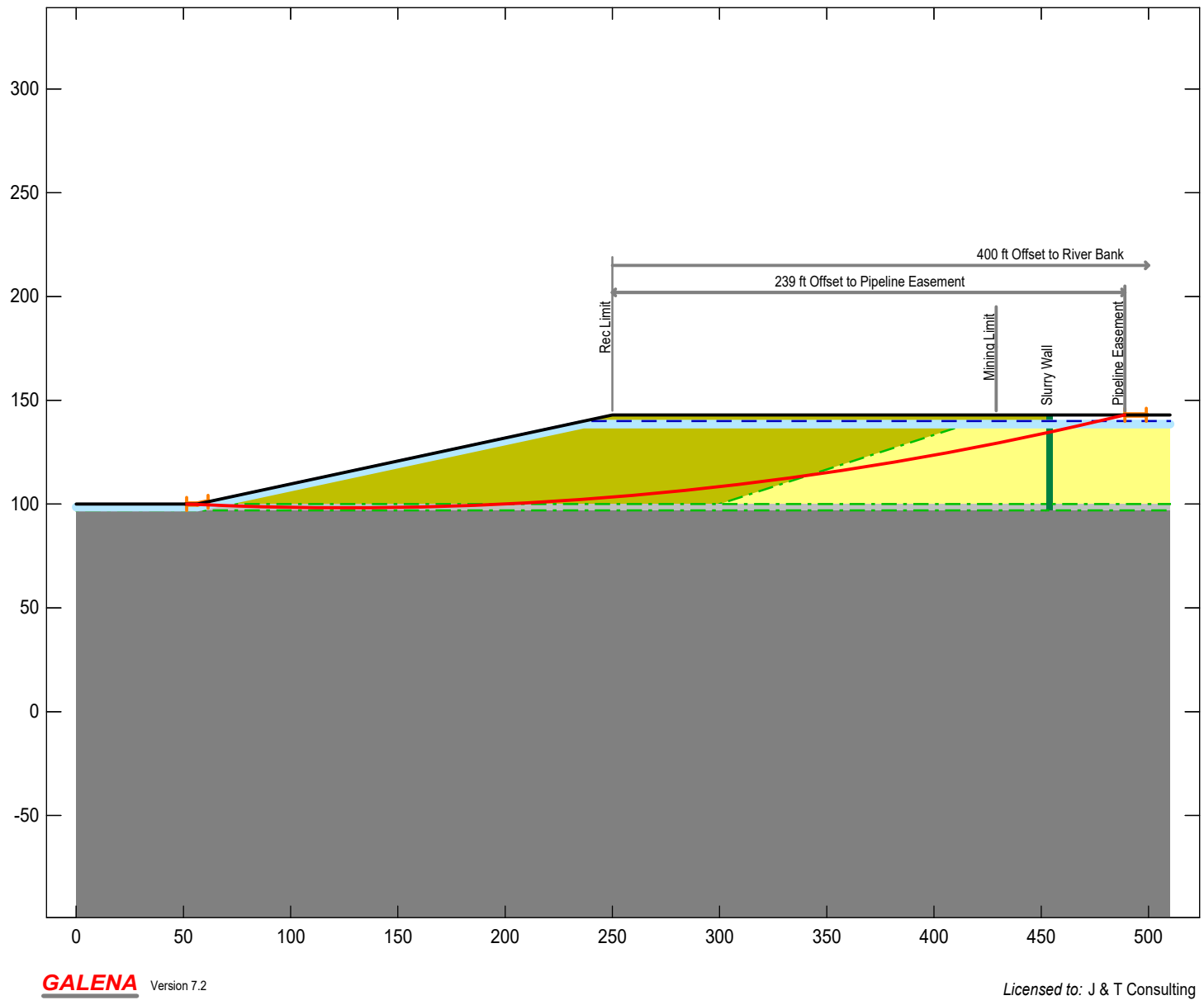
Critical Factor of Safety: 2.27

Project Bennett Pit
Case South B - Reclamation - Full Reservoir - Pseudostatic

File: C:\Galena Models\Bennett Case South B Rec Full-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

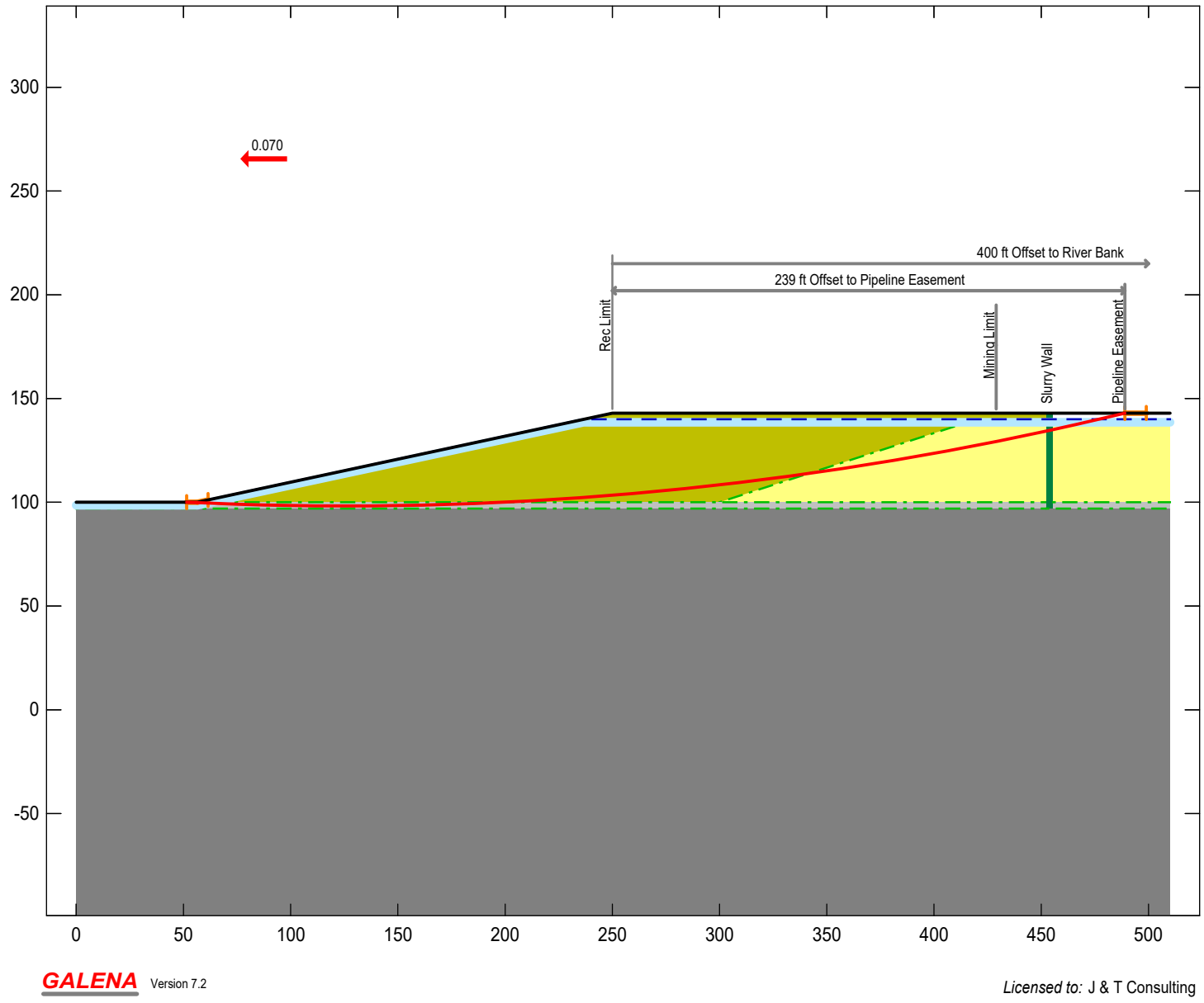
Critical Factor of Safety: 2.96

Project Bennett Pit
Case South B - Reclamation - Rapid Drawdown

File: C:\Galena Models\Bennett Case South B Rec Rapid Drawdown.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.



GALENA Version 7.2

Licensed to: J & T Consulting

Material Keys

1: Overburden (c:150 ø:22 g:110) Sat Đ
2: Sand and Gravel (c:0 ø:35 g:110) Sat Đ
3: Weathered Bedrock (c:100 ø:18 g:125) Sat Đ
4: Stable Bedrock (c:2000 ø:20 g:125) Sat Đ
5: Slurry Wall (c:0 ø:45 g:100) Sat Đ

Analysis 1

Multiple Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

Critical Factor of Safety: 1.69

Project Bennett Pit
Case South B - Reclamation - Rapid Drawdown - Pseudostatic

File: C:\Galena Models\Bennett Case South B Rec Rapid Drawdown-EQ.gmf

Edited: 15 Apr 2025
Processed: 15 Apr 2025

J&T Consulting, Inc.

APPENDIX C

Mining Conditions

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Mining.gmf Processed: 15 Apr 2025 08:37:39

DATA: Analysis 1 - Case South A - Mining

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
	0.00	144.00	455.50	144.00	
Profile: 2 (2 points)	Material beneath: 2 - Sand and Gravel				
	0.00	139.00	455.50	139.00	
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
	0.00	100.00	455.50	100.00	
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
	0.00	97.00	455.50	97.00	
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
	455.50	144.00	458.50	144.00	
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
	458.50	144.00	640.00	144.00	
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
	458.50	139.00	640.00	139.00	
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
	458.50	100.00	640.00	100.00	
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
	455.50	97.00	640.00	97.00	

Slope Surface (6 points)

0.00	100.00	344.00	100.00	432.00	144.00	482.00	144.00	614.00	100.00
640.00	100.00								

Phreatic Surface (5 points)

0.00	100.00	344.00	100.00	455.50	103.00	458.50	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	344.00	YL:	100.00	XR:	487.00	YR:	142.33
Centre:	XC:	362.82	YC:	299.11		Radius:	R:	200.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	200.00
Trial positions within range:	20	20	50

- -

RESULTS: Analysis 1 - Case South A - Mining

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 2.106

Analysis Summary

There were: 18071 successful analyses from a total of 20001 trial failure surfaces
1930 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.84

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	343.74	100.00	482.00	144.00	373.41	245.99	148.98	1.842	<-- Critical Surface
2	345.32	100.66	482.00	144.00	377.02	237.86	140.82	1.843	
3	344.79	100.39	482.53	143.82	375.88	241.92	144.90	1.844	
4	341.63	100.00	482.00	144.00	371.67	250.09	153.06	1.846	
5	342.16	100.00	482.53	143.82	372.33	250.06	153.06	1.846	
6	344.79	100.39	482.00	144.00	375.31	242.04	144.90	1.849	
7	346.89	101.45	482.00	144.00	380.75	229.71	132.65	1.849	
8	340.05	100.00	482.53	143.82	370.62	254.14	157.14	1.850	
9	344.26	100.13	482.53	143.82	374.18	246.08	148.98	1.850	
10	339.53	100.00	482.00	144.00	369.95	254.17	157.14	1.850	
11	342.16	100.00	482.00	144.00	371.75	250.17	153.06	1.852	
12	342.68	100.00	482.53	143.82	372.42	250.15	153.06	1.852	

13	343.21	100.00	483.05	143.65	373.09	250.12	153.06	1.852
14	346.37	101.18	482.53	143.82	379.59	233.82	136.73	1.853
15	343.74	100.00	483.58	143.47	373.76	250.09	153.06	1.854
16	345.84	100.92	483.05	143.65	378.44	237.91	140.82	1.855
17	343.21	100.00	482.53	143.82	372.50	250.23	153.06	1.855
18	345.32	100.66	483.58	143.47	377.31	241.98	144.90	1.856
19	340.05	100.00	482.00	144.00	370.03	254.26	157.14	1.856
20	340.58	100.00	482.53	143.82	370.70	254.23	157.14	1.856
21	344.26	100.13	482.00	144.00	373.60	246.19	148.98	1.856
22	341.11	100.00	483.05	143.65	371.37	254.20	157.14	1.856
23	341.63	100.00	483.58	143.47	372.04	254.17	157.14	1.857
24	344.79	100.39	484.11	143.30	376.21	246.02	148.98	1.857
25	344.26	100.13	484.63	143.12	375.11	250.05	153.06	1.857
26	342.16	100.00	484.11	143.30	372.72	254.14	157.14	1.857
27	342.68	100.00	482.00	144.00	371.83	250.26	153.06	1.857
28	347.95	101.97	482.53	143.82	383.30	225.59	128.57	1.858
29	346.89	101.45	484.11	143.30	381.54	233.72	136.73	1.858
30	346.37	101.18	484.63	143.12	380.41	237.82	140.82	1.858
31	343.74	100.00	483.05	143.65	373.17	250.20	153.06	1.859
32	341.63	100.00	483.05	143.65	371.46	254.29	157.14	1.859
33	345.84	100.92	485.16	142.95	379.31	241.90	144.90	1.860
34	339.00	100.00	483.05	143.65	369.68	258.28	161.22	1.861
35	347.42	101.71	483.05	143.65	382.13	229.74	132.65	1.861
36	340.05	100.00	484.11	143.30	371.03	258.22	161.22	1.861
37	339.53	100.00	483.58	143.47	370.35	258.25	161.22	1.861
38	346.37	101.18	482.00	144.00	379.03	233.96	136.73	1.861
39	340.58	100.00	482.00	144.00	370.11	254.34	157.14	1.861
40	343.74	100.00	482.53	143.82	372.59	250.32	153.06	1.861
41	341.11	100.00	482.53	143.82	370.79	254.31	157.14	1.862
42	345.84	100.92	482.53	143.82	377.88	238.05	140.82	1.862
43	345.32	100.66	483.05	143.65	376.74	242.11	144.90	1.863
44	344.26	100.13	484.11	143.30	374.53	250.17	153.06	1.863
45	344.79	100.39	483.58	143.47	375.63	246.15	148.98	1.863
46	342.16	100.00	483.58	143.47	372.13	254.26	157.14	1.863
47	343.21	100.00	482.00	144.00	371.92	250.35	153.06	1.863
48	342.68	100.00	484.11	143.30	372.80	254.23	157.14	1.864
49	340.05	100.00	483.58	143.47	370.44	258.33	161.22	1.864
50	346.89	101.45	483.58	143.47	380.98	233.86	136.73	1.864
51	343.21	100.00	484.63	143.12	373.48	254.20	157.14	1.865
52	347.95	101.97	482.00	144.00	382.76	225.74	128.57	1.865
53	343.74	100.00	485.16	142.95	374.15	254.17	157.14	1.866
54	342.16	100.00	483.05	143.65	371.54	254.37	157.14	1.866
55	339.00	100.00	482.53	143.82	369.09	258.39	161.22	1.866
56	339.53	100.00	483.05	143.65	369.77	258.36	161.22	1.866
57	344.26	100.13	483.05	143.65	374.76	245.96	148.98	1.867
58	347.95	101.97	484.63	143.12	384.06	229.62	132.65	1.867
59	341.11	100.00	482.00	144.00	370.20	254.43	157.14	1.867
60	346.37	101.18	484.11	143.30	379.85	237.96	140.82	1.867
61	340.58	100.00	484.11	143.30	371.12	258.31	161.22	1.867
62	341.63	100.00	482.53	143.82	370.87	254.40	157.14	1.867
63	341.11	100.00	484.63	143.12	371.79	258.28	161.22	1.868
64	344.26	100.13	483.58	143.47	373.95	250.29	153.06	1.868
65	345.84	100.92	484.63	143.12	378.74	242.03	144.90	1.868
66	344.79	100.39	483.05	143.65	375.05	246.27	148.98	1.869
67	343.74	100.00	482.00	144.00	372.00	250.43	153.06	1.869

68	341.63	100.00	485.16	142.95	372.47	258.25	161.22	1.869
69	345.32	100.66	485.16	142.95	377.65	246.09	148.98	1.869
70	345.32	100.66	482.53	143.82	376.17	242.23	144.90	1.869
71	342.68	100.00	483.58	143.47	372.22	254.34	157.14	1.869
72	345.84	100.92	482.00	144.00	377.31	238.18	140.82	1.869
73	347.42	101.71	485.16	142.95	382.93	233.75	136.73	1.869
74	344.79	100.39	485.68	142.77	376.58	250.12	153.06	1.869
75	342.16	100.00	485.68	142.77	373.14	258.22	161.22	1.869
76	344.26	100.13	486.21	142.60	375.52	254.14	157.14	1.870
77	343.21	100.00	484.11	143.30	372.89	254.31	157.14	1.870
78	340.58	100.00	483.58	143.47	370.53	258.42	161.22	1.870
79	347.42	101.71	482.53	143.82	381.58	229.89	132.65	1.871
80	343.74	100.00	484.63	143.12	373.56	254.29	157.14	1.871
81	339.00	100.00	482.00	144.00	368.50	258.50	161.22	1.871
82	339.53	100.00	482.53	143.82	369.17	258.47	161.22	1.872
83	339.00	100.00	484.63	143.12	370.13	262.35	165.31	1.872
84	348.47	102.24	483.58	143.47	384.66	225.61	128.57	1.872
85	342.68	100.00	483.05	143.65	371.63	254.45	157.14	1.872
86	340.05	100.00	483.05	143.65	369.85	258.45	161.22	1.872
87	346.89	101.45	485.68	142.77	381.82	237.86	140.82	1.872
88	341.63	100.00	482.00	144.00	370.28	254.51	157.14	1.872
89	339.53	100.00	485.16	142.95	370.81	262.32	165.31	1.872
90	342.16	100.00	482.53	143.82	370.95	254.48	157.14	1.873
91	344.26	100.13	483.05	143.65	373.36	250.40	153.06	1.873
92	341.11	100.00	484.11	143.30	371.20	258.39	161.22	1.873
93	345.32	100.66	482.00	144.00	375.60	242.36	144.90	1.873
94	346.89	101.45	483.05	143.65	380.43	234.01	136.73	1.874
95	344.79	100.39	482.53	143.82	374.47	246.39	148.98	1.874
96	341.63	100.00	484.63	143.12	371.88	258.36	161.22	1.874
97	343.21	100.00	483.58	143.47	372.30	254.43	157.14	1.875
98	339.00	100.00	484.11	143.30	369.54	262.46	165.31	1.875
99	342.16	100.00	485.16	142.95	372.55	258.33	161.22	1.875

Critical Failure Surface (circle 1)

Intersects: XL: 343.74 YL: 100.00 XR: 482.00 YR: 144.00
Centre: XC: 373.41 YC: 245.99 Radius: R: 148.98

Generated failure surface: (20 points)

343.74	100.00	351.59	98.62	359.51	97.67	367.47	97.13	375.44	97.03
383.41	97.35	391.35	98.10	399.24	99.27	407.05	100.86	414.77	102.87
422.37	105.29	429.83	108.11	437.13	111.33	444.24	114.93	451.15	118.91
457.84	123.25	464.29	127.95	470.48	132.98	476.39	138.34	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 42 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	343.74	4.69	-10.0	3.93	3.99	3	100.00	18.0	560.92	97.15	156.44	1.05
2	347.66	15.11	-10.0	3.93	3.99	3	100.00	18.0	1797.29	294.96	479.70	1.05
3	351.59	25.35	-6.9	3.96	3.99	3	100.00	18.0	3002.30	466.61	779.05	1.03
4	355.55	35.08	-6.9	3.96	3.99	3	100.00	18.0	4137.50	612.09	1071.25	1.03
5	359.51	44.63	-3.8	3.98	3.99	3	100.00	18.0	5241.78	731.20	1334.64	1.01
6	363.49	53.60	-3.8	3.98	3.99	3	100.00	18.0	6267.84	823.93	1595.33	1.01
7	367.47	62.29	-0.8	3.99	3.99	3	100.00	18.0	7250.44	890.15	1822.85	1.00
8	371.45	70.45	-0.8	3.99	3.99	3	100.00	18.0	8160.71	929.87	2051.64	1.00

9	375.44	78.12	2.3	3.98	3.99	3	100.00	18.0	9004.15	943.04	2243.37	0.99
10	379.43	85.42	2.3	3.98	3.99	3	100.00	18.0	9793.10	929.62	2439.98	0.99
11	383.41	91.94	5.4	3.97	3.99	3	100.00	18.0	10482.83	889.66	2595.97	0.99
12	387.38	98.34	5.4	3.97	3.99	3	100.00	18.0	11146.55	823.16	2760.17	0.99
13	391.35	103.61	8.5	3.94	3.99	3	100.00	18.0	11672.16	730.21	2880.53	0.99
14	395.29	109.08	8.5	3.94	3.99	3	100.00	18.0	12208.30	610.82	3012.20	0.99
15	399.24	103.26	11.5	3.58	3.65	3	100.00	18.0	11481.11	432.35	3092.85	0.99
16	402.81	127.31	11.5	4.24	4.33	2	0.00	35.0	14081.19	325.97	3088.54	0.95
17	407.05	110.97	14.6	3.57	3.69	2	0.00	35.0	12229.11	95.82	3120.15	0.94
18	410.62	132.83	14.6	4.15	4.29	2	0.00	35.0	14611.10	0.00	3204.76	0.94
19	414.77	118.71	17.7	3.61	3.79	2	0.00	35.0	13057.69	0.00	3222.74	0.94
20	418.39	121.08	17.7	3.61	3.79	2	0.00	35.0	13318.90	0.00	3287.21	0.94
21	422.00	133.45	20.4	3.91	4.18	2	0.00	35.0	14679.89	0.00	3284.47	0.93
22	425.91	135.32	20.7	3.91	4.19	2	0.00	35.0	14885.01	0.00	3324.09	0.93
23	429.83	75.66	23.8	2.17	2.37	2	0.00	35.0	8323.04	0.00	3284.92	0.94
24	432.00	88.11	23.8	2.56	2.80	2	0.00	35.0	9691.71	0.00	3237.74	0.94
25	434.56	85.21	23.8	2.56	2.80	2	0.00	35.0	9373.00	0.00	3131.27	0.94
26	437.13	113.02	26.9	3.56	3.99	2	0.00	35.0	12432.53	0.00	2930.63	0.94
27	440.68	106.61	26.9	3.56	3.99	2	0.00	35.0	11727.51	0.00	2764.47	0.94
28	444.24	97.02	29.9	3.46	3.99	2	0.00	35.0	10672.62	0.00	2533.75	0.95
29	447.70	90.15	29.9	3.46	3.99	2	0.00	35.0	9916.34	0.00	2354.22	0.95
30	451.15	102.90	33.0	4.35	5.18	2	0.00	35.0	11319.04	0.00	2089.19	0.96
31	455.50	33.92	33.0	1.56	1.86	5	0.00	45.0	3392.08	0.00	1609.19	0.88
32	457.06	16.49	33.0	0.79	0.94	5	0.00	45.0	1686.00	275.54	1664.53	0.88
33	457.84	13.46	36.1	0.66	0.81	5	0.00	45.0	1433.51	676.36	1801.61	0.89
34	458.50	55.64	36.1	2.90	3.58	2	0.00	35.0	6859.38	3624.18	2074.78	0.97
35	461.40	49.53	36.1	2.90	3.58	2	0.00	35.0	6096.28	3152.96	1839.86	0.97
36	464.29	45.77	39.1	3.09	3.99	2	0.00	35.0	5618.95	2934.97	1561.25	0.98
37	467.38	37.98	39.1	3.09	3.99	2	0.00	35.0	4645.95	2308.86	1283.93	0.98
38	470.48	28.60	42.2	2.95	3.99	2	0.00	35.0	3478.01	1662.65	982.40	1.00
39	473.43	20.69	42.2	2.95	3.99	2	0.00	35.0	2489.00	996.26	690.59	1.00
40	476.39	3.51	45.3	0.66	0.94	2	0.00	35.0	417.33	136.20	498.24	1.03
41	477.05	7.93	45.3	1.98	2.82	1	150.00	22.0	913.65	175.69	321.47	1.16
42	479.03	4.46	45.3	2.97	4.22	1	150.00	22.0	490.53	0.00	67.81	1.16
		2937.32			151.53				330046.28			

X-S Area: 2937.32 Path Length: 151.53 X-S Weight: 330046.28

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Mining-EQ.gmf Processed: 15 Apr 2025 08:38:34

DATA: Analysis 1 - Case South A - Mining - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)		Material beneath:	1 - Overburden	
0.00	144.00	455.50	144.00	
Profile: 2 (2 points)		Material beneath:	2 - Sand and Gravel	
0.00	139.00	455.50	139.00	
Profile: 3 (2 points)		Material beneath:	3 - Weathered Bedrock	
0.00	100.00	455.50	100.00	
Profile: 4 (2 points)		Material beneath:	4 - Stable Bedrock	
0.00	97.00	455.50	97.00	
Profile: 5 (2 points)		Material beneath:	5 - Slurry Wall	
455.50	144.00	458.50	144.00	
Profile: 6 (2 points)		Material beneath:	1 - Overburden	
458.50	144.00	640.00	144.00	
Profile: 7 (2 points)		Material beneath:	2 - Sand and Gravel	
458.50	139.00	640.00	139.00	
Profile: 8 (2 points)		Material beneath:	3 - Weathered Bedrock	
458.50	100.00	640.00	100.00	
Profile: 9 (2 points)		Material beneath:	4 - Stable Bedrock	
455.50	97.00	640.00	97.00	

Slope Surface (6 points)

0.00	100.00	344.00	100.00	432.00	144.00	482.00	144.00	614.00	100.00		
640.00	100.00										

Phreatic Surface (5 points)

0.00	100.00	344.00	100.00	455.50	103.00	458.50	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	344.00	YL:	100.00	XR:	487.00	YR: 142.33
Centre:	XC:	362.82	YC:	299.11	Radius:	R:	200.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	200.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South A - Mining - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.694

Analysis Summary

There were: 18071 successful analyses from a total of 20001 trial failure surfaces
1930 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.49

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	345.32	100.66	482.00	144.00	377.02	237.86	140.82	1.489	<-- Critical Surface
2	344.79	100.39	482.53	143.82	375.88	241.92	144.90	1.490	
3	343.74	100.00	482.00	144.00	373.41	245.99	148.98	1.490	
4	342.16	100.00	482.53	143.82	372.33	250.06	153.06	1.492	
5	341.63	100.00	482.00	144.00	371.67	250.09	153.06	1.493	
6	346.89	101.45	482.00	144.00	380.75	229.71	132.65	1.494	
7	346.37	101.18	484.63	143.12	380.41	237.82	140.82	1.494	
8	345.84	100.92	485.16	142.95	379.31	241.90	144.90	1.495	

9	344.79	100.39	482.00	144.00	375.31	242.04	144.90	1.495
10	344.26	100.13	482.53	143.82	374.18	246.08	148.98	1.495
11	344.26	100.13	484.63	143.12	375.11	250.05	153.06	1.495
12	343.74	100.00	483.58	143.47	373.76	250.09	153.06	1.495
13	346.89	101.45	484.11	143.30	381.54	233.72	136.73	1.495
14	340.05	100.00	482.53	143.82	370.62	254.14	157.14	1.496
15	346.37	101.18	482.53	143.82	379.59	233.82	136.73	1.496
16	344.79	100.39	484.11	143.30	376.21	246.02	148.98	1.496
17	343.21	100.00	483.05	143.65	373.09	250.12	153.06	1.496
18	345.32	100.66	483.58	143.47	377.31	241.98	144.90	1.496
19	345.84	100.92	483.05	143.65	378.44	237.91	140.82	1.496
20	342.68	100.00	482.53	143.82	372.42	250.15	153.06	1.497
21	339.53	100.00	482.00	144.00	369.95	254.17	157.14	1.497
22	342.16	100.00	484.11	143.30	372.72	254.14	157.14	1.497
23	342.16	100.00	482.00	144.00	371.75	250.17	153.06	1.498
24	341.63	100.00	483.58	143.47	372.04	254.17	157.14	1.498
25	347.95	101.97	482.53	143.82	383.30	225.59	128.57	1.499
26	341.11	100.00	483.05	143.65	371.37	254.20	157.14	1.499
27	343.21	100.00	482.53	143.82	372.50	250.23	153.06	1.500
28	347.42	101.71	483.05	143.65	382.13	229.74	132.65	1.500
29	347.95	101.97	484.63	143.12	384.06	229.62	132.65	1.500
30	340.05	100.00	484.11	143.30	371.03	258.22	161.22	1.500
31	340.58	100.00	482.53	143.82	370.70	254.23	157.14	1.500
32	344.26	100.13	486.21	142.60	375.52	254.14	157.14	1.501
33	343.74	100.00	485.16	142.95	374.15	254.17	157.14	1.501
34	343.74	100.00	483.05	143.65	373.17	250.20	153.06	1.501
35	347.42	101.71	485.16	142.95	382.93	233.75	136.73	1.501
36	344.26	100.13	484.11	143.30	374.53	250.17	153.06	1.501
37	344.26	100.13	482.00	144.00	373.60	246.19	148.98	1.502
38	344.79	100.39	485.68	142.77	376.58	250.12	153.06	1.502
39	343.21	100.00	484.63	143.12	373.48	254.20	157.14	1.502
40	340.05	100.00	482.00	144.00	370.03	254.26	157.14	1.502
41	339.53	100.00	483.58	143.47	370.35	258.25	161.22	1.502
42	341.63	100.00	483.05	143.65	371.46	254.29	157.14	1.502
43	346.89	101.45	483.58	143.47	380.98	233.86	136.73	1.502
44	346.89	101.45	487.79	142.07	382.72	241.85	144.90	1.502
45	346.89	101.45	485.68	142.77	381.82	237.86	140.82	1.502
46	344.79	100.39	483.58	143.47	375.63	246.15	148.98	1.502
47	345.32	100.66	487.26	142.25	378.61	250.05	153.06	1.502
48	342.68	100.00	484.11	143.30	372.80	254.23	157.14	1.502
49	345.32	100.66	485.16	142.95	377.65	246.09	148.98	1.502
50	342.16	100.00	485.68	142.77	373.14	258.22	161.22	1.503
51	342.68	100.00	482.00	144.00	371.83	250.26	153.06	1.503
52	346.37	101.18	484.11	143.30	379.85	237.96	140.82	1.503
53	345.84	100.92	484.63	143.12	378.74	242.03	144.90	1.503
54	339.00	100.00	483.05	143.65	369.68	258.28	161.22	1.503
55	345.32	100.66	483.05	143.65	376.74	242.11	144.90	1.503
56	342.16	100.00	483.58	143.47	372.13	254.26	157.14	1.503
57	341.63	100.00	485.16	142.95	372.47	258.25	161.22	1.504
58	345.84	100.92	486.74	142.42	379.67	246.01	148.98	1.504
59	345.84	100.92	482.53	143.82	377.88	238.05	140.82	1.504
60	346.37	101.18	482.00	144.00	379.03	233.96	136.73	1.504
61	346.37	101.18	486.21	142.60	380.74	241.95	144.90	1.504
62	340.05	100.00	483.58	143.47	370.44	258.33	161.22	1.505
63	341.11	100.00	484.63	143.12	371.79	258.28	161.22	1.505

64	343.74	100.00	482.53	143.82	372.59	250.32	153.06	1.505
65	341.11	100.00	482.53	143.82	370.79	254.31	157.14	1.505
66	340.58	100.00	484.11	143.30	371.12	258.31	161.22	1.506
67	343.74	100.00	486.74	142.42	374.59	258.25	161.22	1.506
68	347.95	101.97	482.00	144.00	382.76	225.74	128.57	1.506
69	340.58	100.00	482.00	144.00	370.11	254.34	157.14	1.506
70	345.32	100.66	488.84	141.72	379.04	254.14	157.14	1.507
71	343.74	100.00	484.63	143.12	373.56	254.29	157.14	1.507
72	339.53	100.00	485.16	142.95	370.81	262.32	165.31	1.507
73	344.26	100.13	485.68	142.77	374.93	254.25	157.14	1.507
74	345.84	100.92	488.32	141.89	380.07	250.11	153.06	1.507
75	344.26	100.13	483.58	143.47	373.95	250.29	153.06	1.507
76	348.47	102.24	483.58	143.47	384.66	225.61	128.57	1.507
77	344.79	100.39	487.26	142.25	376.99	254.20	157.14	1.507
78	343.21	100.00	486.21	142.60	373.91	258.28	161.22	1.507
79	342.16	100.00	483.05	143.65	371.54	254.37	157.14	1.507
80	344.26	100.13	483.05	143.65	374.76	245.96	148.98	1.508
81	343.21	100.00	482.00	144.00	371.92	250.35	153.06	1.508
82	343.21	100.00	484.11	143.30	372.89	254.31	157.14	1.508
83	346.37	101.18	487.79	142.07	381.11	246.06	148.98	1.508
84	342.68	100.00	485.68	142.77	373.23	258.30	161.22	1.508
85	339.53	100.00	483.05	143.65	369.77	258.36	161.22	1.508
86	339.00	100.00	484.63	143.12	370.13	262.35	165.31	1.508
87	342.68	100.00	483.58	143.47	372.22	254.34	157.14	1.508
88	344.79	100.39	485.16	142.95	376.00	250.24	153.06	1.508
89	345.32	100.66	486.74	142.42	378.04	250.18	153.06	1.509
90	347.95	101.97	486.21	142.60	384.32	233.78	136.73	1.509
91	344.79	100.39	483.05	143.65	375.05	246.27	148.98	1.509
92	346.89	101.45	489.37	141.54	383.10	245.96	148.98	1.509
93	347.42	101.71	484.63	143.12	382.38	233.90	136.73	1.509
94	341.63	100.00	486.74	142.42	372.93	262.32	165.31	1.509
95	342.16	100.00	485.16	142.95	372.55	258.33	161.22	1.509
96	348.47	102.24	485.68	142.77	385.43	229.64	132.65	1.509
97	339.00	100.00	482.53	143.82	369.09	258.39	161.22	1.509
98	347.42	101.71	486.74	142.42	383.23	237.90	140.82	1.509
99	347.42	101.71	488.84	141.72	384.14	241.88	144.90	1.510

Critical Failure Surface (circle 1)

Intersects: XL: 345.32 YL: 100.66 XR: 482.00 YR: 144.00
Centre: XC: 377.02 YC: 237.86 Radius: R: 140.82

Generated failure surface: (20 points)

345.32	100.66	353.08	99.09	360.91	97.97	368.80	97.28	376.71	97.04
384.63	97.25	392.52	97.90	400.36	98.99	408.13	100.52	415.80	102.48
423.34	104.88	430.74	107.69	437.98	110.92	445.01	114.54	451.84	118.56
458.42	122.95	464.75	127.71	470.80	132.81	476.56	138.25	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 45 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	345.32	2.60	-11.4	2.72	2.78	2	0.00	35.0	286.21	0.00	116.11	1.13
2	348.04	7.04	-11.4	2.52	2.57	3	100.00	18.0	791.02	46.16	341.84	1.07
3	350.56	11.49	-11.4	2.52	2.57	3	100.00	18.0	1322.93	138.47	561.08	1.07
4	353.08	26.28	-8.2	3.92	3.96	3	100.00	18.0	3052.60	367.03	811.25	1.04

5	356.99	36.16	-8.2	3.92	3.96	3	100.00	18.0	4214.39	532.20	1116.01	1.04
6	360.91	45.93	-5.0	3.94	3.96	3	100.00	18.0	5352.46	670.16	1386.06	1.02
7	364.86	55.06	-5.0	3.94	3.96	3	100.00	18.0	6404.44	780.89	1657.41	1.02
8	368.80	63.97	-1.7	3.96	3.96	3	100.00	18.0	7420.38	864.22	1888.47	1.01
9	372.76	72.27	-1.7	3.96	3.96	3	100.00	18.0	8354.77	920.16	2126.08	1.01
10	376.71	80.15	1.5	3.96	3.96	3	100.00	18.0	9228.20	948.61	2318.48	0.99
11	380.67	87.57	1.5	3.96	3.96	3	100.00	18.0	10038.58	949.57	2522.11	0.99
12	384.63	94.25	4.7	3.95	3.96	3	100.00	18.0	10752.69	923.03	2676.13	0.99
13	388.57	100.76	4.7	3.95	3.96	3	100.00	18.0	11434.42	869.03	2845.62	0.99
14	392.52	106.13	7.9	3.92	3.96	3	100.00	18.0	11977.10	787.62	2961.54	0.98
15	396.44	111.68	7.9	3.92	3.96	3	100.00	18.0	12527.02	678.81	3096.83	0.98
16	400.36	75.89	11.2	2.57	2.61	3	100.00	18.0	8467.75	376.83	3157.77	0.98
17	402.93	77.88	11.2	2.57	2.61	3	100.00	18.0	8649.59	305.59	3224.57	0.98
18	405.49	82.12	11.2	2.64	2.69	2	0.00	35.0	9089.55	239.82	3162.61	0.93
19	408.13	83.77	14.4	2.63	2.71	2	0.00	35.0	9250.22	153.14	3146.44	0.92
20	410.76	85.45	14.4	2.63	2.71	2	0.00	35.0	9411.65	51.04	3197.24	0.92
21	413.39	79.87	14.4	2.41	2.49	2	0.00	35.0	8786.14	0.00	3251.49	0.92
22	415.80	104.50	17.6	3.10	3.25	2	0.00	35.0	11495.20	0.00	3225.81	0.91
23	418.90	106.26	17.6	3.10	3.25	2	0.00	35.0	11688.81	0.00	3280.11	0.91
24	422.00	46.61	17.6	1.34	1.41	2	0.00	35.0	5127.42	0.00	3319.02	0.91
25	423.34	129.57	20.8	3.70	3.96	2	0.00	35.0	14252.27	0.00	3267.68	0.91
26	427.04	131.21	20.8	3.70	3.96	2	0.00	35.0	14432.73	0.00	3309.06	0.91
27	430.74	44.83	24.0	1.26	1.37	2	0.00	35.0	4931.19	0.00	3247.63	0.91
28	432.00	104.82	24.0	2.99	3.27	2	0.00	35.0	11529.67	0.00	3190.13	0.91
29	434.99	100.84	24.0	2.99	3.27	2	0.00	35.0	11091.86	0.00	3068.96	0.91
30	437.98	113.23	27.3	3.52	3.96	2	0.00	35.0	12455.32	0.00	2849.28	0.91
31	441.49	106.85	27.3	3.52	3.96	2	0.00	35.0	11753.51	0.00	2688.73	0.91
32	445.01	97.07	30.5	3.41	3.96	2	0.00	35.0	10677.66	0.00	2451.49	0.91
33	448.42	90.22	30.5	3.41	3.96	2	0.00	35.0	9924.13	0.00	2278.49	0.91
34	451.84	88.73	33.7	3.66	4.40	2	0.00	35.0	9760.84	0.00	2028.17	0.92
35	455.50	33.75	33.7	1.50	1.80	5	0.00	45.0	3375.14	0.00	1553.87	0.83
36	457.00	30.62	33.7	1.42	1.71	5	0.00	45.0	3183.10	910.69	1710.24	0.83
37	458.42	62.85	36.9	3.16	3.96	2	0.00	35.0	7751.48	4164.55	2084.62	0.92
38	461.59	55.32	36.9	3.16	3.96	2	0.00	35.0	6810.74	3577.11	1826.21	0.92
39	464.75	45.44	40.1	3.03	3.96	2	0.00	35.0	5579.92	2968.18	1533.32	0.94
40	467.78	37.72	40.1	3.03	3.96	2	0.00	35.0	4614.60	2337.76	1259.66	0.94
41	470.80	28.28	43.4	2.88	3.96	2	0.00	35.0	3440.57	1686.79	958.95	0.95
42	473.68	20.46	43.4	2.88	3.96	2	0.00	35.0	2462.78	1015.35	671.50	0.95
43	476.56	3.82	46.6	0.71	1.03	2	0.00	35.0	454.14	153.32	476.04	0.97
44	477.27	7.57	46.6	1.89	2.75	1	150.00	22.0	872.21	171.79	289.43	1.13
45	479.16	4.26	46.6	2.84	4.13	1	150.00	22.0	468.28	0.00	45.49	1.13
		---			---				---			
X-S Area:		2981.16	Path Length:		150.43		X-S Weight:		334945.69			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Mining.gmf Processed: 15 Apr 2025 08:43:41

DATA: Analysis 1 - Case South B - Mining

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
	0.00	143.00	452.50	143.00	
Profile: 2 (2 points)	Material beneath: 2 - Sand and Gravel				
	0.00	139.00	452.50	139.00	
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
	0.00	100.00	452.50	100.00	
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
	0.00	97.00	452.50	97.00	
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
	452.50	143.00	455.50	143.00	
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
	455.50	143.00	510.00	143.00	
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
	455.50	139.00	510.00	139.00	
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
	455.50	100.00	510.00	100.00	
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
	452.50	97.00	510.00	97.00	

Slope Surface (4 points)

0.00	100.00	300.00	100.00	429.00	143.00	510.00	143.00

Phreatic Surface (5 points)

0.00	100.00	300.00	100.00	452.50	103.00	455.50	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	300.00	YL:	100.00	XR:	494.00	YR: 143.00
Centre:	XC:	359.44	YC:	290.96	Radius:	R:	200.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	150.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South B - Mining

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 3.739

Analysis Summary

There were: 20001 successful analyses from a total of 20001 trial failure surfaces

Critical (minimum) Factor of Safety: 2.40

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	303.95	101.32	490.05	143.00	349.28	335.23	238.27	2.397	<-- Critical Surface
2	304.47	101.49	490.05	143.00	350.31	332.19	235.20	2.400	
3	305.00	101.67	490.05	143.00	351.33	329.14	232.14	2.403	
4	302.89	100.96	489.53	143.00	346.80	341.38	244.39	2.404	
5	303.42	101.14	489.53	143.00	347.83	338.35	241.33	2.406	
6	302.89	100.96	490.58	143.00	346.91	344.47	247.45	2.409	
7	305.00	101.67	491.63	143.00	351.85	332.16	235.20	2.410	
8	302.37	100.79	489.00	143.00	345.34	344.48	247.45	2.411	
9	305.00	101.67	489.53	143.00	350.92	329.22	232.14	2.411	
10	303.95	101.32	489.53	143.00	348.86	335.31	238.27	2.411	
11	302.89	100.96	489.00	143.00	346.38	341.45	244.39	2.411	
12	303.42	101.14	490.58	143.00	347.94	341.44	244.39	2.412	
13	303.42	101.14	489.00	143.00	347.41	338.42	241.33	2.412	
14	303.95	101.32	489.00	143.00	348.44	335.39	238.27	2.413	

15	304.47	101.49	491.11	143.00	350.41	335.29	238.27	2.414
16	304.47	101.49	489.00	143.00	349.47	332.35	235.20	2.414
17	303.42	101.14	491.11	143.00	348.35	341.36	244.39	2.415
18	303.95	101.32	490.58	143.00	348.96	338.41	241.33	2.415
19	305.00	101.67	491.11	143.00	351.43	332.24	235.20	2.415
20	304.47	101.49	489.53	143.00	349.89	332.27	235.20	2.416
21	301.84	100.61	490.05	143.00	344.43	350.58	253.57	2.417
22	302.37	100.79	490.05	143.00	345.46	347.57	250.51	2.419
23	304.47	101.49	492.68	143.00	350.93	338.30	241.33	2.419
24	305.00	101.67	489.00	143.00	350.51	329.31	232.14	2.419
25	304.47	101.49	490.05	143.00	349.58	335.45	238.27	2.420
26	303.95	101.32	491.11	143.00	349.38	338.33	241.33	2.420
27	302.89	100.96	490.05	143.00	346.49	344.54	247.45	2.420
28	305.00	101.67	492.68	143.00	351.95	335.26	238.27	2.420
29	303.42	101.14	492.16	143.00	348.47	344.45	247.45	2.421
30	301.32	100.44	489.53	143.00	342.97	353.67	256.63	2.421
31	304.47	101.49	490.58	143.00	349.99	335.37	238.27	2.421
32	300.26	100.09	489.00	143.00	340.47	359.75	262.76	2.422
33	302.37	100.79	491.63	143.00	346.00	350.58	253.57	2.422
34	303.42	101.14	490.05	143.00	347.52	341.52	244.39	2.422
35	301.84	100.61	491.11	143.00	344.55	353.67	256.63	2.422
36	305.00	101.67	490.05	143.00	350.60	332.41	235.20	2.422
37	301.84	100.61	489.53	143.00	344.00	350.66	253.57	2.423
38	300.79	100.26	489.00	143.00	341.51	356.74	259.69	2.423
39	303.95	101.32	490.05	143.00	348.55	338.49	241.33	2.423
40	302.89	100.96	491.63	143.00	347.02	347.56	250.51	2.424
41	302.37	100.79	489.53	143.00	345.03	347.64	250.51	2.424
42	305.00	101.67	489.00	143.00	351.24	326.03	229.08	2.425
43	302.37	100.79	491.11	143.00	345.58	350.65	253.57	2.425
44	303.42	101.14	491.63	143.00	348.05	344.53	247.45	2.425
45	301.32	100.44	489.00	143.00	342.54	353.74	256.63	2.425
46	305.00	101.67	492.16	143.00	351.54	335.34	238.27	2.425
47	299.74	100.00	489.00	143.00	339.54	362.82	265.82	2.426
48	303.95	101.32	493.74	143.00	350.02	344.44	247.45	2.426
49	302.89	100.96	489.53	143.00	346.07	344.62	247.45	2.426
50	303.95	101.32	492.16	143.00	349.49	341.42	244.39	2.426
51	303.95	101.32	491.63	143.00	349.07	341.50	244.39	2.427
52	300.79	100.26	490.58	143.00	342.06	359.76	262.76	2.427
53	302.89	100.96	493.21	143.00	347.56	350.57	253.57	2.427
54	301.84	100.61	489.00	143.00	343.58	350.73	253.57	2.428
55	305.00	101.67	490.58	143.00	351.02	332.32	235.20	2.428
56	302.89	100.96	491.11	143.00	346.60	347.63	250.51	2.428
57	303.42	101.14	489.53	143.00	347.10	341.59	244.39	2.428
58	304.47	101.49	493.74	143.00	351.04	341.40	244.39	2.428
59	303.42	101.14	493.21	143.00	348.59	347.55	250.51	2.429
60	304.47	101.49	491.63	143.00	350.10	338.47	241.33	2.429
61	301.32	100.44	490.58	143.00	343.09	356.75	259.69	2.429
62	303.95	101.32	489.53	143.00	348.13	338.56	241.33	2.430
63	301.84	100.61	489.00	143.00	344.31	347.50	250.51	2.430
64	305.00	101.67	493.74	143.00	352.06	338.36	241.33	2.430
65	302.89	100.96	490.58	143.00	346.18	347.71	250.51	2.430
66	300.26	100.09	490.05	143.00	340.60	362.83	265.82	2.431
67	298.68	100.00	489.00	143.00	338.62	365.89	268.88	2.431
68	303.42	101.14	491.11	143.00	347.63	344.61	247.45	2.431
69	302.37	100.79	492.68	143.00	346.12	353.66	256.63	2.431

70	301.84	100.61	490.58	143.00	344.12	353.74	256.63	2.431
71	304.47	101.49	489.53	143.00	349.16	335.53	238.27	2.431
72	304.47	101.49	492.16	143.00	350.51	338.39	241.33	2.431
73	302.37	100.79	489.00	143.00	344.61	347.71	250.51	2.432
74	300.79	100.26	490.05	143.00	341.64	359.82	262.76	2.432
75	300.79	100.26	491.63	143.00	342.20	362.83	265.82	2.432
76	299.21	100.00	489.53	143.00	339.15	365.89	268.88	2.432
77	301.32	100.44	492.16	143.00	343.65	359.76	262.76	2.432
78	304.47	101.49	495.32	143.00	351.57	344.42	247.45	2.432
79	305.00	101.67	489.53	143.00	350.19	332.49	235.20	2.432
80	303.95	101.32	493.21	143.00	349.61	344.52	247.45	2.433
81	302.89	100.96	489.00	143.00	345.64	344.69	247.45	2.433
82	302.89	100.96	492.68	143.00	347.14	350.65	253.57	2.433
83	303.95	101.32	491.11	143.00	348.66	341.58	244.39	2.433
84	302.37	100.79	490.58	143.00	345.15	350.73	253.57	2.433
85	303.42	101.14	490.58	143.00	347.21	344.68	247.45	2.434
86	301.32	100.44	490.05	143.00	342.67	356.82	259.69	2.434
87	305.00	101.67	491.63	143.00	351.12	335.43	238.27	2.434
88	300.26	100.09	489.53	143.00	340.17	362.89	265.82	2.434
89	305.00	101.67	495.32	143.00	352.59	341.38	244.39	2.435
90	301.84	100.61	492.16	143.00	344.67	356.75	259.69	2.435
91	303.42	101.14	489.00	143.00	346.68	341.67	244.39	2.435
92	304.47	101.49	491.11	143.00	349.68	338.55	241.33	2.435
93	299.74	100.00	490.05	143.00	339.68	365.89	268.88	2.435
94	303.42	101.14	492.68	143.00	348.17	347.62	250.51	2.435
95	301.32	100.44	491.63	143.00	343.22	359.83	262.76	2.436
96	305.00	101.67	491.11	143.00	350.71	335.51	238.27	2.436
97	302.89	100.96	494.26	143.00	347.69	353.66	256.63	2.436
98	303.95	101.32	489.00	143.00	347.71	338.64	241.33	2.436
99	299.21	100.00	489.00	143.00	338.72	365.96	268.88	2.436

Critical Failure Surface (circle 1)

Intersects: XL: 303.95 YL: 101.32 XR: 490.05 YR: 143.00
Centre: XC: 349.28 YC: 335.23 Radius: R: 238.27

Generated failure surface: (20 points)

303.95	101.32	314.13	99.57	324.37	98.27	334.66	97.41	344.98	97.00
355.30	97.04	365.62	97.53	375.90	98.46	386.14	99.83	396.30	101.65
406.38	103.91	416.35	106.60	426.19	109.72	435.89	113.27	445.43	117.23
454.78	121.60	463.94	126.37	472.88	131.53	481.59	137.08	490.05	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 46 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	303.95	2.65	-9.7	3.24	3.29	2	0.00	35.0	291.45	0.00	94.69	1.07
2	307.19	7.95	-9.7	3.24	3.29	2	0.00	35.0	874.34	0.00	284.06	1.07
3	310.43	4.28	-9.7	1.20	1.21	2	0.00	35.0	472.46	8.66	415.15	1.07
4	311.62	11.27	-9.7	2.50	2.54	3	100.00	18.0	1265.50	74.02	524.76	1.04
5	314.13	32.35	-7.2	5.12	5.16	3	100.00	18.0	3703.50	348.68	739.95	1.03
6	319.25	44.43	-7.2	5.12	5.16	3	100.00	18.0	5143.18	590.83	1025.14	1.03
7	324.37	56.21	-4.8	5.15	5.16	3	100.00	18.0	6534.51	797.22	1286.22	1.01
8	329.51	67.24	-4.8	5.15	5.16	3	100.00	18.0	7823.85	967.83	1539.28	1.01
9	334.66	77.91	-2.3	5.16	5.16	3	100.00	18.0	9057.45	1102.49	1765.66	1.01
10	339.82	87.84	-2.3	5.16	5.16	3	100.00	18.0	10190.26	1201.22	1986.33	1.01

11	344.98	97.28	0.2	5.16	5.16	3	100.00	18.0	11250.91	1263.93	2178.02	1.00
12	350.14	106.06	0.2	5.16	5.16	3	100.00	18.0	12222.63	1290.62	2366.12	1.00
13	355.30	114.15	2.7	5.16	5.16	3	100.00	18.0	13097.91	1281.25	2523.17	0.99
14	360.46	121.76	2.7	5.16	5.16	3	100.00	18.0	13904.82	1235.83	2678.57	0.99
15	365.62	128.41	5.2	5.14	5.16	3	100.00	18.0	14585.58	1154.40	2801.08	0.99
16	370.76	134.83	5.2	5.14	5.16	3	100.00	18.0	15225.26	1036.96	2923.69	0.99
17	375.90	139.97	7.7	5.12	5.16	3	100.00	18.0	15705.05	883.60	3011.77	0.99
18	381.02	145.17	7.7	5.12	5.16	3	100.00	18.0	16176.43	694.36	3101.59	0.99
19	386.14	27.03	10.1	0.93	0.95	3	100.00	18.0	2999.46	105.77	3132.12	0.99
20	387.07	135.61	10.1	4.62	4.69	2	0.00	35.0	15010.00	393.66	3094.69	0.97
21	391.69	138.90	10.1	4.62	4.69	2	0.00	35.0	15321.20	178.67	3156.47	0.97
22	396.30	36.33	12.6	1.19	1.22	2	0.00	35.0	3998.28	9.26	3152.67	0.96
23	397.49	136.95	12.6	4.44	4.55	2	0.00	35.0	15064.01	0.00	3182.29	0.96
24	401.94	139.10	12.6	4.44	4.55	2	0.00	35.0	15301.46	0.00	3232.46	0.96
25	406.38	158.06	15.1	4.98	5.16	2	0.00	35.0	17386.56	0.00	3233.08	0.96
26	411.36	159.63	15.1	4.98	5.16	2	0.00	35.0	17559.73	0.00	3265.28	0.96
27	416.35	158.59	17.6	4.92	5.16	2	0.00	35.0	17445.01	0.00	3244.11	0.96
28	421.27	158.99	17.6	4.92	5.16	2	0.00	35.0	17488.38	0.00	3252.18	0.96
29	426.19	90.71	20.1	2.81	2.99	2	0.00	35.0	9978.47	0.00	3210.14	0.96
30	429.00	108.95	20.1	3.45	3.67	2	0.00	35.0	11984.28	0.00	3143.09	0.96
31	432.45	104.61	20.1	3.45	3.67	2	0.00	35.0	11507.15	0.00	3017.95	0.96
32	435.89	137.06	22.6	4.77	5.16	2	0.00	35.0	15076.28	0.00	2819.78	0.97
33	440.66	127.61	22.6	4.77	5.16	2	0.00	35.0	14037.42	0.00	2625.48	0.97
34	445.43	88.23	25.0	3.54	3.90	2	0.00	35.0	9705.58	0.00	2414.71	0.97
35	448.96	82.39	25.0	3.54	3.90	2	0.00	35.0	9062.75	0.00	2254.77	0.97
36	452.50	32.69	25.0	1.48	1.63	5	0.00	45.0	3268.60	0.00	1851.54	0.92
37	453.98	17.37	25.0	0.80	0.89	5	0.00	45.0	1775.73	264.60	1895.47	0.92
38	454.78	92.53	27.5	4.58	5.16	2	0.00	35.0	11388.21	5544.61	2300.51	0.98
39	459.36	81.61	27.5	4.58	5.16	2	0.00	35.0	10022.50	4775.83	2021.98	0.98
40	463.94	68.58	30.0	4.47	5.16	2	0.00	35.0	8398.62	3975.56	1718.44	0.99
41	468.41	57.04	30.0	4.47	5.16	2	0.00	35.0	6955.45	3143.62	1418.99	0.99
42	472.88	43.89	32.5	4.35	5.16	2	0.00	35.0	5317.02	2280.82	1098.71	1.00
43	477.24	31.82	32.5	4.35	5.16	2	0.00	35.0	3807.22	1387.26	779.26	1.00
44	481.59	13.61	35.0	2.74	3.35	2	0.00	35.0	1593.72	409.38	503.13	1.01
45	484.33	5.00	35.0	1.43	1.74	1	150.00	22.0	565.35	54.43	317.92	1.09
46	485.76	6.43	35.0	4.29	5.23	1	150.00	22.0	707.58	0.00	108.44	1.09
		---			---				---			
	X-S Area:	3819.08	Path Length:		196.20		X-S Weight:		430251.12			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Mining-EQ.gmf Processed: 15 Apr 2025 08:44:32

DATA: Analysis 1 - Case South B - Mining - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden			
0.00	143.00	452.50	143.00	
Profile: 2 (2 points)	Material beneath: 2 - Sand and Gravel			
0.00	139.00	452.50	139.00	
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock			
0.00	100.00	452.50	100.00	
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock			
0.00	97.00	452.50	97.00	
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall			
452.50	143.00	455.50	143.00	
Profile: 6 (2 points)	Material beneath: 1 - Overburden			
455.50	143.00	510.00	143.00	
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel			
455.50	139.00	510.00	139.00	
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock			
455.50	100.00	510.00	100.00	
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock			
452.50	97.00	510.00	97.00	

Slope Surface (4 points)

0.00	100.00	300.00	100.00	429.00	143.00	510.00	143.00

Phreatic Surface (5 points)

0.00	100.00	300.00	100.00	452.50	103.00	455.50	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 300.00 YL: 100.00 XR: 494.00 YR: 143.00

Centre: XC: 359.44 YC: 290.96 Radius: R: 200.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	150.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South B - Mining - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 2.860

Analysis Summary

There were: 20001 successful analyses from a total of 20001 trial failure surfaces

Critical (minimum) Factor of Safety: 1.82

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	303.95	101.32	490.05	143.00	349.28	335.23	238.27	1.821	<-- Critical Surface
2	304.47	101.49	490.05	143.00	350.31	332.19	235.20	1.823	
3	305.00	101.67	490.05	143.00	351.33	329.14	232.14	1.824	
4	305.00	101.67	491.63	143.00	351.85	332.16	235.20	1.826	
5	302.89	100.96	489.53	143.00	346.80	341.38	244.39	1.828	
6	303.42	101.14	489.53	143.00	347.83	338.35	241.33	1.829	
7	302.89	100.96	490.58	143.00	346.91	344.47	247.45	1.830	
8	304.47	101.49	491.11	143.00	350.41	335.29	238.27	1.830	
9	304.47	101.49	492.68	143.00	350.93	338.30	241.33	1.830	
10	305.00	101.67	489.53	143.00	350.92	329.22	232.14	1.831	

11	305.00	101.67	491.11	143.00	351.43	332.24	235.20	1.831
12	303.42	101.14	490.58	143.00	347.94	341.44	244.39	1.831
13	305.00	101.67	492.68	143.00	351.95	335.26	238.27	1.831
14	303.42	101.14	491.11	143.00	348.35	341.36	244.39	1.832
15	303.95	101.32	489.53	143.00	348.86	335.31	238.27	1.832
16	303.95	101.32	490.58	143.00	348.96	338.41	241.33	1.833
17	302.37	100.79	489.00	143.00	345.34	344.48	247.45	1.834
18	303.95	101.32	493.74	143.00	350.02	344.44	247.45	1.834
19	302.89	100.96	489.00	143.00	346.38	341.45	244.39	1.834
20	303.42	101.14	492.16	143.00	348.47	344.45	247.45	1.834
21	303.42	101.14	489.00	143.00	347.41	338.42	241.33	1.835
22	304.47	101.49	495.32	143.00	351.57	344.42	247.45	1.835
23	303.95	101.32	489.00	143.00	348.44	335.39	238.27	1.835
24	304.47	101.49	489.00	143.00	349.47	332.35	235.20	1.835
25	303.95	101.32	491.11	143.00	349.38	338.33	241.33	1.835
26	304.47	101.49	493.74	143.00	351.04	341.40	244.39	1.835
27	304.47	101.49	489.53	143.00	349.89	332.27	235.20	1.836
28	305.00	101.67	495.32	143.00	352.59	341.38	244.39	1.836
29	305.00	101.67	493.74	143.00	352.06	338.36	241.33	1.836
30	305.00	101.67	492.16	143.00	351.54	335.34	238.27	1.837
31	302.89	100.96	493.21	143.00	347.56	350.57	253.57	1.837
32	302.37	100.79	491.63	143.00	346.00	350.58	253.57	1.837
33	301.84	100.61	490.05	143.00	344.43	350.58	253.57	1.837
34	304.47	101.49	490.58	143.00	349.99	335.37	238.27	1.838
35	303.42	101.14	493.21	143.00	348.59	347.55	250.51	1.838
36	302.89	100.96	491.63	143.00	347.02	347.56	250.51	1.838
37	304.47	101.49	490.05	143.00	349.58	335.45	238.27	1.838
38	302.37	100.79	490.05	143.00	345.46	347.57	250.51	1.838
39	303.95	101.32	492.16	143.00	349.49	341.42	244.39	1.838
40	303.95	101.32	496.37	143.00	350.68	350.54	253.57	1.838
41	304.47	101.49	497.95	143.00	352.23	350.52	253.57	1.839
42	303.42	101.14	491.63	143.00	348.05	344.53	247.45	1.839
43	301.84	100.61	491.11	143.00	344.55	353.67	256.63	1.839
44	302.89	100.96	490.05	143.00	346.49	344.54	247.45	1.839
45	305.00	101.67	489.00	143.00	350.51	329.31	232.14	1.839
46	305.00	101.67	490.05	143.00	350.60	332.41	235.20	1.840
47	304.47	101.49	496.37	143.00	351.69	347.51	250.51	1.840
48	303.95	101.32	491.63	143.00	349.07	341.50	244.39	1.840
49	303.42	101.14	490.05	143.00	347.52	341.52	244.39	1.840
50	305.00	101.67	497.95	143.00	353.24	347.49	250.51	1.840
51	304.47	101.49	494.79	143.00	351.16	344.50	247.45	1.840
52	303.42	101.14	494.79	143.00	349.13	350.56	253.57	1.840
53	303.95	101.32	490.05	143.00	348.55	338.49	241.33	1.841
54	303.95	101.32	493.21	143.00	349.61	344.52	247.45	1.841
55	305.00	101.67	496.37	143.00	352.70	344.47	247.45	1.841
56	302.37	100.79	491.11	143.00	345.58	350.65	253.57	1.841
57	304.47	101.49	491.63	143.00	350.10	338.47	241.33	1.841
58	305.00	101.67	494.79	143.00	352.17	341.46	244.39	1.841
59	302.89	100.96	494.26	143.00	347.69	353.66	256.63	1.842
60	304.47	101.49	492.16	143.00	350.51	338.39	241.33	1.842
61	302.37	100.79	492.68	143.00	346.12	353.66	256.63	1.842
62	301.32	100.44	489.53	143.00	342.97	353.67	256.63	1.842
63	305.00	101.67	490.58	143.00	351.02	332.32	235.20	1.842
64	303.42	101.14	494.26	143.00	348.71	350.63	253.57	1.843
65	303.42	101.14	495.84	143.00	349.25	353.65	256.63	1.843

66	301.84	100.61	489.53	143.00	344.00	350.66	253.57	1.843
67	302.89	100.96	491.11	143.00	346.60	347.63	250.51	1.843
68	302.89	100.96	492.68	143.00	347.14	350.65	253.57	1.843
69	303.95	101.32	494.79	143.00	350.14	347.53	250.51	1.844
70	303.95	101.32	494.26	143.00	349.73	347.61	250.51	1.844
71	302.37	100.79	489.53	143.00	345.03	347.64	250.51	1.844
72	305.00	101.67	489.00	143.00	351.24	326.03	229.08	1.844
73	304.47	101.49	497.42	143.00	351.82	350.60	253.57	1.844
74	303.42	101.14	492.68	143.00	348.17	347.62	250.51	1.844
75	300.26	100.09	489.00	143.00	340.47	359.75	262.76	1.844
76	300.79	100.26	490.58	143.00	342.06	359.76	262.76	1.844
77	304.47	101.49	493.21	143.00	350.63	341.48	244.39	1.844
78	302.89	100.96	496.89	143.00	348.38	359.75	262.76	1.844
79	301.32	100.44	492.16	143.00	343.65	359.76	262.76	1.845
80	303.42	101.14	491.11	143.00	347.63	344.61	247.45	1.845
81	302.37	100.79	495.32	143.00	346.81	359.76	262.76	1.845
82	305.00	101.67	491.63	143.00	351.12	335.43	238.27	1.845
83	301.84	100.61	493.74	143.00	345.23	359.76	262.76	1.845
84	302.89	100.96	489.53	143.00	346.07	344.62	247.45	1.845
85	300.79	100.26	489.00	143.00	341.51	356.74	259.69	1.845
86	303.95	101.32	492.68	143.00	349.19	344.59	247.45	1.845
87	305.00	101.67	497.42	143.00	352.83	347.57	250.51	1.845
88	301.32	100.44	490.58	143.00	343.09	356.75	259.69	1.846
89	304.47	101.49	499.00	143.00	352.37	353.62	256.63	1.846
90	303.42	101.14	496.89	143.00	349.39	356.73	259.69	1.846
91	304.47	101.49	492.68	143.00	350.21	341.56	244.39	1.846
92	301.84	100.61	492.16	143.00	344.67	356.75	259.69	1.846
93	303.42	101.14	489.53	143.00	347.10	341.59	244.39	1.846
94	303.95	101.32	491.11	143.00	348.66	341.58	244.39	1.846
95	302.89	100.96	490.58	143.00	346.18	347.71	250.51	1.846
96	303.95	101.32	495.84	143.00	350.27	350.62	253.57	1.846
97	305.00	101.67	499.00	143.00	353.37	350.58	253.57	1.846
98	302.37	100.79	493.74	143.00	346.25	356.75	259.69	1.846
99	305.00	101.67	495.84	143.00	352.29	344.55	247.45	1.846

Critical Failure Surface (circle 1)

Intersects: XL: 303.95 YL: 101.32 XR: 490.05 YR: 143.00
Centre: XC: 349.28 YC: 335.23 Radius: R: 238.27

Generated failure surface: (20 points)

303.95	101.32	314.13	99.57	324.37	98.27	334.66	97.41	344.98	97.00
355.30	97.04	365.62	97.53	375.90	98.46	386.14	99.83	396.30	101.65
406.38	103.91	416.35	106.60	426.19	109.72	435.89	113.27	445.43	117.23
454.78	121.60	463.94	126.37	472.88	131.53	481.59	137.08	490.05	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 46 slices)

Slice	X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	303.95	2.65	-9.7	3.24	3.29	2	0.00	35.0	291.45	0.00	96.29	1.09
2	307.19	7.95	-9.7	3.24	3.29	2	0.00	35.0	874.34	0.00	288.88	1.09
3	310.43	4.28	-9.7	1.20	1.21	2	0.00	35.0	472.46	8.66	422.08	1.09
4	311.62	11.27	-9.7	2.50	2.54	3	100.00	18.0	1265.50	74.02	530.85	1.05
5	314.13	32.35	-7.2	5.12	5.16	3	100.00	18.0	3703.50	348.68	745.42	1.03
6	319.25	44.43	-7.2	5.12	5.16	3	100.00	18.0	5143.18	590.83	1031.94	1.03

7	324.37	56.21	-4.8	5.15	5.16	3	100.00	18.0	6534.51	797.22	1291.45	1.02
8	329.51	67.24	-4.8	5.15	5.16	3	100.00	18.0	7823.85	967.83	1545.30	1.02
9	334.66	77.91	-2.3	5.16	5.16	3	100.00	18.0	9057.45	1102.49	1768.85	1.01
10	339.82	87.84	-2.3	5.16	5.16	3	100.00	18.0	10190.26	1201.22	1989.87	1.01
11	344.98	97.28	0.2	5.16	5.16	3	100.00	18.0	11250.91	1263.93	2177.67	1.00
12	350.14	106.06	0.2	5.16	5.16	3	100.00	18.0	12222.63	1290.62	2365.74	1.00
13	355.30	114.15	2.7	5.16	5.16	3	100.00	18.0	13097.91	1281.25	2518.00	0.99
14	360.46	121.76	2.7	5.16	5.16	3	100.00	18.0	13904.82	1235.83	2673.07	0.99
15	365.62	128.41	5.2	5.14	5.16	3	100.00	18.0	14585.58	1154.40	2790.04	0.99
16	370.76	134.83	5.2	5.14	5.16	3	100.00	18.0	15225.26	1036.96	2912.10	0.99
17	375.90	139.97	7.7	5.12	5.16	3	100.00	18.0	15705.05	883.60	2994.03	0.99
18	381.02	145.17	7.7	5.12	5.16	3	100.00	18.0	16176.43	694.36	3083.13	0.99
19	386.14	27.03	10.1	0.93	0.95	3	100.00	18.0	2999.46	105.77	3107.36	0.98
20	387.07	135.61	10.1	4.62	4.69	2	0.00	35.0	15010.00	393.66	3048.08	0.95
21	391.69	138.90	10.1	4.62	4.69	2	0.00	35.0	15321.20	178.67	3108.20	0.95
22	396.30	36.33	12.6	1.19	1.22	2	0.00	35.0	3998.28	9.26	3092.68	0.94
23	397.49	136.95	12.6	4.44	4.55	2	0.00	35.0	15064.01	0.00	3121.59	0.94
24	401.94	139.10	12.6	4.44	4.55	2	0.00	35.0	15301.46	0.00	3170.80	0.94
25	406.38	158.06	15.1	4.98	5.16	2	0.00	35.0	17386.56	0.00	3159.93	0.94
26	411.36	159.63	15.1	4.98	5.16	2	0.00	35.0	17559.73	0.00	3191.41	0.94
27	416.35	158.59	17.6	4.92	5.16	2	0.00	35.0	17445.01	0.00	3159.31	0.94
28	421.27	158.99	17.6	4.92	5.16	2	0.00	35.0	17488.38	0.00	3167.16	0.94
29	426.19	90.71	20.1	2.81	2.99	2	0.00	35.0	9978.47	0.00	3114.99	0.93
30	429.00	108.95	20.1	3.45	3.67	2	0.00	35.0	11984.28	0.00	3049.93	0.93
31	432.45	104.61	20.1	3.45	3.67	2	0.00	35.0	11507.15	0.00	2928.50	0.93
32	435.89	137.06	22.6	4.77	5.16	2	0.00	35.0	15076.28	0.00	2726.35	0.93
33	440.66	127.61	22.6	4.77	5.16	2	0.00	35.0	14037.42	0.00	2538.49	0.93
34	445.43	88.23	25.0	3.54	3.90	2	0.00	35.0	9705.58	0.00	2326.25	0.94
35	448.96	82.39	25.0	3.54	3.90	2	0.00	35.0	9062.75	0.00	2172.17	0.94
36	452.50	32.69	25.0	1.48	1.63	5	0.00	45.0	3268.60	0.00	1760.60	0.88
37	453.98	17.37	25.0	0.80	0.89	5	0.00	45.0	1775.73	264.60	1817.01	0.88
38	454.78	92.53	27.5	4.58	5.16	2	0.00	35.0	11388.21	5544.61	2251.25	0.94
39	459.36	81.61	27.5	4.58	5.16	2	0.00	35.0	10022.50	4775.83	1977.93	0.94
40	463.94	68.58	30.0	4.47	5.16	2	0.00	35.0	8398.62	3975.56	1676.98	0.94
41	468.41	57.04	30.0	4.47	5.16	2	0.00	35.0	6955.45	3143.62	1383.58	0.94
42	472.88	43.89	32.5	4.35	5.16	2	0.00	35.0	5317.02	2280.82	1067.63	0.95
43	477.24	31.82	32.5	4.35	5.16	2	0.00	35.0	3807.22	1387.26	755.10	0.95
44	481.59	13.61	35.0	2.74	3.35	2	0.00	35.0	1593.72	409.38	483.71	0.96
45	484.33	5.00	35.0	1.43	1.74	1	150.00	22.0	565.35	54.43	296.66	1.06
46	485.76	6.43	35.0	4.29	5.23	1	150.00	22.0	707.58	0.00	92.94	1.06
		---			---				---			
X-S Area:		3819.08	Path Length:		196.20		X-S Weight:		430251.12			

Reclamation Conditions

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Rec Full.gmf Processed: 15 Apr 2025 08:39:29

DATA: Analysis 1 - Case South A - Reclamation - Full Reservoir

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	144.00	455.50	144.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
344.00	100.00	423.00	139.00	455.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	455.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	455.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
455.50	144.00	458.50	144.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
458.50	144.00	640.00	144.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
458.50	139.00	640.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
458.50	100.00	640.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
455.50	97.00	640.00	97.00		

Slope Surface (7 points)

0.00	100.00	34.00	100.00	232.00	144.00	432.00	144.00	482.00	144.00	614.00	100.00	640.00	100.00

Phreatic Surface (2 points)

0.00	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	34.00	YL:	100.00	XR:	487.00	YR: 142.33
Centre:	XC:	75.62	YC:	2099.57	Radius:	R:	2000.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South A - Reclamation - Full Reservoir

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 5.377

Analysis Summary

There were: 18814 successful analyses from a total of 20001 trial failure surfaces
1187 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 4.90

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	29.00	100.00	482.00	144.00	112.17	1597.69	1500.00	4.900	<-- Critical Surface
2	29.53	100.00	482.00	144.00	112.26	1597.72	1500.00	4.902	
3	30.05	100.00	482.00	144.00	112.35	1597.74	1500.00	4.905	
4	30.58	100.00	482.00	144.00	112.45	1597.76	1500.00	4.908	
5	31.11	100.00	482.00	144.00	112.54	1597.79	1500.00	4.911	
6	31.63	100.00	482.00	144.00	112.63	1597.81	1500.00	4.913	
7	29.00	100.00	482.53	143.82	113.16	1597.64	1500.00	4.914	
8	29.00	100.00	482.00	144.00	110.17	1618.24	1520.41	4.915	
9	32.16	100.00	482.00	144.00	112.72	1597.83	1500.00	4.916	
10	29.53	100.00	482.53	143.82	113.26	1597.66	1500.00	4.917	
11	29.53	100.00	482.00	144.00	110.26	1618.26	1520.41	4.917	
12	32.68	100.00	482.00	144.00	112.82	1597.86	1500.00	4.918	

13	30.05	100.00	482.53	143.82	113.35	1597.69	1500.00	4.920
14	30.05	100.00	482.00	144.00	110.35	1618.29	1520.41	4.920
15	33.21	100.00	482.00	144.00	112.91	1597.88	1500.00	4.921
16	30.58	100.00	482.00	144.00	110.44	1618.31	1520.41	4.922
17	30.58	100.00	482.53	143.82	113.45	1597.71	1500.00	4.922
18	33.74	100.00	482.00	144.00	113.00	1597.90	1500.00	4.924
19	31.11	100.00	482.00	144.00	110.54	1618.33	1520.41	4.925
20	31.11	100.00	482.53	143.82	113.54	1597.73	1500.00	4.925
21	31.63	100.00	482.00	144.00	110.63	1618.35	1520.41	4.927
22	31.63	100.00	482.53	143.82	113.63	1597.76	1500.00	4.928
23	29.00	100.00	482.00	144.00	108.17	1638.78	1540.82	4.929
24	29.00	100.00	482.53	143.82	111.18	1618.19	1520.41	4.929
25	32.16	100.00	482.00	144.00	110.72	1618.38	1520.41	4.930
26	32.16	100.00	482.53	143.82	113.73	1597.78	1500.00	4.931
27	29.53	100.00	482.00	144.00	108.26	1638.80	1540.82	4.931
28	29.53	100.00	482.53	143.82	111.27	1618.21	1520.41	4.932
29	32.68	100.00	482.00	144.00	110.80	1618.40	1520.41	4.932
30	34.26	100.06	482.00	144.00	113.28	1597.98	1500.00	4.933
31	32.68	100.00	482.53	143.82	113.82	1597.80	1500.00	4.933
32	30.05	100.00	482.00	144.00	108.35	1638.83	1540.82	4.933
33	30.05	100.00	482.53	143.82	111.36	1618.23	1520.41	4.934
34	33.21	100.00	482.00	144.00	110.89	1618.42	1520.41	4.935
35	29.00	100.00	483.05	143.65	114.16	1597.58	1500.00	4.935
36	29.53	100.00	483.05	143.65	114.25	1597.61	1500.00	4.935
37	30.05	100.00	483.05	143.65	114.35	1597.63	1500.00	4.935
38	30.58	100.00	482.00	144.00	108.44	1638.85	1540.82	4.936
39	33.21	100.00	482.53	143.82	113.91	1597.83	1500.00	4.936
40	30.58	100.00	483.05	143.65	114.45	1597.65	1500.00	4.937
41	30.58	100.00	482.53	143.82	111.45	1618.26	1520.41	4.937
42	33.74	100.00	482.00	144.00	110.98	1618.44	1520.41	4.937
43	31.11	100.00	482.00	144.00	108.53	1638.87	1540.82	4.938
44	33.74	100.00	482.53	143.82	114.01	1597.85	1500.00	4.939
45	31.11	100.00	482.53	143.82	111.55	1618.28	1520.41	4.940
46	31.11	100.00	483.05	143.65	114.54	1597.68	1500.00	4.940
47	31.63	100.00	482.00	144.00	108.62	1638.89	1540.82	4.940
48	31.63	100.00	482.53	143.82	111.64	1618.30	1520.41	4.942
49	29.00	100.00	482.00	144.00	106.18	1659.32	1561.22	4.942
50	31.63	100.00	483.05	143.65	114.64	1597.70	1500.00	4.943
51	32.16	100.00	482.00	144.00	108.71	1638.91	1540.82	4.943
52	29.00	100.00	482.53	143.82	109.19	1638.73	1540.82	4.943
53	29.00	100.00	483.05	143.65	112.18	1618.13	1520.41	4.944
54	29.53	100.00	482.00	144.00	106.27	1659.34	1561.22	4.944
55	32.16	100.00	482.53	143.82	111.73	1618.32	1520.41	4.945
56	32.68	100.00	482.00	144.00	108.79	1638.94	1540.82	4.945
57	32.16	100.00	483.05	143.65	114.73	1597.73	1500.00	4.945
58	29.53	100.00	482.53	143.82	109.28	1638.75	1540.82	4.946
59	34.26	100.06	482.00	144.00	111.26	1618.52	1520.41	4.946
60	29.53	100.00	483.05	143.65	112.28	1618.15	1520.41	4.946
61	30.05	100.00	482.00	144.00	106.35	1659.36	1561.22	4.947
62	32.68	100.00	482.53	143.82	111.82	1618.35	1520.41	4.947
63	33.21	100.00	482.00	144.00	108.88	1638.96	1540.82	4.947
64	32.68	100.00	483.05	143.65	114.82	1597.75	1500.00	4.948
65	34.26	100.06	482.53	143.82	114.29	1597.92	1500.00	4.948
66	30.05	100.00	482.53	143.82	109.37	1638.77	1540.82	4.948
67	30.58	100.00	482.00	144.00	106.44	1659.38	1561.22	4.949

68	30.05	100.00	483.05	143.65	112.37	1618.18	1520.41	4.949
69	33.74	100.00	482.00	144.00	108.97	1638.98	1540.82	4.949
70	33.21	100.00	482.53	143.82	111.91	1618.37	1520.41	4.950
71	30.58	100.00	482.53	143.82	109.46	1638.80	1540.82	4.951
72	31.11	100.00	482.00	144.00	106.53	1659.40	1561.22	4.951
73	33.21	100.00	483.05	143.65	114.92	1597.77	1500.00	4.951
74	30.58	100.00	483.05	143.65	112.46	1618.20	1520.41	4.952
75	29.00	100.00	483.58	143.47	115.15	1597.52	1500.00	4.952
76	33.74	100.00	482.53	143.82	112.00	1618.39	1520.41	4.952
77	34.79	100.18	482.00	144.00	113.75	1598.10	1500.00	4.953
78	31.63	100.00	482.00	144.00	106.61	1659.42	1561.22	4.953
79	31.11	100.00	482.53	143.82	109.55	1638.82	1540.82	4.953
80	33.74	100.00	483.05	143.65	115.01	1597.80	1500.00	4.954
81	29.53	100.00	483.58	143.47	115.25	1597.55	1500.00	4.954
82	31.11	100.00	483.05	143.65	112.56	1618.22	1520.41	4.955
83	29.00	100.00	482.00	144.00	104.19	1679.84	1581.63	4.955
84	32.16	100.00	482.00	144.00	106.70	1659.44	1561.22	4.955
85	31.63	100.00	482.53	143.82	109.64	1638.84	1540.82	4.956
86	30.05	100.00	483.58	143.47	115.35	1597.57	1500.00	4.956
87	29.53	100.00	482.00	144.00	104.27	1679.87	1581.63	4.957
88	29.00	100.00	482.53	143.82	107.21	1659.26	1561.22	4.957
89	32.68	100.00	482.00	144.00	106.78	1659.47	1561.22	4.957
90	31.63	100.00	483.05	143.65	112.65	1618.25	1520.41	4.957
91	32.16	100.00	482.53	143.82	109.73	1638.86	1540.82	4.958
92	29.00	100.00	483.05	143.65	110.21	1638.67	1540.82	4.958
93	29.00	100.00	483.58	143.47	113.19	1618.08	1520.41	4.958
94	34.26	100.06	482.00	144.00	109.25	1639.05	1540.82	4.959
95	30.05	100.00	482.00	144.00	104.36	1679.89	1581.63	4.959
96	33.21	100.00	482.00	144.00	106.87	1659.49	1561.22	4.959
97	29.53	100.00	482.53	143.82	107.30	1659.29	1561.22	4.959
98	32.16	100.00	483.05	143.65	112.74	1618.27	1520.41	4.960
99	32.68	100.00	482.53	143.82	109.82	1638.88	1540.82	4.960

Critical Failure Surface (circle 1)

Intersects: XL: 29.00 YL: 100.00 XR: 482.00 YR: 144.00
Centre: XC: 112.17 YC: 1597.69 Radius: R: 1500.00
Generated failure surface: (20 points)

29.00	100.00	53.02	98.86	77.06	98.10	101.10	97.73	125.15	97.75
149.19	98.15	173.22	98.94	197.24	100.11	221.24	101.66	245.21	103.60
269.14	105.93	293.04	108.64	316.88	111.73	340.68	115.20	364.41	119.05
388.09	123.29	411.69	127.90	435.21	132.89	458.65	138.26	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 45 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	29.00	0.59	-2.7	5.00	5.01	3	100.00	18.0	83.69	12843.50	2576.14	1.00
2	34.00	14.45	-2.7	9.51	9.52	3	100.00	18.0	1937.54	24632.85	2697.52	1.00
3	43.51	38.85	-2.7	9.51	9.52	3	100.00	18.0	5175.86	24901.14	2906.74	1.00
4	53.02	82.82	-1.8	12.02	12.02	3	100.00	18.0	11009.19	31758.89	3129.07	1.00
5	65.04	119.45	-1.8	12.02	12.02	3	100.00	18.0	15853.79	32042.35	3365.99	1.00
6	77.06	154.99	-0.9	12.02	12.02	3	100.00	18.0	20542.91	32252.55	3588.04	1.00
7	89.08	189.33	-0.9	12.02	12.02	3	100.00	18.0	25063.93	32391.41	3797.61	1.00
8	101.10	222.55	0.0	12.02	12.02	3	100.00	18.0	29426.27	32458.91	3991.89	1.00

9	113.12	254.59	0.0	12.02	12.02	3	100.00	18.0	33621.89	32453.19	4174.10	1.00
10	125.15	285.41	1.0	12.02	12.02	3	100.00	18.0	37647.31	32374.14	4340.62	1.00
11	137.17	315.12	1.0	12.02	12.02	3	100.00	18.0	41514.61	32223.73	4495.42	1.00
12	149.19	343.53	1.9	12.02	12.02	3	100.00	18.0	45201.39	32002.03	4634.21	1.00
13	161.21	370.90	1.9	12.02	12.02	3	100.00	18.0	48739.38	31707.08	4761.65	1.00
14	173.22	359.40	2.8	10.91	10.92	3	100.00	18.0	47167.96	28483.37	4868.15	1.00
15	184.13	380.03	2.8	10.91	10.92	3	100.00	18.0	49813.38	28120.85	4959.02	1.00
16	195.04	79.24	2.8	2.20	2.21	1	150.00	22.0	10380.90	5634.38	5011.74	1.00
17	197.24	393.32	3.7	10.63	10.65	1	150.00	22.0	51524.68	26949.37	5053.25	1.00
18	207.87	411.10	3.7	10.63	10.65	1	150.00	22.0	53853.54	26491.18	5124.36	1.00
19	218.50	108.80	3.7	2.74	2.74	1	150.00	22.0	14235.81	6751.52	5181.60	1.00
20	221.24	438.04	4.6	10.76	10.80	1	150.00	22.0	56975.38	26207.54	5272.96	1.00
21	232.00	540.59	4.6	13.21	13.25	1	150.00	22.0	69984.58	31362.37	5276.93	1.00
22	245.21	476.46	5.5	11.97	12.02	1	150.00	22.0	61661.95	27620.07	5127.02	1.00
23	257.17	462.55	5.5	11.97	12.02	1	150.00	22.0	59839.75	26748.01	4975.39	1.00
24	269.14	446.75	6.5	11.95	12.02	1	150.00	22.0	57771.52	25804.81	4807.23	1.00
25	281.09	430.57	6.5	11.95	12.02	1	150.00	22.0	55652.15	24788.82	4630.71	1.00
26	293.04	412.43	7.4	11.92	12.02	1	150.00	22.0	53277.79	23700.44	4437.94	1.00
27	304.96	394.01	7.4	11.92	12.02	1	150.00	22.0	50863.87	22540.99	4236.61	1.00
28	316.88	373.62	8.3	11.90	12.02	1	150.00	22.0	48194.29	21309.91	4019.36	1.00
29	328.78	352.96	8.3	11.90	12.02	1	150.00	22.0	45488.15	20007.22	3793.32	1.00
30	340.68	330.36	9.2	11.87	12.02	1	150.00	22.0	42529.62	18633.63	3551.70	1.00
31	352.55	307.49	9.2	11.87	12.02	1	150.00	22.0	39533.82	17187.94	3301.02	1.00
32	364.41	282.71	10.1	11.84	12.02	1	150.00	22.0	36289.71	15670.46	3035.16	1.00
33	376.25	257.66	10.1	11.84	12.02	1	150.00	22.0	33007.68	14082.29	2759.96	1.00
34	388.09	103.35	11.1	5.11	5.21	1	150.00	22.0	13216.41	5595.61	2554.90	1.00
35	393.20	173.86	11.1	9.24	9.42	2	0.00	35.0	22117.41	9291.25	2354.47	0.99
36	402.44	157.16	11.1	9.24	9.42	2	0.00	35.0	19776.81	8229.43	2105.07	0.99
37	411.69	168.56	12.0	11.31	11.57	2	0.00	35.0	20886.67	8587.32	1813.62	0.99
38	423.00	114.70	12.0	9.00	9.20	2	0.00	35.0	14039.93	5593.98	1531.98	0.99
39	432.00	36.74	12.0	3.21	3.28	2	0.00	35.0	4486.74	1729.55	1372.49	0.99
40	435.21	100.92	12.9	10.15	10.41	2	0.00	35.0	12279.86	4511.82	1185.77	0.99
41	445.35	77.35	12.9	10.15	10.41	2	0.00	35.0	9334.09	3003.23	900.02	0.99
42	455.50	18.36	12.9	3.00	3.08	5	0.00	45.0	1929.38	599.05	623.11	0.98
43	458.50	17.06	13.8	3.17	3.26	2	0.00	35.0	2028.18	485.95	624.02	0.99
44	461.67	32.53	13.8	8.13	8.38	1	150.00	22.0	3749.63	522.66	445.70	1.01
45	469.80	18.30	13.8	12.20	12.56	1	150.00	22.0	2013.08	0.00	154.34	1.01
		---			---				---			
X-S Area:		10649.57	Path Length:		456.89	X-S Weight:			1379722.25			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Rec Full-EQ.gmf Processed: 15 Apr 2025 08:40:23

DATA: Analysis 1 - Case South A - Reclamation - Full Reservoir - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	144.00	455.50	144.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
344.00	100.00	423.00	139.00	455.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	455.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	455.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
455.50	144.00	458.50	144.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
458.50	144.00	640.00	144.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
458.50	139.00	640.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
458.50	100.00	640.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
455.50	97.00	640.00	97.00		

Slope Surface (7 points)

0.00	100.00	34.00	100.00	232.00	144.00	432.00	144.00	482.00	144.00	614.00	100.00
640.00	100.00										

Phreatic Surface (2 points)

0.00	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	34.00	YL:	100.00	XR:	487.00	YR: 142.33
Centre:	XC:	75.62	YC:	2099.57	Radius:	R:	2000.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

- -

RESULTS: Analysis 1 - Case South A - Reclamation - Full Reservoir - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 2.272

Analysis Summary

There were: 18814 successful analyses from a total of 20001 trial failure surfaces
1187 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.11

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	29.00	100.00	482.00	144.00	112.17	1597.69	1500.00	2.106	<-- Critical Surface
2	29.53	100.00	482.00	144.00	112.26	1597.72	1500.00	2.107	
3	29.00	100.00	482.53	143.82	113.16	1597.64	1500.00	2.107	
4	30.05	100.00	482.00	144.00	112.35	1597.74	1500.00	2.107	
5	29.53	100.00	482.53	143.82	113.26	1597.66	1500.00	2.108	
6	30.58	100.00	482.00	144.00	112.45	1597.76	1500.00	2.108	
7	30.05	100.00	482.53	143.82	113.35	1597.69	1500.00	2.109	
8	31.11	100.00	482.00	144.00	112.54	1597.79	1500.00	2.109	

9	30.58	100.00	482.53	143.82	113.45	1597.71	1500.00	2.110
10	31.63	100.00	482.00	144.00	112.63	1597.81	1500.00	2.110
11	31.11	100.00	482.53	143.82	113.54	1597.73	1500.00	2.111
12	32.16	100.00	482.00	144.00	112.72	1597.83	1500.00	2.111
13	30.05	100.00	483.05	143.65	114.35	1597.63	1500.00	2.111
14	29.53	100.00	483.05	143.65	114.25	1597.61	1500.00	2.111
15	30.58	100.00	483.05	143.65	114.45	1597.65	1500.00	2.111
16	32.68	100.00	482.00	144.00	112.82	1597.86	1500.00	2.112
17	29.00	100.00	483.05	143.65	114.16	1597.58	1500.00	2.112
18	31.63	100.00	482.53	143.82	113.63	1597.76	1500.00	2.112
19	31.11	100.00	483.05	143.65	114.54	1597.68	1500.00	2.112
20	33.21	100.00	482.00	144.00	112.91	1597.88	1500.00	2.112
21	32.16	100.00	482.53	143.82	113.73	1597.78	1500.00	2.112
22	29.00	100.00	482.00	144.00	110.17	1618.24	1520.41	2.113
23	33.74	100.00	482.00	144.00	113.00	1597.90	1500.00	2.113
24	31.63	100.00	483.05	143.65	114.64	1597.70	1500.00	2.113
25	32.68	100.00	482.53	143.82	113.82	1597.80	1500.00	2.113
26	29.53	100.00	482.00	144.00	110.26	1618.26	1520.41	2.114
27	29.00	100.00	483.58	143.47	115.15	1597.52	1500.00	2.114
28	32.16	100.00	483.05	143.65	114.73	1597.73	1500.00	2.114
29	33.21	100.00	482.53	143.82	113.91	1597.83	1500.00	2.114
30	29.00	100.00	484.11	143.30	116.14	1597.47	1500.00	2.114
31	29.53	100.00	483.58	143.47	115.25	1597.55	1500.00	2.115
32	29.00	100.00	482.53	143.82	111.18	1618.19	1520.41	2.115
33	30.05	100.00	482.00	144.00	110.35	1618.29	1520.41	2.115
34	33.74	100.00	482.53	143.82	114.01	1597.85	1500.00	2.115
35	32.68	100.00	483.05	143.65	114.82	1597.75	1500.00	2.115
36	29.53	100.00	484.11	143.30	116.24	1597.49	1500.00	2.115
37	30.05	100.00	483.58	143.47	115.35	1597.57	1500.00	2.115
38	30.58	100.00	482.00	144.00	110.44	1618.31	1520.41	2.115
39	29.53	100.00	482.53	143.82	111.27	1618.21	1520.41	2.115
40	30.05	100.00	484.11	143.30	116.34	1597.52	1500.00	2.115
41	33.21	100.00	483.05	143.65	114.92	1597.77	1500.00	2.116
42	31.11	100.00	482.00	144.00	110.54	1618.33	1520.41	2.116
43	29.00	100.00	483.05	143.65	112.18	1618.13	1520.41	2.116
44	30.58	100.00	484.11	143.30	116.44	1597.54	1500.00	2.116
45	30.05	100.00	482.53	143.82	111.36	1618.23	1520.41	2.116
46	34.26	100.06	482.00	144.00	113.28	1597.98	1500.00	2.116
47	29.00	100.00	484.63	143.12	117.14	1597.41	1500.00	2.116
48	33.74	100.00	483.05	143.65	115.01	1597.80	1500.00	2.117
49	31.63	100.00	483.58	143.47	115.63	1597.65	1500.00	2.117
50	31.11	100.00	484.11	143.30	116.54	1597.57	1500.00	2.117
51	31.63	100.00	482.00	144.00	110.63	1618.35	1520.41	2.117
52	29.53	100.00	483.05	143.65	112.28	1618.15	1520.41	2.117
53	30.58	100.00	482.53	143.82	111.45	1618.26	1520.41	2.117
54	31.11	100.00	483.58	143.47	115.54	1597.62	1500.00	2.117
55	29.53	100.00	484.63	143.12	117.23	1597.43	1500.00	2.117
56	32.16	100.00	483.58	143.47	115.73	1597.67	1500.00	2.117
57	30.58	100.00	483.58	143.47	115.44	1597.60	1500.00	2.117
58	32.16	100.00	482.00	144.00	110.72	1618.38	1520.41	2.118
59	29.00	100.00	483.58	143.47	113.19	1618.08	1520.41	2.118
60	31.11	100.00	482.53	143.82	111.55	1618.28	1520.41	2.118
61	30.05	100.00	483.05	143.65	112.37	1618.18	1520.41	2.118
62	30.05	100.00	484.63	143.12	117.33	1597.46	1500.00	2.118
63	32.68	100.00	483.58	143.47	115.82	1597.69	1500.00	2.118

64	34.26	100.06	482.53	143.82	114.29	1597.92	1500.00	2.118
65	32.68	100.00	482.00	144.00	110.80	1618.40	1520.41	2.118
66	30.58	100.00	484.63	143.12	117.43	1597.48	1500.00	2.119
67	31.63	100.00	482.53	143.82	111.64	1618.30	1520.41	2.119
68	29.53	100.00	483.58	143.47	113.28	1618.10	1520.41	2.119
69	30.58	100.00	483.05	143.65	112.46	1618.20	1520.41	2.119
70	33.21	100.00	483.58	143.47	115.92	1597.72	1500.00	2.119
71	29.00	100.00	485.16	142.95	118.12	1597.35	1500.00	2.119
72	33.21	100.00	482.00	144.00	110.89	1618.42	1520.41	2.119
73	31.11	100.00	484.63	143.12	117.53	1597.51	1500.00	2.119
74	32.16	100.00	482.53	143.82	111.73	1618.32	1520.41	2.119
75	33.21	100.00	484.11	143.30	116.92	1597.66	1500.00	2.119
76	33.74	100.00	483.58	143.47	116.01	1597.74	1500.00	2.119
77	31.11	100.00	483.05	143.65	112.56	1618.22	1520.41	2.119
78	32.68	100.00	484.11	143.30	116.82	1597.64	1500.00	2.120
79	29.53	100.00	485.16	142.95	118.23	1597.38	1500.00	2.120
80	33.74	100.00	482.00	144.00	110.98	1618.44	1520.41	2.120
81	32.16	100.00	484.11	143.30	116.73	1597.61	1500.00	2.120
82	31.63	100.00	484.63	143.12	117.63	1597.53	1500.00	2.120
83	29.00	100.00	482.00	144.00	108.17	1638.78	1540.82	2.120
84	31.63	100.00	484.11	143.30	116.63	1597.59	1500.00	2.120
85	32.68	100.00	482.53	143.82	111.82	1618.35	1520.41	2.120
86	33.74	100.00	484.11	143.30	117.02	1597.69	1500.00	2.120
87	31.63	100.00	483.05	143.65	112.65	1618.25	1520.41	2.120
88	30.05	100.00	485.16	142.95	118.32	1597.40	1500.00	2.120
89	32.16	100.00	484.63	143.12	117.73	1597.56	1500.00	2.121
90	29.53	100.00	482.00	144.00	108.26	1638.80	1540.82	2.121
91	33.21	100.00	482.53	143.82	111.91	1618.37	1520.41	2.121
92	30.58	100.00	485.16	142.95	118.42	1597.43	1500.00	2.121
93	32.16	100.00	483.05	143.65	112.74	1618.27	1520.41	2.121
94	32.68	100.00	484.63	143.12	117.82	1597.58	1500.00	2.121
95	29.00	100.00	485.68	142.77	119.11	1597.29	1500.00	2.121
96	30.05	100.00	482.00	144.00	108.35	1638.83	1540.82	2.121
97	29.00	100.00	482.53	143.82	109.19	1638.73	1540.82	2.122
98	33.74	100.00	482.53	143.82	112.00	1618.39	1520.41	2.122
99	31.11	100.00	485.16	142.95	118.52	1597.45	1500.00	2.122

Critical Failure Surface (circle 1)

Intersects: XL: 29.00 YL: 100.00 XR: 482.00 YR: 144.00
Centre: XC: 112.17 YC: 1597.69 Radius: R: 1500.00

Generated failure surface: (20 points)

29.00	100.00	53.02	98.86	77.06	98.10	101.10	97.73	125.15	97.75
149.19	98.15	173.22	98.94	197.24	100.11	221.24	101.66	245.21	103.60
269.14	105.93	293.04	108.64	316.88	111.73	340.68	115.20	364.41	119.05
388.09	123.29	411.69	127.90	435.21	132.89	458.65	138.26	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 45 slices)

Slice	X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	29.00	0.59	-2.7	5.00	5.01	3	100.00	18.0	83.69	12843.50	2577.48	1.01
2	34.00	14.45	-2.7	9.51	9.52	3	100.00	18.0	1937.54	24632.85	2699.28	1.01
3	43.51	38.85	-2.7	9.51	9.52	3	100.00	18.0	5175.86	24901.14	2909.26	1.01
4	53.02	82.82	-1.8	12.02	12.02	3	100.00	18.0	11009.19	31758.89	3131.28	1.01

5	65.04	119.45	-1.8	12.02	12.02	3	100.00	18.0	15853.79	32042.35	3368.80	1.01
6	77.06	154.99	-0.9	12.02	12.02	3	100.00	18.0	20542.91	32252.55	3589.69	1.00
7	89.08	189.33	-0.9	12.02	12.02	3	100.00	18.0	25063.93	32391.41	3799.52	1.00
8	101.10	222.55	0.0	12.02	12.02	3	100.00	18.0	29426.27	32458.91	3991.80	1.00
9	113.12	254.59	0.0	12.02	12.02	3	100.00	18.0	33621.89	32453.19	4174.00	1.00
10	125.15	285.41	1.0	12.02	12.02	3	100.00	18.0	37647.31	32374.14	4337.75	1.00
11	137.17	315.12	1.0	12.02	12.02	3	100.00	18.0	41514.61	32223.73	4492.32	1.00
12	149.19	343.53	1.9	12.02	12.02	3	100.00	18.0	45201.39	32002.03	4627.68	1.00
13	161.21	370.90	1.9	12.02	12.02	3	100.00	18.0	48739.38	31707.08	4754.69	1.00
14	173.22	359.40	2.8	10.91	10.92	3	100.00	18.0	47167.96	28483.37	4857.21	0.99
15	184.13	380.03	2.8	10.91	10.92	3	100.00	18.0	49813.38	28120.85	4947.56	0.99
16	195.04	79.24	2.8	2.20	2.21	1	150.00	22.0	10380.90	5634.38	4996.79	0.99
17	197.24	393.32	3.7	10.63	10.65	1	150.00	22.0	51524.68	26949.37	5032.96	0.99
18	207.87	411.10	3.7	10.63	10.65	1	150.00	22.0	53853.54	26491.18	5103.27	0.99
19	218.50	108.80	3.7	2.74	2.74	1	150.00	22.0	14235.81	6751.52	5159.93	0.99
20	221.24	438.04	4.6	10.76	10.80	1	150.00	22.0	56975.38	26207.54	5244.90	0.99
21	232.00	540.59	4.6	13.21	13.25	1	150.00	22.0	69984.58	31362.37	5248.31	0.99
22	245.21	476.46	5.5	11.97	12.02	1	150.00	22.0	61661.95	27620.07	5093.63	0.99
23	257.17	462.55	5.5	11.97	12.02	1	150.00	22.0	59839.75	26748.01	4942.82	0.99
24	269.14	446.75	6.5	11.95	12.02	1	150.00	22.0	57771.52	25804.81	4770.43	0.98
25	281.09	430.57	6.5	11.95	12.02	1	150.00	22.0	55652.15	24788.82	4595.02	0.98
26	293.04	412.43	7.4	11.92	12.02	1	150.00	22.0	53277.79	23700.44	4398.67	0.98
27	304.96	394.01	7.4	11.92	12.02	1	150.00	22.0	50863.87	22540.99	4198.79	0.98
28	316.88	373.62	8.3	11.90	12.02	1	150.00	22.0	48194.29	21309.91	3978.69	0.98
29	328.78	352.96	8.3	11.90	12.02	1	150.00	22.0	45488.15	20007.22	3754.48	0.98
30	340.68	330.36	9.2	11.87	12.02	1	150.00	22.0	42529.62	18633.63	3510.81	0.98
31	352.55	307.49	9.2	11.87	12.02	1	150.00	22.0	39533.82	17187.94	3262.39	0.98
32	364.41	282.71	10.1	11.84	12.02	1	150.00	22.0	36289.71	15670.46	2995.37	0.98
33	376.25	257.66	10.1	11.84	12.02	1	150.00	22.0	33007.68	14082.29	2722.88	0.98
34	388.09	103.35	11.1	5.11	5.21	1	150.00	22.0	13216.41	5595.61	2516.73	0.98
35	393.20	173.86	11.1	9.24	9.42	2	0.00	35.0	22117.41	9291.25	2306.87	0.96
36	402.44	157.16	11.1	9.24	9.42	2	0.00	35.0	19776.81	8229.43	2062.22	0.96
37	411.69	168.56	12.0	11.31	11.57	2	0.00	35.0	20886.67	8587.32	1773.37	0.95
38	423.00	114.70	12.0	9.00	9.20	2	0.00	35.0	14039.93	5593.98	1497.26	0.95
39	432.00	36.74	12.0	3.21	3.28	2	0.00	35.0	4486.74	1729.55	1340.73	0.95
40	435.21	100.92	12.9	10.15	10.41	2	0.00	35.0	12279.86	4511.82	1155.42	0.95
41	445.35	77.35	12.9	10.15	10.41	2	0.00	35.0	9334.09	3003.23	875.35	0.95
42	455.50	18.36	12.9	3.00	3.08	5	0.00	45.0	1929.38	599.05	599.15	0.93
43	458.50	17.06	13.8	3.17	3.26	2	0.00	35.0	2028.18	485.95	603.61	0.95
44	461.67	32.53	13.8	8.13	8.38	1	150.00	22.0	3749.63	522.66	426.32	0.98
45	469.80	18.30	13.8	12.20	12.56	1	150.00	22.0	2013.08	0.00	140.84	0.98
		---			---				---			
X-S Area:		10649.57	Path Length:		456.89		X-S Weight:		1379722.25			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Rec Rapid Drawdown.gmf Processed: 15 Apr 2025 09:32:06

DATA: Analysis 1 - Case South A - Reclamation - Rapid Drawdown

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	144.00	455.50	144.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
344.00	100.00	423.00	139.00	455.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	455.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	455.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
455.50	144.00	458.50	144.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
458.50	144.00	640.00	144.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
458.50	139.00	640.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
458.50	100.00	640.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
455.50	97.00	640.00	97.00		

Slope Surface (7 points)

0.00	100.00	34.00	100.00	232.00	144.00	432.00	144.00	482.00	144.00	614.00	100.00	640.00	100.00

Phreatic Surface (4 points)

0.00	100.00	34.00	100.00	223.00	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 34.00 YL: 100.00 XR: 487.00 YR: 142.33

Centre: XC: 75.62 YC: 2099.57 Radius: R: 2000.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

- -

RESULTS: Analysis 1 - Case South A - Reclamation - Rapid Drawdown

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 3.065

Analysis Summary

There were: 18814 successful analyses from a total of 20001 trial failure surfaces
1187 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.79

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	29.00	100.00	482.00	144.00	112.17	1597.69	1500.00	2.787	<-- Critical Surface
2	29.53	100.00	482.00	144.00	112.26	1597.72	1500.00	2.789	
3	30.05	100.00	482.00	144.00	112.35	1597.74	1500.00	2.790	
4	30.58	100.00	482.00	144.00	112.45	1597.76	1500.00	2.792	
5	31.11	100.00	482.00	144.00	112.54	1597.79	1500.00	2.794	
6	29.00	100.00	482.53	143.82	113.16	1597.64	1500.00	2.794	
7	31.63	100.00	482.00	144.00	112.63	1597.81	1500.00	2.795	
8	29.00	100.00	482.00	144.00	110.17	1618.24	1520.41	2.796	
9	29.53	100.00	482.53	143.82	113.26	1597.66	1500.00	2.796	
10	32.16	100.00	482.00	144.00	112.72	1597.83	1500.00	2.797	
11	29.53	100.00	482.00	144.00	110.26	1618.26	1520.41	2.798	
12	30.05	100.00	482.53	143.82	113.35	1597.69	1500.00	2.798	

13	32.68	100.00	482.00	144.00	112.82	1597.86	1500.00	2.799
14	30.05	100.00	482.00	144.00	110.35	1618.29	1520.41	2.799
15	30.58	100.00	482.53	143.82	113.45	1597.71	1500.00	2.800
16	33.21	100.00	482.00	144.00	112.91	1597.88	1500.00	2.800
17	30.58	100.00	482.00	144.00	110.44	1618.31	1520.41	2.801
18	31.11	100.00	482.53	143.82	113.54	1597.73	1500.00	2.802
19	33.74	100.00	482.00	144.00	113.00	1597.90	1500.00	2.802
20	31.11	100.00	482.00	144.00	110.54	1618.33	1520.41	2.803
21	31.63	100.00	482.53	143.82	113.63	1597.76	1500.00	2.803
22	29.00	100.00	482.53	143.82	111.18	1618.19	1520.41	2.804
23	31.63	100.00	482.00	144.00	110.63	1618.35	1520.41	2.804
24	29.00	100.00	482.00	144.00	108.17	1638.78	1540.82	2.805
25	32.16	100.00	482.53	143.82	113.73	1597.78	1500.00	2.805
26	29.53	100.00	482.53	143.82	111.27	1618.21	1520.41	2.805
27	32.16	100.00	482.00	144.00	110.72	1618.38	1520.41	2.806
28	29.00	100.00	483.05	143.65	114.16	1597.58	1500.00	2.806
29	29.53	100.00	483.05	143.65	114.25	1597.61	1500.00	2.806
30	29.53	100.00	482.00	144.00	108.26	1638.80	1540.82	2.806
31	30.05	100.00	483.05	143.65	114.35	1597.63	1500.00	2.806
32	32.68	100.00	482.53	143.82	113.82	1597.80	1500.00	2.807
33	30.05	100.00	482.53	143.82	111.36	1618.23	1520.41	2.807
34	32.68	100.00	482.00	144.00	110.80	1618.40	1520.41	2.807
35	30.58	100.00	483.05	143.65	114.45	1597.65	1500.00	2.808
36	30.05	100.00	482.00	144.00	108.35	1638.83	1540.82	2.808
37	34.26	100.06	482.00	144.00	113.28	1597.98	1500.00	2.808
38	33.21	100.00	482.53	143.82	113.91	1597.83	1500.00	2.808
39	33.21	100.00	482.00	144.00	110.89	1618.42	1520.41	2.809
40	30.58	100.00	482.53	143.82	111.45	1618.26	1520.41	2.809
41	31.11	100.00	483.05	143.65	114.54	1597.68	1500.00	2.809
42	30.58	100.00	482.00	144.00	108.44	1638.85	1540.82	2.809
43	33.74	100.00	482.53	143.82	114.01	1597.85	1500.00	2.810
44	33.74	100.00	482.00	144.00	110.98	1618.44	1520.41	2.810
45	31.11	100.00	482.53	143.82	111.55	1618.28	1520.41	2.810
46	31.11	100.00	482.00	144.00	108.53	1638.87	1540.82	2.811
47	31.63	100.00	483.05	143.65	114.64	1597.70	1500.00	2.811
48	29.00	100.00	483.05	143.65	112.18	1618.13	1520.41	2.812
49	31.63	100.00	482.53	143.82	111.64	1618.30	1520.41	2.812
50	31.63	100.00	482.00	144.00	108.62	1638.89	1540.82	2.812
51	29.00	100.00	482.53	143.82	109.19	1638.73	1540.82	2.813
52	32.16	100.00	483.05	143.65	114.73	1597.73	1500.00	2.813
53	29.00	100.00	482.00	144.00	106.18	1659.32	1561.22	2.813
54	29.53	100.00	483.05	143.65	112.28	1618.15	1520.41	2.813
55	32.16	100.00	482.53	143.82	111.73	1618.32	1520.41	2.814
56	32.16	100.00	482.00	144.00	108.71	1638.91	1540.82	2.814
57	29.53	100.00	482.53	143.82	109.28	1638.75	1540.82	2.814
58	29.53	100.00	482.00	144.00	106.27	1659.34	1561.22	2.815
59	32.68	100.00	483.05	143.65	114.82	1597.75	1500.00	2.815
60	29.00	100.00	483.58	143.47	115.15	1597.52	1500.00	2.815
61	30.05	100.00	483.05	143.65	112.37	1618.18	1520.41	2.815
62	32.68	100.00	482.00	144.00	108.79	1638.94	1540.82	2.815
63	32.68	100.00	482.53	143.82	111.82	1618.35	1520.41	2.815
64	30.05	100.00	482.53	143.82	109.37	1638.77	1540.82	2.816
65	30.05	100.00	482.00	144.00	106.35	1659.36	1561.22	2.816
66	29.53	100.00	483.58	143.47	115.25	1597.55	1500.00	2.816
67	34.26	100.06	482.53	143.82	114.29	1597.92	1500.00	2.816

68	34.26	100.06	482.00	144.00	111.26	1618.52	1520.41	2.816
69	33.21	100.00	483.05	143.65	114.92	1597.77	1500.00	2.816
70	33.21	100.00	482.00	144.00	108.88	1638.96	1540.82	2.817
71	30.58	100.00	483.05	143.65	112.46	1618.20	1520.41	2.817
72	33.21	100.00	482.53	143.82	111.91	1618.37	1520.41	2.817
73	30.58	100.00	482.00	144.00	106.44	1659.38	1561.22	2.817
74	30.05	100.00	483.58	143.47	115.35	1597.57	1500.00	2.817
75	30.58	100.00	482.53	143.82	109.46	1638.80	1540.82	2.817
76	33.74	100.00	482.00	144.00	108.97	1638.98	1540.82	2.818
77	33.74	100.00	483.05	143.65	115.01	1597.80	1500.00	2.818
78	31.11	100.00	483.05	143.65	112.56	1618.22	1520.41	2.818
79	33.74	100.00	482.53	143.82	112.00	1618.39	1520.41	2.819
80	31.11	100.00	482.00	144.00	106.53	1659.40	1561.22	2.819
81	31.11	100.00	482.53	143.82	109.55	1638.82	1540.82	2.819
82	29.00	100.00	483.58	143.47	113.19	1618.08	1520.41	2.819
83	34.79	100.18	482.00	144.00	113.75	1598.10	1500.00	2.820
84	31.63	100.00	483.05	143.65	112.65	1618.25	1520.41	2.820
85	31.63	100.00	482.00	144.00	106.61	1659.42	1561.22	2.820
86	31.63	100.00	482.53	143.82	109.64	1638.84	1540.82	2.820
87	29.00	100.00	483.05	143.65	110.21	1638.67	1540.82	2.821
88	29.00	100.00	484.11	143.30	116.14	1597.47	1500.00	2.821
89	29.00	100.00	482.00	144.00	104.19	1679.84	1581.63	2.821
90	29.53	100.00	483.58	143.47	113.28	1618.10	1520.41	2.821
91	29.00	100.00	482.53	143.82	107.21	1659.26	1561.22	2.821
92	30.58	100.00	483.58	143.47	115.44	1597.60	1500.00	2.821
93	31.11	100.00	483.58	143.47	115.54	1597.62	1500.00	2.821
94	32.16	100.00	482.00	144.00	106.70	1659.44	1561.22	2.822
95	31.63	100.00	483.58	143.47	115.63	1597.65	1500.00	2.822
96	32.16	100.00	483.05	143.65	112.74	1618.27	1520.41	2.822
97	32.16	100.00	482.53	143.82	109.73	1638.86	1540.82	2.822
98	29.53	100.00	483.05	143.65	110.30	1638.70	1540.82	2.822
99	29.53	100.00	484.11	143.30	116.24	1597.49	1500.00	2.822

Critical Failure Surface (circle 1)

Intersects: XL: 29.00 YL: 100.00 XR: 482.00 YR: 144.00
Centre: XC: 112.17 YC: 1597.69 Radius: R: 1500.00

Generated failure surface: (20 points)

29.00	100.00	53.02	98.86	77.06	98.10	101.10	97.73	125.15	97.75
149.19	98.15	173.22	98.94	197.24	100.11	221.24	101.66	245.21	103.60
269.14	105.93	293.04	108.64	316.88	111.73	340.68	115.20	364.41	119.05
388.09	123.29	411.69	127.90	435.21	132.89	458.65	138.26	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 44 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	29.00	0.59	-2.7	5.00	5.01	3	100.00	18.0	83.69	37.08	18.50	1.01
2	34.00	14.45	-2.7	9.51	9.52	3	100.00	18.0	1932.52	888.01	205.54	1.01
3	43.51	38.85	-2.7	9.51	9.52	3	100.00	18.0	5160.79	2381.90	546.02	1.01
4	53.02	82.82	-1.8	12.02	12.02	3	100.00	18.0	10975.77	5071.16	916.24	1.00
5	65.04	119.45	-1.8	12.02	12.02	3	100.00	18.0	15804.32	7310.61	1318.82	1.00
6	77.06	154.99	-0.9	12.02	12.02	3	100.00	18.0	20477.37	9477.81	1705.54	1.00
7	89.08	189.33	-0.9	12.02	12.02	3	100.00	18.0	24982.33	11573.27	2080.63	1.00
8	101.10	222.55	0.0	12.02	12.02	3	100.00	18.0	29328.59	13596.97	2439.12	1.00

9	113.12	254.59	0.0	12.02	12.02	3	100.00	18.0	33508.16	15548.21	2786.71	1.00
10	125.15	285.41	1.0	12.02	12.02	3	100.00	18.0	37517.54	17426.41	3116.99	1.00
11	137.17	315.12	1.0	12.02	12.02	3	100.00	18.0	41368.78	19232.55	3437.02	1.00
12	149.19	343.53	1.9	12.02	12.02	3	100.00	18.0	45039.56	20966.73	3739.12	1.00
13	161.21	370.90	1.9	12.02	12.02	3	100.00	18.0	48561.50	22627.70	4031.61	1.00
14	173.22	359.40	2.8	10.91	10.92	3	100.00	18.0	46992.62	21931.35	4293.44	1.00
15	184.13	380.03	2.8	10.91	10.92	3	100.00	18.0	49624.82	23181.30	4534.04	1.00
16	195.04	79.24	2.8	2.20	2.21	1	150.00	22.0	10341.22	4832.62	4674.87	0.99
17	197.24	445.28	3.7	12.00	12.02	1	150.00	22.0	58106.32	27172.16	4815.44	0.99
18	209.24	467.94	3.7	12.00	12.02	1	150.00	22.0	61057.95	28541.10	5060.21	0.99
19	221.24	438.04	4.6	10.76	10.80	1	150.00	22.0	56975.38	26207.54	5256.86	0.99
20	232.00	540.59	4.6	13.21	13.25	1	150.00	22.0	69984.58	31362.37	5260.52	0.99
21	245.21	476.46	5.5	11.97	12.02	1	150.00	22.0	61661.95	27620.07	5107.86	0.99
22	257.17	462.55	5.5	11.97	12.02	1	150.00	22.0	59839.75	26748.01	4956.69	0.99
23	269.14	446.75	6.5	11.95	12.02	1	150.00	22.0	57771.52	25804.81	4786.09	0.99
24	281.09	430.57	6.5	11.95	12.02	1	150.00	22.0	55652.15	24788.82	4610.21	0.99
25	293.04	412.43	7.4	11.92	12.02	1	150.00	22.0	53277.79	23700.44	4415.37	0.99
26	304.96	394.01	7.4	11.92	12.02	1	150.00	22.0	50863.87	22540.99	4214.87	0.99
27	316.88	373.62	8.3	11.90	12.02	1	150.00	22.0	48194.29	21309.91	3995.96	0.99
28	328.78	352.96	8.3	11.90	12.02	1	150.00	22.0	45488.15	20007.22	3770.97	0.99
29	340.68	330.36	9.2	11.87	12.02	1	150.00	22.0	42529.62	18633.63	3528.16	0.99
30	352.55	307.49	9.2	11.87	12.02	1	150.00	22.0	39533.82	17187.94	3278.78	0.99
31	364.41	282.71	10.1	11.84	12.02	1	150.00	22.0	36289.71	15670.46	3012.24	0.99
32	376.25	257.66	10.1	11.84	12.02	1	150.00	22.0	33007.68	14082.29	2738.60	0.99
33	388.09	103.35	11.1	5.11	5.21	1	150.00	22.0	13216.41	5595.61	2532.89	0.99
34	393.20	173.86	11.1	9.24	9.42	2	0.00	35.0	22117.41	9291.25	2326.86	0.97
35	402.44	157.16	11.1	9.24	9.42	2	0.00	35.0	19776.81	8229.43	2080.22	0.97
36	411.69	168.56	12.0	11.31	11.57	2	0.00	35.0	20886.67	8587.32	1790.24	0.97
37	423.00	114.70	12.0	9.00	9.20	2	0.00	35.0	14039.93	5593.98	1511.82	0.97
38	432.00	36.74	12.0	3.21	3.28	2	0.00	35.0	4486.74	1729.55	1354.04	0.97
39	435.21	100.92	12.9	10.15	10.41	2	0.00	35.0	12279.86	4511.82	1168.12	0.97
40	445.35	77.35	12.9	10.15	10.41	2	0.00	35.0	9334.09	3003.23	885.68	0.97
41	455.50	18.36	12.9	3.00	3.08	5	0.00	45.0	1929.38	599.05	609.08	0.95
42	458.50	17.06	13.8	3.17	3.26	2	0.00	35.0	2028.18	485.95	612.14	0.97
43	461.67	32.53	13.8	8.13	8.38	1	150.00	22.0	3749.63	522.66	434.50	0.99
44	469.80	18.30	13.8	12.20	12.56	1	150.00	22.0	2013.08	0.00	146.54	0.99
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	X-S Area:	10649.57	Path Length:		456.89		X-S Weight:		1377792.00			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South A Rec Rapid Drawdown-EQ.gmf Processed: 15 Apr 2025 08:42:01

DATA: Analysis 1 - Case South A - Reclamation - Rapid Drawdown - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	144.00	455.50	144.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
344.00	100.00	423.00	139.00	455.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	455.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	455.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
455.50	144.00	458.50	144.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
458.50	144.00	640.00	144.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
458.50	139.00	640.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
458.50	100.00	640.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
455.50	97.00	640.00	97.00		

Slope Surface (7 points)

0.00	100.00	34.00	100.00	232.00	144.00	432.00	144.00	482.00	144.00	614.00	100.00	640.00	100.00

Phreatic Surface (4 points)

0.00	100.00	34.00	100.00	223.00	141.00	640.00	141.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	34.00	YL:	100.00	XR:	487.00	YR: 142.33
Centre:	XC:	75.62	YC:	2099.57	Radius:	R:	2000.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

- -

RESULTS: Analysis 1 - Case South A - Reclamation - Rapid Drawdown - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.718

Analysis Summary

There were: 18814 successful analyses from a total of 20001 trial failure surfaces
1187 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.58

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	29.00	100.00	482.00	144.00	112.17	1597.69	1500.00	1.582	<-- Critical Surface
2	29.53	100.00	482.00	144.00	112.26	1597.72	1500.00	1.582	
3	30.05	100.00	482.00	144.00	112.35	1597.74	1500.00	1.583	
4	29.00	100.00	482.53	143.82	113.16	1597.64	1500.00	1.583	
5	30.58	100.00	482.00	144.00	112.45	1597.76	1500.00	1.584	
6	29.53	100.00	482.53	143.82	113.26	1597.66	1500.00	1.584	
7	31.11	100.00	482.00	144.00	112.54	1597.79	1500.00	1.585	
8	30.05	100.00	482.53	143.82	113.35	1597.69	1500.00	1.585	

9	31.63	100.00	482.00	144.00	112.63	1597.81	1500.00	1.585
10	30.58	100.00	482.53	143.82	113.45	1597.71	1500.00	1.586
11	32.16	100.00	482.00	144.00	112.72	1597.83	1500.00	1.586
12	31.11	100.00	482.53	143.82	113.54	1597.73	1500.00	1.586
13	32.68	100.00	482.00	144.00	112.82	1597.86	1500.00	1.587
14	30.05	100.00	483.05	143.65	114.35	1597.63	1500.00	1.587
15	29.53	100.00	483.05	143.65	114.25	1597.61	1500.00	1.587
16	29.00	100.00	482.00	144.00	110.17	1618.24	1520.41	1.587
17	29.00	100.00	483.05	143.65	114.16	1597.58	1500.00	1.587
18	31.63	100.00	482.53	143.82	113.63	1597.76	1500.00	1.587
19	30.58	100.00	483.05	143.65	114.45	1597.65	1500.00	1.587
20	33.21	100.00	482.00	144.00	112.91	1597.88	1500.00	1.588
21	29.53	100.00	482.00	144.00	110.26	1618.26	1520.41	1.588
22	32.16	100.00	482.53	143.82	113.73	1597.78	1500.00	1.588
23	31.11	100.00	483.05	143.65	114.54	1597.68	1500.00	1.588
24	33.74	100.00	482.00	144.00	113.00	1597.90	1500.00	1.588
25	30.05	100.00	482.00	144.00	110.35	1618.29	1520.41	1.589
26	32.68	100.00	482.53	143.82	113.82	1597.80	1500.00	1.589
27	29.00	100.00	482.53	143.82	111.18	1618.19	1520.41	1.589
28	31.63	100.00	483.05	143.65	114.64	1597.70	1500.00	1.589
29	30.58	100.00	482.00	144.00	110.44	1618.31	1520.41	1.589
30	33.21	100.00	482.53	143.82	113.91	1597.83	1500.00	1.589
31	29.00	100.00	483.58	143.47	115.15	1597.52	1500.00	1.590
32	29.53	100.00	482.53	143.82	111.27	1618.21	1520.41	1.590
33	32.16	100.00	483.05	143.65	114.73	1597.73	1500.00	1.590
34	31.11	100.00	482.00	144.00	110.54	1618.33	1520.41	1.590
35	29.53	100.00	483.58	143.47	115.25	1597.55	1500.00	1.590
36	33.74	100.00	482.53	143.82	114.01	1597.85	1500.00	1.590
37	29.00	100.00	484.11	143.30	116.14	1597.47	1500.00	1.590
38	30.05	100.00	482.53	143.82	111.36	1618.23	1520.41	1.591
39	30.05	100.00	483.58	143.47	115.35	1597.57	1500.00	1.591
40	32.68	100.00	483.05	143.65	114.82	1597.75	1500.00	1.591
41	31.63	100.00	482.00	144.00	110.63	1618.35	1520.41	1.591
42	29.00	100.00	483.05	143.65	112.18	1618.13	1520.41	1.591
43	34.26	100.06	482.00	144.00	113.28	1597.98	1500.00	1.591
44	29.53	100.00	484.11	143.30	116.24	1597.49	1500.00	1.591
45	30.58	100.00	482.53	143.82	111.45	1618.26	1520.41	1.591
46	33.21	100.00	483.05	143.65	114.92	1597.77	1500.00	1.591
47	32.16	100.00	482.00	144.00	110.72	1618.38	1520.41	1.591
48	30.05	100.00	484.11	143.30	116.34	1597.52	1500.00	1.592
49	29.53	100.00	483.05	143.65	112.28	1618.15	1520.41	1.592
50	31.11	100.00	482.53	143.82	111.55	1618.28	1520.41	1.592
51	32.68	100.00	482.00	144.00	110.80	1618.40	1520.41	1.592
52	33.74	100.00	483.05	143.65	115.01	1597.80	1500.00	1.592
53	30.58	100.00	484.11	143.30	116.44	1597.54	1500.00	1.592
54	31.63	100.00	483.58	143.47	115.63	1597.65	1500.00	1.592
55	30.05	100.00	483.05	143.65	112.37	1618.18	1520.41	1.592
56	31.11	100.00	483.58	143.47	115.54	1597.62	1500.00	1.592
57	29.00	100.00	482.00	144.00	108.17	1638.78	1540.82	1.593
58	29.00	100.00	483.58	143.47	113.19	1618.08	1520.41	1.593
59	29.00	100.00	484.63	143.12	117.14	1597.41	1500.00	1.593
60	30.58	100.00	483.58	143.47	115.44	1597.60	1500.00	1.593
61	31.63	100.00	482.53	143.82	111.64	1618.30	1520.41	1.593
62	33.21	100.00	482.00	144.00	110.89	1618.42	1520.41	1.593
63	32.16	100.00	483.58	143.47	115.73	1597.67	1500.00	1.593

64	31.11	100.00	484.11	143.30	116.54	1597.57	1500.00	1.593
65	34.26	100.06	482.53	143.82	114.29	1597.92	1500.00	1.593
66	30.58	100.00	483.05	143.65	112.46	1618.20	1520.41	1.593
67	29.53	100.00	482.00	144.00	108.26	1638.80	1540.82	1.593
68	29.53	100.00	484.63	143.12	117.23	1597.43	1500.00	1.593
69	32.16	100.00	482.53	143.82	111.73	1618.32	1520.41	1.593
70	33.74	100.00	482.00	144.00	110.98	1618.44	1520.41	1.593
71	29.53	100.00	483.58	143.47	113.28	1618.10	1520.41	1.593
72	32.68	100.00	483.58	143.47	115.82	1597.69	1500.00	1.593
73	31.11	100.00	483.05	143.65	112.56	1618.22	1520.41	1.594
74	30.05	100.00	482.00	144.00	108.35	1638.83	1540.82	1.594
75	30.05	100.00	484.63	143.12	117.33	1597.46	1500.00	1.594
76	32.68	100.00	482.53	143.82	111.82	1618.35	1520.41	1.594
77	33.21	100.00	483.58	143.47	115.92	1597.72	1500.00	1.594
78	29.00	100.00	482.53	143.82	109.19	1638.73	1540.82	1.594
79	30.58	100.00	482.00	144.00	108.44	1638.85	1540.82	1.595
80	30.58	100.00	484.63	143.12	117.43	1597.48	1500.00	1.595
81	31.63	100.00	483.05	143.65	112.65	1618.25	1520.41	1.595
82	33.21	100.00	482.53	143.82	111.91	1618.37	1520.41	1.595
83	33.74	100.00	483.58	143.47	116.01	1597.74	1500.00	1.595
84	29.00	100.00	485.16	142.95	118.12	1597.35	1500.00	1.595
85	29.53	100.00	482.53	143.82	109.28	1638.75	1540.82	1.595
86	31.11	100.00	482.00	144.00	108.53	1638.87	1540.82	1.595
87	31.11	100.00	484.63	143.12	117.53	1597.51	1500.00	1.595
88	33.21	100.00	484.11	143.30	116.92	1597.66	1500.00	1.595
89	32.68	100.00	484.11	143.30	116.82	1597.64	1500.00	1.595
90	32.16	100.00	483.05	143.65	112.74	1618.27	1520.41	1.595
91	32.16	100.00	484.11	143.30	116.73	1597.61	1500.00	1.595
92	31.63	100.00	484.11	143.30	116.63	1597.59	1500.00	1.595
93	33.74	100.00	482.53	143.82	112.00	1618.39	1520.41	1.595
94	29.53	100.00	485.16	142.95	118.23	1597.38	1500.00	1.596
95	31.63	100.00	482.00	144.00	108.62	1638.89	1540.82	1.596
96	30.05	100.00	482.53	143.82	109.37	1638.77	1540.82	1.596
97	31.63	100.00	484.63	143.12	117.63	1597.53	1500.00	1.596
98	34.26	100.06	482.00	144.00	111.26	1618.52	1520.41	1.596
99	32.68	100.00	483.05	143.65	112.83	1618.29	1520.41	1.596

Critical Failure Surface (circle 1)

Intersects: XL: 29.00 YL: 100.00 XR: 482.00 YR: 144.00
Centre: XC: 112.17 YC: 1597.69 Radius: R: 1500.00

Generated failure surface: (20 points)

29.00	100.00	53.02	98.86	77.06	98.10	101.10	97.73	125.15	97.75
149.19	98.15	173.22	98.94	197.24	100.11	221.24	101.66	245.21	103.60
269.14	105.93	293.04	108.64	316.88	111.73	340.68	115.20	364.41	119.05
388.09	123.29	411.69	127.90	435.21	132.89	458.65	138.26	482.00	144.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 44 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	29.00	0.59	-2.7	5.00	5.01	3	100.00	18.0	83.69	37.08	19.86	1.01
2	34.00	14.45	-2.7	9.51	9.52	3	100.00	18.0	1932.52	888.01	207.33	1.01
3	43.51	38.85	-2.7	9.51	9.52	3	100.00	18.0	5160.79	2381.90	548.59	1.01
4	53.02	82.82	-1.8	12.02	12.02	3	100.00	18.0	10975.77	5071.16	918.49	1.01

5	65.04	119.45	-1.8	12.02	12.02	3	100.00	18.0	15804.32	7310.61	1321.68	1.01
6	77.06	154.99	-0.9	12.02	12.02	3	100.00	18.0	20477.37	9477.81	1707.22	1.00
7	89.08	189.33	-0.9	12.02	12.02	3	100.00	18.0	24982.33	11573.27	2082.58	1.00
8	101.10	222.55	0.0	12.02	12.02	3	100.00	18.0	29328.59	13596.97	2439.03	1.00
9	113.12	254.59	0.0	12.02	12.02	3	100.00	18.0	33508.16	15548.21	2786.61	1.00
10	125.15	285.41	1.0	12.02	12.02	3	100.00	18.0	37517.54	17426.41	3114.07	1.00
11	137.17	315.12	1.0	12.02	12.02	3	100.00	18.0	41368.78	19232.55	3433.85	1.00
12	149.19	343.53	1.9	12.02	12.02	3	100.00	18.0	45039.56	20966.73	3732.47	0.99
13	161.21	370.90	1.9	12.02	12.02	3	100.00	18.0	48561.50	22627.70	4024.52	0.99
14	173.22	359.40	2.8	10.91	10.92	3	100.00	18.0	46992.62	21931.35	4282.31	0.99
15	184.13	380.03	2.8	10.91	10.92	3	100.00	18.0	49624.82	23181.30	4522.37	0.99
16	195.04	79.24	2.8	2.20	2.21	1	150.00	22.0	10341.22	4832.62	4659.68	0.99
17	197.24	445.28	3.7	12.00	12.02	1	150.00	22.0	58106.32	27172.16	4794.81	0.99
18	209.24	467.94	3.7	12.00	12.02	1	150.00	22.0	61057.95	28541.10	5038.65	0.99
19	221.24	438.04	4.6	10.76	10.80	1	150.00	22.0	56975.38	26207.54	5228.81	0.98
20	232.00	540.59	4.6	13.21	13.25	1	150.00	22.0	69984.58	31362.37	5231.90	0.98
21	245.21	476.46	5.5	11.97	12.02	1	150.00	22.0	61661.95	27620.07	5074.54	0.98
22	257.17	462.55	5.5	11.97	12.02	1	150.00	22.0	59839.75	26748.01	4924.20	0.98
23	269.14	446.75	6.5	11.95	12.02	1	150.00	22.0	57771.52	25804.81	4749.44	0.98
24	281.09	430.57	6.5	11.95	12.02	1	150.00	22.0	55652.15	24788.82	4574.67	0.98
25	293.04	412.43	7.4	11.92	12.02	1	150.00	22.0	53277.79	23700.44	4376.34	0.98
26	304.96	394.01	7.4	11.92	12.02	1	150.00	22.0	50863.87	22540.99	4177.29	0.98
27	316.88	373.62	8.3	11.90	12.02	1	150.00	22.0	48194.29	21309.91	3955.63	0.97
28	328.78	352.96	8.3	11.90	12.02	1	150.00	22.0	45488.15	20007.22	3732.45	0.97
29	340.68	330.36	9.2	11.87	12.02	1	150.00	22.0	42529.62	18633.63	3487.69	0.97
30	352.55	307.49	9.2	11.87	12.02	1	150.00	22.0	39533.82	17187.94	3240.53	0.97
31	364.41	282.71	10.1	11.84	12.02	1	150.00	22.0	36289.71	15670.46	2972.93	0.97
32	376.25	257.66	10.1	11.84	12.02	1	150.00	22.0	33007.68	14082.29	2701.96	0.97
33	388.09	103.35	11.1	5.11	5.21	1	150.00	22.0	13216.41	5595.61	2495.25	0.97
34	393.20	173.86	11.1	9.24	9.42	2	0.00	35.0	22117.41	9291.25	2280.69	0.94
35	402.44	157.16	11.1	9.24	9.42	2	0.00	35.0	19776.81	8229.43	2038.66	0.94
36	411.69	168.56	12.0	11.31	11.57	2	0.00	35.0	20886.67	8587.32	1751.34	0.93
37	423.00	114.70	12.0	9.00	9.20	2	0.00	35.0	14039.93	5593.98	1478.26	0.93
38	432.00	36.74	12.0	3.21	3.28	2	0.00	35.0	4486.74	1729.55	1323.34	0.93
39	435.21	100.92	12.9	10.15	10.41	2	0.00	35.0	12279.86	4511.82	1138.88	0.93
40	445.35	77.35	12.9	10.15	10.41	2	0.00	35.0	9334.09	3003.23	861.91	0.93
41	455.50	18.36	12.9	3.00	3.08	5	0.00	45.0	1929.38	599.05	586.41	0.90
42	458.50	17.06	13.8	3.17	3.26	2	0.00	35.0	2028.18	485.95	592.53	0.93
43	461.67	32.53	13.8	8.13	8.38	1	150.00	22.0	3749.63	522.66	415.50	0.97
44	469.80	18.30	13.8	12.20	12.56	1	150.00	22.0	2013.08	0.00	133.30	0.97
		---			---				---			
	X-S Area:	10649.57	Path Length:		456.89		X-S Weight:		1377792.00			

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Rec Full.gmf Processed: 15 Apr 2025 08:45:17

DATA: Analysis 1 - Case South B - Reclamation - Full Reservoir

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	143.00	452.50	143.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
300.00	100.00	417.00	139.00	452.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	452.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	452.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
452.50	143.00	455.50	143.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
455.50	143.00	510.00	143.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
455.50	139.00	510.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
455.50	100.00	510.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
452.50	97.00	510.00	97.00		

Slope Surface (4 points)

0.00	100.00	56.50	100.00	250.00	143.00	510.00	143.00

Phreatic Surface (2 points)

0.00	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	56.50	YL:	100.00	XR:	494.00	YR: 143.00
Centre:	XC:	80.81	YC:	2099.85	Radius:	R:	2000.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South B - Reclamation - Full Reservoir

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 5.527

Analysis Summary

There were: 17516 successful analyses from a total of 20001 trial failure surfaces
2485 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 5.24

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	51.50	100.00	489.00	143.00	125.11	1598.19	1500.00	5.245	<-- Critical Surface
2	52.03	100.00	489.00	143.00	125.20	1598.21	1500.00	5.247	
3	52.55	100.00	489.00	143.00	125.28	1598.24	1500.00	5.249	
4	51.50	100.00	489.00	143.00	123.09	1618.72	1520.41	5.251	
5	53.08	100.00	489.00	143.00	125.37	1598.26	1500.00	5.251	
6	53.61	100.00	489.00	143.00	125.45	1598.28	1500.00	5.253	
7	52.03	100.00	489.00	143.00	123.18	1618.74	1520.41	5.253	
8	52.55	100.00	489.00	143.00	123.26	1618.76	1520.41	5.255	
9	54.13	100.00	489.00	143.00	125.54	1598.30	1500.00	5.255	
10	51.50	100.00	489.53	143.00	125.55	1598.17	1500.00	5.255	
11	54.66	100.00	489.00	143.00	125.62	1598.32	1500.00	5.257	
12	51.50	100.00	489.00	143.00	121.08	1639.24	1540.82	5.257	
13	52.03	100.00	489.53	143.00	125.64	1598.19	1500.00	5.258	

14	55.18	100.00	489.00	143.00	125.71	1598.34	1500.00	5.259
15	52.03	100.00	489.00	143.00	121.16	1639.26	1540.82	5.260
16	52.55	100.00	489.53	143.00	125.72	1598.21	1500.00	5.260
17	55.71	100.00	489.00	143.00	125.79	1598.36	1500.00	5.261
18	54.13	100.00	489.00	143.00	123.51	1618.82	1520.41	5.261
19	53.61	100.00	489.00	143.00	123.43	1618.80	1520.41	5.261
20	53.08	100.00	489.53	143.00	125.81	1598.24	1500.00	5.262
21	51.50	100.00	489.53	143.00	123.54	1618.70	1520.41	5.262
22	53.08	100.00	489.00	143.00	123.34	1618.78	1520.41	5.262
23	52.55	100.00	489.00	143.00	121.24	1639.28	1540.82	5.262
24	54.66	100.00	489.00	143.00	123.59	1618.84	1520.41	5.263
25	52.03	100.00	489.53	143.00	123.62	1618.72	1520.41	5.264
26	53.61	100.00	489.53	143.00	125.90	1598.26	1500.00	5.264
27	53.08	100.00	489.00	143.00	121.32	1639.30	1540.82	5.265
28	55.18	100.00	489.00	143.00	123.67	1618.86	1520.41	5.265
29	52.55	100.00	489.53	143.00	123.70	1618.74	1520.41	5.266
30	54.13	100.00	489.53	143.00	125.98	1598.28	1500.00	5.266
31	51.50	100.00	490.05	143.00	125.99	1598.15	1500.00	5.266
32	51.50	100.00	489.00	143.00	119.06	1659.76	1561.22	5.267
33	53.61	100.00	489.00	143.00	121.40	1639.32	1540.82	5.267
34	56.24	100.00	489.00	143.00	125.87	1598.38	1500.00	5.267
35	53.08	100.00	489.53	143.00	123.79	1618.76	1520.41	5.267
36	54.66	100.00	489.53	143.00	126.07	1598.30	1500.00	5.268
37	55.71	100.00	489.00	143.00	123.75	1618.88	1520.41	5.268
38	52.03	100.00	490.05	143.00	126.08	1598.17	1500.00	5.268
39	52.03	100.00	489.00	143.00	119.14	1659.78	1561.22	5.269
40	51.50	100.00	489.53	143.00	121.52	1639.22	1540.82	5.269
41	54.13	100.00	489.00	143.00	121.48	1639.34	1540.82	5.269
42	52.03	100.00	489.53	143.00	121.60	1639.24	1540.82	5.269
43	55.18	100.00	489.53	143.00	126.15	1598.32	1500.00	5.270
44	56.24	100.00	489.00	143.00	123.83	1618.90	1520.41	5.270
45	52.55	100.00	490.05	143.00	126.16	1598.19	1500.00	5.270
46	52.55	100.00	489.00	143.00	119.22	1659.80	1561.22	5.271
47	55.71	100.00	489.53	143.00	126.23	1598.34	1500.00	5.272
48	56.76	100.06	489.00	143.00	126.15	1598.45	1500.00	5.272
49	54.66	100.00	489.00	143.00	121.56	1639.36	1540.82	5.272
50	52.55	100.00	489.53	143.00	121.69	1639.26	1540.82	5.272
51	51.50	100.00	490.05	143.00	123.98	1618.68	1520.41	5.272
52	53.08	100.00	490.05	143.00	126.25	1598.21	1500.00	5.272
53	53.08	100.00	489.00	143.00	119.30	1659.82	1561.22	5.273
54	56.24	100.00	489.53	143.00	126.32	1598.36	1500.00	5.274
55	54.66	100.00	489.53	143.00	124.04	1618.82	1520.41	5.274
56	55.18	100.00	489.00	143.00	121.64	1639.38	1540.82	5.274
57	54.13	100.00	489.53	143.00	123.95	1618.80	1520.41	5.274
58	53.61	100.00	489.53	143.00	123.87	1618.78	1520.41	5.274
59	52.03	100.00	490.05	143.00	124.06	1618.70	1520.41	5.274
60	53.61	100.00	490.05	143.00	126.34	1598.24	1500.00	5.274
61	53.08	100.00	489.53	143.00	121.77	1639.28	1540.82	5.274
62	55.18	100.00	489.53	143.00	124.12	1618.84	1520.41	5.275
63	51.50	100.00	489.00	143.00	117.04	1680.27	1581.63	5.275
64	53.61	100.00	489.00	143.00	119.37	1659.84	1561.22	5.275
65	52.55	100.00	490.05	143.00	124.15	1618.72	1520.41	5.276
66	55.71	100.00	489.00	143.00	121.72	1639.40	1540.82	5.276
67	54.13	100.00	490.05	143.00	126.42	1598.26	1500.00	5.276
68	51.50	100.00	490.58	143.00	126.43	1598.13	1500.00	5.276

69	51.50	100.00	489.53	143.00	119.51	1659.74	1561.22	5.276
70	53.61	100.00	489.53	143.00	121.85	1639.30	1540.82	5.277
71	52.03	100.00	489.00	143.00	117.12	1680.29	1581.63	5.277
72	54.13	100.00	489.00	143.00	119.45	1659.86	1561.22	5.278
73	55.71	100.00	489.53	143.00	124.20	1618.86	1520.41	5.278
74	53.08	100.00	490.05	143.00	124.23	1618.74	1520.41	5.278
75	54.66	100.00	490.05	143.00	126.51	1598.28	1500.00	5.278
76	56.24	100.00	489.00	143.00	121.80	1639.42	1540.82	5.278
77	52.03	100.00	490.58	143.00	126.52	1598.15	1500.00	5.279
78	52.03	100.00	489.53	143.00	119.59	1659.76	1561.22	5.279
79	54.13	100.00	489.53	143.00	121.93	1639.32	1540.82	5.279
80	52.55	100.00	489.00	143.00	117.20	1680.31	1581.63	5.279
81	54.66	100.00	489.00	143.00	119.53	1659.88	1561.22	5.280
82	53.61	100.00	490.05	143.00	124.31	1618.76	1520.41	5.280
83	56.24	100.00	489.53	143.00	124.28	1618.88	1520.41	5.280
84	55.18	100.00	490.05	143.00	126.59	1598.30	1500.00	5.280
85	56.76	100.06	489.00	143.00	124.11	1618.97	1520.41	5.280
86	52.55	100.00	490.58	143.00	126.60	1598.17	1500.00	5.281
87	52.55	100.00	489.53	143.00	119.67	1659.78	1561.22	5.281
88	53.08	100.00	489.00	143.00	117.27	1680.33	1581.63	5.281
89	52.03	100.00	490.05	143.00	122.05	1639.22	1540.82	5.281
90	54.66	100.00	489.53	143.00	122.01	1639.34	1540.82	5.282
91	51.50	100.00	490.05	143.00	121.97	1639.20	1540.82	5.282
92	55.18	100.00	489.00	143.00	119.61	1659.89	1561.22	5.282
93	52.55	100.00	490.05	143.00	122.13	1639.24	1540.82	5.282
94	55.71	100.00	490.05	143.00	126.68	1598.32	1500.00	5.282
95	51.50	100.00	490.58	143.00	124.42	1618.66	1520.41	5.283
96	53.08	100.00	490.58	143.00	126.69	1598.19	1500.00	5.283
97	53.61	100.00	489.00	143.00	117.35	1680.35	1581.63	5.283
98	51.50	100.00	489.00	143.00	115.03	1700.78	1602.04	5.283
99	53.08	100.00	489.53	143.00	119.75	1659.80	1561.22	5.283

Critical Failure Surface (circle 1)

Intersects: XL: 51.50 YL: 100.00 XR: 489.00 YR: 143.00
Centre: XC: 125.11 YC: 1598.19 Radius: R: 1500.00

Generated failure surface: (20 points)

51.50	100.00	74.70	99.04	97.91	98.44	121.13	98.20	144.35	98.32
167.57	98.79	190.78	99.63	213.97	100.83	237.13	102.38	260.28	104.29
283.38	106.57	306.46	109.19	329.48	112.18	352.46	115.52	375.39	119.22
398.25	123.27	421.05	127.68	443.78	132.43	466.43	137.54	489.00	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 43 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	51.50	0.52	-2.4	5.00	5.00	3	100.00	18.0	72.92	12522.98	2511.40	1.00
2	56.50	12.80	-2.4	9.10	9.11	3	100.00	18.0	1712.55	22959.09	2622.13	1.00
3	65.60	34.63	-2.4	9.10	9.11	3	100.00	18.0	4606.73	23173.12	2814.39	1.00
4	74.70	74.80	-1.5	11.61	11.61	3	100.00	18.0	9927.22	29783.53	3019.68	1.00
5	86.31	108.22	-1.5	11.61	11.61	3	100.00	18.0	14340.25	30001.11	3239.29	1.00
6	97.91	140.64	-0.6	11.61	11.61	3	100.00	18.0	18612.04	30153.64	3445.13	1.00
7	109.52	171.99	-0.6	11.61	11.61	3	100.00	18.0	22733.26	30241.04	3639.25	1.00
8	121.13	202.32	0.3	11.61	11.61	3	100.00	18.0	26709.45	30264.29	3819.23	1.00
9	132.74	231.59	0.3	11.61	11.61	3	100.00	18.0	30536.97	30221.46	3987.84	1.00

10	144.35	259.75	1.2	11.61	11.61	3	100.00	18.0	34209.16	30112.66	4141.99	1.00
11	155.96	286.92	1.2	11.61	11.61	3	100.00	18.0	37740.84	29939.68	4285.08	1.00
12	167.57	312.91	2.1	11.60	11.61	3	100.00	18.0	41106.62	29701.62	4413.39	1.00
13	179.17	337.97	2.1	11.60	11.61	3	100.00	18.0	44341.00	29398.42	4530.94	1.00
14	190.78	220.72	3.0	7.16	7.17	3	100.00	18.0	28928.20	17982.46	4615.86	1.00
15	197.94	257.36	3.0	8.01	8.02	1	150.00	22.0	33714.35	19925.88	4675.95	1.00
16	205.95	268.32	3.0	8.01	8.02	1	150.00	22.0	35149.96	19718.87	4743.60	1.00
17	213.97	394.81	3.8	11.27	11.29	1	150.00	22.0	51719.64	27337.96	4810.26	1.00
18	225.23	414.50	3.8	11.27	11.29	1	150.00	22.0	54299.38	26805.12	4882.35	1.00
19	236.50	521.27	4.7	13.50	13.55	1	150.00	22.0	67861.52	31368.64	5007.44	1.00
20	250.00	402.06	4.7	10.28	10.31	1	150.00	22.0	52022.71	23244.19	5042.90	1.00
21	260.28	440.68	5.6	11.55	11.61	1	150.00	22.0	57000.56	25457.15	4909.61	1.00
22	271.83	427.55	5.6	11.55	11.61	1	150.00	22.0	55281.48	24634.35	4761.42	1.00
23	283.38	412.71	6.5	11.54	11.61	1	150.00	22.0	53337.82	23746.08	4598.07	1.00
24	294.92	397.54	6.5	11.54	11.61	1	150.00	22.0	51351.42	22793.77	4426.67	1.00
25	306.46	380.63	7.4	11.51	11.61	1	150.00	22.0	49137.62	21776.89	4240.36	1.00
26	317.97	363.45	7.4	11.51	11.61	1	150.00	22.0	46886.13	20695.44	4045.82	1.00
27	329.48	374.46	8.3	12.52	12.65	1	150.00	22.0	48265.32	21243.64	3826.87	1.00
28	342.00	295.34	8.3	10.46	10.57	2	0.00	35.0	37969.22	16644.68	3591.16	0.99
29	352.46	304.36	9.2	11.46	11.61	2	0.00	35.0	38946.12	17064.03	3357.16	0.99
30	363.93	283.17	9.2	11.46	11.61	2	0.00	35.0	36034.84	15724.82	3106.10	0.99
31	375.39	260.29	10.0	11.43	11.61	2	0.00	35.0	32910.82	14321.48	2840.77	0.99
32	386.82	237.13	10.0	11.43	11.61	2	0.00	35.0	29754.57	12853.87	2568.15	0.99
33	398.25	176.46	10.9	9.37	9.55	2	0.00	35.0	21955.34	9427.34	2308.03	0.99
34	407.63	159.48	10.9	9.37	9.55	2	0.00	35.0	19657.17	8348.24	2066.20	0.99
35	417.00	63.67	10.9	4.05	4.13	2	0.00	35.0	7800.34	3273.87	1896.98	0.99
36	421.05	160.63	11.8	11.36	11.61	2	0.00	35.0	19635.38	8067.01	1699.78	0.99
37	432.42	133.60	11.8	11.36	11.61	2	0.00	35.0	16256.54	6343.73	1406.49	0.99
38	443.78	83.58	12.7	8.72	8.94	2	0.00	35.0	10106.92	3672.60	1137.08	1.00
39	452.50	24.79	12.7	3.00	3.08	5	0.00	45.0	2636.42	1009.76	856.11	0.98
40	455.50	73.14	12.7	10.93	11.21	2	0.00	35.0	8716.04	2580.83	780.81	1.00
41	466.43	28.52	13.6	6.03	6.20	2	0.00	35.0	3329.74	669.47	538.26	1.00
42	472.46	14.47	13.6	4.13	4.25	1	150.00	22.0	1635.28	132.72	382.05	1.01
43	476.60	18.61	13.6	12.40	12.76	1	150.00	22.0	2046.67	0.00	155.19	1.01
		9768.33			441.19				1260996.50			

X-S Area: 9768.33 Path Length: 441.19 X-S Weight: 1260996.50

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Rec Full-EQ.gmf Processed: 15 Apr 2025 08:46:05

DATA: Analysis 1 - Case South B - Reclamation - Full Reservoir - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	143.00	452.50	143.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
300.00	100.00	417.00	139.00	452.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	452.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	452.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
452.50	143.00	455.50	143.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
455.50	143.00	510.00	143.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
455.50	139.00	510.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
455.50	100.00	510.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
452.50	97.00	510.00	97.00		

Slope Surface (4 points)

0.00	100.00	56.50	100.00	250.00	143.00	510.00	143.00

Phreatic Surface (2 points)

0.00	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects:	XL:	56.50	YL:	100.00	XR:	494.00	YR: 143.00
Centre:	XC:	80.81	YC:	2099.85	Radius:	R:	2000.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South B - Reclamation - Full Reservoir - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 2.385

Analysis Summary

There were: 17516 successful analyses from a total of 20001 trial failure surfaces
2485 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.27

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	51.50	100.00	489.00	143.00	125.11	1598.19	1500.00	2.265	<-- Critical Surface
2	52.03	100.00	489.00	143.00	125.20	1598.21	1500.00	2.266	
3	52.55	100.00	489.00	143.00	125.28	1598.24	1500.00	2.267	
4	53.08	100.00	489.00	143.00	125.37	1598.26	1500.00	2.267	
5	53.61	100.00	489.00	143.00	125.45	1598.28	1500.00	2.268	
6	51.50	100.00	489.53	143.00	125.55	1598.17	1500.00	2.268	
7	54.13	100.00	489.00	143.00	125.54	1598.30	1500.00	2.268	
8	52.03	100.00	489.53	143.00	125.64	1598.19	1500.00	2.268	
9	54.66	100.00	489.00	143.00	125.62	1598.32	1500.00	2.269	

10	52.55	100.00	489.53	143.00	125.72	1598.21	1500.00	2.269
11	51.50	100.00	489.00	143.00	123.09	1618.72	1520.41	2.269
12	55.18	100.00	489.00	143.00	125.71	1598.34	1500.00	2.269
13	53.08	100.00	489.53	143.00	125.81	1598.24	1500.00	2.269
14	52.03	100.00	489.00	143.00	123.18	1618.74	1520.41	2.270
15	55.71	100.00	489.00	143.00	125.79	1598.36	1500.00	2.270
16	51.50	100.00	490.05	143.00	125.99	1598.15	1500.00	2.270
17	53.61	100.00	489.53	143.00	125.90	1598.26	1500.00	2.270
18	52.55	100.00	489.00	143.00	123.26	1618.76	1520.41	2.270
19	54.13	100.00	489.53	143.00	125.98	1598.28	1500.00	2.271
20	52.03	100.00	490.05	143.00	126.08	1598.17	1500.00	2.271
21	54.66	100.00	489.53	143.00	126.07	1598.30	1500.00	2.271
22	52.55	100.00	490.05	143.00	126.16	1598.19	1500.00	2.271
23	51.50	100.00	489.53	143.00	123.54	1618.70	1520.41	2.271
24	55.18	100.00	489.53	143.00	126.15	1598.32	1500.00	2.272
25	53.08	100.00	490.05	143.00	126.25	1598.21	1500.00	2.272
26	52.03	100.00	489.53	143.00	123.62	1618.72	1520.41	2.272
27	54.13	100.00	489.00	143.00	123.51	1618.82	1520.41	2.272
28	56.24	100.00	489.00	143.00	125.87	1598.38	1500.00	2.272
29	55.71	100.00	489.53	143.00	126.23	1598.34	1500.00	2.272
30	54.66	100.00	489.00	143.00	123.59	1618.84	1520.41	2.272
31	51.50	100.00	490.58	143.00	126.43	1598.13	1500.00	2.272
32	53.61	100.00	490.05	143.00	126.34	1598.24	1500.00	2.272
33	53.61	100.00	489.00	143.00	123.43	1618.80	1520.41	2.272
34	52.55	100.00	489.53	143.00	123.70	1618.74	1520.41	2.272
35	51.50	100.00	489.00	143.00	121.08	1639.24	1540.82	2.273
36	56.24	100.00	489.53	143.00	126.32	1598.36	1500.00	2.273
37	53.08	100.00	489.00	143.00	123.34	1618.78	1520.41	2.273
38	52.03	100.00	490.58	143.00	126.52	1598.15	1500.00	2.273
39	54.13	100.00	490.05	143.00	126.42	1598.26	1500.00	2.273
40	53.08	100.00	489.53	143.00	123.79	1618.76	1520.41	2.273
41	56.76	100.06	489.00	143.00	126.15	1598.45	1500.00	2.273
42	55.18	100.00	489.00	143.00	123.67	1618.86	1520.41	2.273
43	52.03	100.00	489.00	143.00	121.16	1639.26	1540.82	2.273
44	54.66	100.00	490.05	143.00	126.51	1598.28	1500.00	2.273
45	52.55	100.00	490.58	143.00	126.60	1598.17	1500.00	2.274
46	51.50	100.00	490.05	143.00	123.98	1618.68	1520.41	2.274
47	55.71	100.00	489.00	143.00	123.75	1618.88	1520.41	2.274
48	55.18	100.00	490.05	143.00	126.59	1598.30	1500.00	2.274
49	53.08	100.00	490.58	143.00	126.69	1598.19	1500.00	2.274
50	52.55	100.00	489.00	143.00	121.24	1639.28	1540.82	2.274
51	52.03	100.00	490.05	143.00	124.06	1618.70	1520.41	2.274
52	55.71	100.00	490.05	143.00	126.68	1598.32	1500.00	2.275
53	51.50	100.00	491.11	143.00	126.87	1598.11	1500.00	2.275
54	56.24	100.00	489.00	143.00	123.83	1618.90	1520.41	2.275
55	53.61	100.00	490.58	143.00	126.78	1598.21	1500.00	2.275
56	52.55	100.00	490.05	143.00	124.15	1618.72	1520.41	2.275
57	54.66	100.00	489.53	143.00	124.04	1618.82	1520.41	2.275
58	53.08	100.00	489.00	143.00	121.32	1639.30	1540.82	2.275
59	56.24	100.00	490.05	143.00	126.76	1598.34	1500.00	2.275
60	55.18	100.00	489.53	143.00	124.12	1618.84	1520.41	2.275
61	52.03	100.00	491.11	143.00	126.96	1598.13	1500.00	2.275
62	54.13	100.00	489.53	143.00	123.95	1618.80	1520.41	2.275
63	54.13	100.00	490.58	143.00	126.86	1598.24	1500.00	2.275
64	53.08	100.00	490.05	143.00	124.23	1618.74	1520.41	2.275

65	52.03	100.00	489.53	143.00	121.60	1639.24	1540.82	2.275
66	53.61	100.00	489.53	143.00	123.87	1618.78	1520.41	2.276
67	51.50	100.00	489.53	143.00	121.52	1639.22	1540.82	2.276
68	53.61	100.00	489.00	143.00	121.40	1639.32	1540.82	2.276
69	52.55	100.00	491.11	143.00	127.04	1598.15	1500.00	2.276
70	53.61	100.00	490.05	143.00	124.31	1618.76	1520.41	2.276
71	54.66	100.00	490.58	143.00	126.95	1598.26	1500.00	2.276
72	55.71	100.00	489.53	143.00	124.20	1618.86	1520.41	2.276
73	51.50	100.00	490.58	143.00	124.42	1618.66	1520.41	2.276
74	56.76	100.06	489.53	143.00	126.60	1598.43	1500.00	2.276
75	52.55	100.00	489.53	143.00	121.69	1639.26	1540.82	2.276
76	55.18	100.00	490.58	143.00	127.03	1598.28	1500.00	2.276
77	53.08	100.00	491.11	143.00	127.13	1598.17	1500.00	2.276
78	54.13	100.00	489.00	143.00	121.48	1639.34	1540.82	2.277
79	52.03	100.00	490.58	143.00	124.50	1618.68	1520.41	2.277
80	56.24	100.00	489.53	143.00	124.28	1618.88	1520.41	2.277
81	51.50	100.00	491.63	143.00	127.31	1598.08	1500.00	2.277
82	55.71	100.00	490.58	143.00	127.12	1598.30	1500.00	2.277
83	53.61	100.00	491.11	143.00	127.22	1598.19	1500.00	2.277
84	53.08	100.00	489.53	143.00	121.77	1639.28	1540.82	2.277
85	52.55	100.00	490.58	143.00	124.59	1618.70	1520.41	2.277
86	54.66	100.00	489.00	143.00	121.56	1639.36	1540.82	2.277
87	52.03	100.00	491.63	143.00	127.39	1598.11	1500.00	2.277
88	56.24	100.00	490.58	143.00	127.20	1598.32	1500.00	2.277
89	54.13	100.00	491.11	143.00	127.30	1598.21	1500.00	2.278
90	53.08	100.00	490.58	143.00	124.67	1618.72	1520.41	2.278
91	55.18	100.00	490.05	143.00	124.56	1618.82	1520.41	2.278
92	51.50	100.00	489.00	143.00	119.06	1659.76	1561.22	2.278
93	53.61	100.00	489.53	143.00	121.85	1639.30	1540.82	2.278
94	55.18	100.00	489.00	143.00	121.64	1639.38	1540.82	2.278
95	55.71	100.00	490.05	143.00	124.64	1618.84	1520.41	2.278
96	56.76	100.06	489.00	143.00	124.11	1618.97	1520.41	2.278
97	54.66	100.00	490.05	143.00	124.48	1618.80	1520.41	2.278
98	52.55	100.00	491.63	143.00	127.48	1598.13	1500.00	2.278
99	53.61	100.00	490.58	143.00	124.76	1618.74	1520.41	2.278

Critical Failure Surface (circle 1)

Intersects: XL: 51.50 YL: 100.00 XR: 489.00 YR: 143.00
Centre: XC: 125.11 YC: 1598.19 Radius: R: 1500.00

Generated failure surface: (20 points)

51.50	100.00	74.70	99.04	97.91	98.44	121.13	98.20	144.35	98.32
167.57	98.79	190.78	99.63	213.97	100.83	237.13	102.38	260.28	104.29
283.38	106.57	306.46	109.19	329.48	112.18	352.46	115.52	375.39	119.22
398.25	123.27	421.05	127.68	443.78	132.43	466.43	137.54	489.00	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 43 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	51.50	0.52	-2.4	5.00	5.00	3	100.00	18.0	72.92	12522.98	2512.47	1.01
2	56.50	12.80	-2.4	9.10	9.11	3	100.00	18.0	1712.55	22959.09	2623.52	1.01
3	65.60	34.63	-2.4	9.10	9.11	3	100.00	18.0	4606.73	23173.12	2816.35	1.01
4	74.70	74.80	-1.5	11.61	11.61	3	100.00	18.0	9927.22	29783.53	3021.30	1.00
5	86.31	108.22	-1.5	11.61	11.61	3	100.00	18.0	14340.25	30001.11	3241.33	1.00

6	97.91	140.64	-0.6	11.61	11.61	3	100.00	18.0	18612.04	30153.64	3446.11	1.00
7	109.52	171.99	-0.6	11.61	11.61	3	100.00	18.0	22733.26	30241.04	3640.38	1.00
8	121.13	202.32	0.3	11.61	11.61	3	100.00	18.0	26709.45	30264.29	3818.60	1.00
9	132.74	231.59	0.3	11.61	11.61	3	100.00	18.0	30536.97	30221.46	3987.14	1.00
10	144.35	259.75	1.2	11.61	11.61	3	100.00	18.0	34209.16	30112.66	4138.89	1.00
11	155.96	286.92	1.2	11.61	11.61	3	100.00	18.0	37740.84	29939.68	4281.71	1.00
12	167.57	312.91	2.1	11.60	11.61	3	100.00	18.0	41106.62	29701.62	4407.07	1.00
13	179.17	337.97	2.1	11.60	11.61	3	100.00	18.0	44341.00	29398.42	4524.20	1.00
14	190.78	220.72	3.0	7.16	7.17	3	100.00	18.0	28928.20	17982.46	4605.79	0.99
15	197.94	257.36	3.0	8.01	8.02	1	150.00	22.0	33714.35	19925.88	4662.68	0.99
16	205.95	268.32	3.0	8.01	8.02	1	150.00	22.0	35149.96	19718.87	4729.85	0.99
17	213.97	394.81	3.8	11.27	11.29	1	150.00	22.0	51719.64	27337.96	4791.71	0.99
18	225.23	414.50	3.8	11.27	11.29	1	150.00	22.0	54299.38	26805.12	4863.00	0.99
19	236.50	521.27	4.7	13.50	13.55	1	150.00	22.0	67861.52	31368.64	4982.38	0.99
20	250.00	402.06	4.7	10.28	10.31	1	150.00	22.0	52022.71	23244.19	5016.82	0.99
21	260.28	440.68	5.6	11.55	11.61	1	150.00	22.0	57000.56	25457.15	4879.39	0.99
22	271.83	427.55	5.6	11.55	11.61	1	150.00	22.0	55281.48	24634.35	4731.96	0.99
23	283.38	412.71	6.5	11.54	11.61	1	150.00	22.0	53337.82	23746.08	4564.99	0.99
24	294.92	397.54	6.5	11.54	11.61	1	150.00	22.0	51351.42	22793.77	4394.60	0.99
25	306.46	380.63	7.4	11.51	11.61	1	150.00	22.0	49137.62	21776.89	4205.23	0.99
26	317.97	363.45	7.4	11.51	11.61	1	150.00	22.0	46886.13	20695.44	4011.99	0.99
27	329.48	374.46	8.3	12.52	12.65	1	150.00	22.0	48265.32	21243.64	3790.69	0.98
28	342.00	295.34	8.3	10.46	10.57	2	0.00	35.0	37969.22	16644.68	3541.89	0.97
29	352.46	304.36	9.2	11.46	11.61	2	0.00	35.0	38946.12	17064.03	3306.25	0.96
30	363.93	283.17	9.2	11.46	11.61	2	0.00	35.0	36034.84	15724.82	3058.85	0.96
31	375.39	260.29	10.0	11.43	11.61	2	0.00	35.0	32910.82	14321.48	2793.36	0.96
32	386.82	237.13	10.0	11.43	11.61	2	0.00	35.0	29754.57	12853.87	2525.05	0.96
33	398.25	176.46	10.9	9.37	9.55	2	0.00	35.0	21955.34	9427.34	2265.75	0.96
34	407.63	159.48	10.9	9.37	9.55	2	0.00	35.0	19657.17	8348.24	2028.05	0.96
35	417.00	63.67	10.9	4.05	4.13	2	0.00	35.0	7800.34	3273.87	1861.66	0.96
36	421.05	160.63	11.8	11.36	11.61	2	0.00	35.0	19635.38	8067.01	1665.09	0.96
37	432.42	133.60	11.8	11.36	11.61	2	0.00	35.0	16256.54	6343.73	1376.80	0.96
38	443.78	83.58	12.7	8.72	8.94	2	0.00	35.0	10106.92	3672.60	1110.19	0.96
39	452.50	24.79	12.7	3.00	3.08	5	0.00	45.0	2636.42	1009.76	828.97	0.93
40	455.50	73.14	12.7	10.93	11.21	2	0.00	35.0	8716.04	2580.83	760.43	0.96
41	466.43	28.52	13.6	6.03	6.20	2	0.00	35.0	3329.74	669.47	521.26	0.96
42	472.46	14.47	13.6	4.13	4.25	1	150.00	22.0	1635.28	132.72	365.08	0.99
43	476.60	18.61	13.6	12.40	12.76	1	150.00	22.0	2046.67	0.00	142.83	0.99

X-S Area: 9768.33 Path Length: 441.19 X-S Weight: 1260996.50

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Rec Rapid Drawdown.gmf Processed: 15 Apr 2025 08:46:49

DATA: Analysis 1 - Case South B - Reclamation - Rapid Drawdown

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	143.00	452.50	143.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
300.00	100.00	417.00	139.00	452.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	452.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	452.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
452.50	143.00	455.50	143.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
455.50	143.00	510.00	143.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
455.50	139.00	510.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
455.50	100.00	510.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
452.50	97.00	510.00	97.00		

Slope Surface (4 points)

0.00	100.00	56.50	100.00	250.00	143.00	510.00	143.00

Phreatic Surface (4 points)

0.00	100.00	56.50	100.00	236.50	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 56.50 YL: 100.00 XR: 494.00 YR: 143.00

Centre: XC: 80.81 YC: 2099.85 Radius: R: 2000.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

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RESULTS: Analysis 1 - Case South B - Reclamation - Rapid Drawdown

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 3.136

Analysis Summary

There were: 17516 successful analyses from a total of 20001 trial failure surfaces
2485 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.96

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	51.50	100.00	489.00	143.00	125.11	1598.19	1500.00	2.962	<-- Critical Surface
2	52.03	100.00	489.00	143.00	125.20	1598.21	1500.00	2.963	
3	52.55	100.00	489.00	143.00	125.28	1598.24	1500.00	2.965	
4	53.08	100.00	489.00	143.00	125.37	1598.26	1500.00	2.966	
5	51.50	100.00	489.00	143.00	123.09	1618.72	1520.41	2.966	
6	53.61	100.00	489.00	143.00	125.45	1598.28	1500.00	2.967	
7	52.03	100.00	489.00	143.00	123.18	1618.74	1520.41	2.967	
8	51.50	100.00	489.53	143.00	125.55	1598.17	1500.00	2.968	
9	54.13	100.00	489.00	143.00	125.54	1598.30	1500.00	2.968	
10	52.55	100.00	489.00	143.00	123.26	1618.76	1520.41	2.969	
11	52.03	100.00	489.53	143.00	125.64	1598.19	1500.00	2.969	
12	54.66	100.00	489.00	143.00	125.62	1598.32	1500.00	2.970	
13	52.55	100.00	489.53	143.00	125.72	1598.21	1500.00	2.970	

14	51.50	100.00	489.00	143.00	121.08	1639.24	1540.82	2.970
15	55.18	100.00	489.00	143.00	125.71	1598.34	1500.00	2.971
16	53.08	100.00	489.53	143.00	125.81	1598.24	1500.00	2.972
17	51.50	100.00	489.53	143.00	123.54	1618.70	1520.41	2.972
18	52.03	100.00	489.00	143.00	121.16	1639.26	1540.82	2.972
19	55.71	100.00	489.00	143.00	125.79	1598.36	1500.00	2.972
20	53.61	100.00	489.00	143.00	123.43	1618.80	1520.41	2.973
21	53.08	100.00	489.00	143.00	123.34	1618.78	1520.41	2.973
22	54.13	100.00	489.00	143.00	123.51	1618.82	1520.41	2.973
23	53.61	100.00	489.53	143.00	125.90	1598.26	1500.00	2.973
24	52.03	100.00	489.53	143.00	123.62	1618.72	1520.41	2.973
25	51.50	100.00	490.05	143.00	125.99	1598.15	1500.00	2.973
26	52.55	100.00	489.00	143.00	121.24	1639.28	1540.82	2.974
27	54.66	100.00	489.00	143.00	123.59	1618.84	1520.41	2.974
28	54.13	100.00	489.53	143.00	125.98	1598.28	1500.00	2.974
29	52.55	100.00	489.53	143.00	123.70	1618.74	1520.41	2.974
30	52.03	100.00	490.05	143.00	126.08	1598.17	1500.00	2.975
31	53.08	100.00	489.00	143.00	121.32	1639.30	1540.82	2.975
32	55.18	100.00	489.00	143.00	123.67	1618.86	1520.41	2.975
33	54.66	100.00	489.53	143.00	126.07	1598.30	1500.00	2.976
34	53.08	100.00	489.53	143.00	123.79	1618.76	1520.41	2.976
35	56.24	100.00	489.00	143.00	125.87	1598.38	1500.00	2.976
36	52.55	100.00	490.05	143.00	126.16	1598.19	1500.00	2.976
37	53.61	100.00	489.00	143.00	121.40	1639.32	1540.82	2.977
38	51.50	100.00	489.00	143.00	119.06	1659.76	1561.22	2.977
39	55.18	100.00	489.53	143.00	126.15	1598.32	1500.00	2.977
40	55.71	100.00	489.00	143.00	123.75	1618.88	1520.41	2.977
41	51.50	100.00	489.53	143.00	121.52	1639.22	1540.82	2.977
42	52.03	100.00	489.53	143.00	121.60	1639.24	1540.82	2.977
43	53.08	100.00	490.05	143.00	126.25	1598.21	1500.00	2.977
44	51.50	100.00	490.05	143.00	123.98	1618.68	1520.41	2.978
45	55.71	100.00	489.53	143.00	126.23	1598.34	1500.00	2.978
46	52.03	100.00	489.00	143.00	119.14	1659.78	1561.22	2.978
47	54.13	100.00	489.00	143.00	121.48	1639.34	1540.82	2.978
48	56.24	100.00	489.00	143.00	123.83	1618.90	1520.41	2.978
49	53.61	100.00	490.05	143.00	126.34	1598.24	1500.00	2.979
50	52.55	100.00	489.53	143.00	121.69	1639.26	1540.82	2.979
51	52.03	100.00	490.05	143.00	124.06	1618.70	1520.41	2.979
52	51.50	100.00	490.58	143.00	126.43	1598.13	1500.00	2.979
53	56.76	100.06	489.00	143.00	126.15	1598.45	1500.00	2.979
54	56.24	100.00	489.53	143.00	126.32	1598.36	1500.00	2.979
55	52.55	100.00	489.00	143.00	119.22	1659.80	1561.22	2.979
56	54.66	100.00	489.00	143.00	121.56	1639.36	1540.82	2.980
57	53.61	100.00	489.53	143.00	123.87	1618.78	1520.41	2.980
58	54.13	100.00	489.53	143.00	123.95	1618.80	1520.41	2.980
59	54.66	100.00	489.53	143.00	124.04	1618.82	1520.41	2.980
60	54.13	100.00	490.05	143.00	126.42	1598.26	1500.00	2.980
61	52.55	100.00	490.05	143.00	124.15	1618.72	1520.41	2.980
62	52.03	100.00	490.58	143.00	126.52	1598.15	1500.00	2.980
63	53.08	100.00	489.53	143.00	121.77	1639.28	1540.82	2.980
64	55.18	100.00	489.53	143.00	124.12	1618.84	1520.41	2.981
65	53.08	100.00	489.00	143.00	119.30	1659.82	1561.22	2.981
66	55.18	100.00	489.00	143.00	121.64	1639.38	1540.82	2.981
67	54.66	100.00	490.05	143.00	126.51	1598.28	1500.00	2.981
68	53.08	100.00	490.05	143.00	124.23	1618.74	1520.41	2.981

69	52.55	100.00	490.58	143.00	126.60	1598.17	1500.00	2.982
70	51.50	100.00	489.53	143.00	119.51	1659.74	1561.22	2.982
71	53.61	100.00	489.53	143.00	121.85	1639.30	1540.82	2.982
72	53.61	100.00	489.00	143.00	119.37	1659.84	1561.22	2.982
73	51.50	100.00	489.00	143.00	117.04	1680.27	1581.63	2.982
74	55.71	100.00	489.53	143.00	124.20	1618.86	1520.41	2.982
75	55.71	100.00	489.00	143.00	121.72	1639.40	1540.82	2.982
76	55.18	100.00	490.05	143.00	126.59	1598.30	1500.00	2.983
77	53.61	100.00	490.05	143.00	124.31	1618.76	1520.41	2.983
78	53.08	100.00	490.58	143.00	126.69	1598.19	1500.00	2.983
79	51.50	100.00	490.58	143.00	124.42	1618.66	1520.41	2.983
80	52.03	100.00	489.53	143.00	119.59	1659.76	1561.22	2.983
81	54.13	100.00	489.53	143.00	121.93	1639.32	1540.82	2.983
82	54.13	100.00	489.00	143.00	119.45	1659.86	1561.22	2.984
83	52.03	100.00	489.00	143.00	117.12	1680.29	1581.63	2.984
84	51.50	100.00	490.05	143.00	121.97	1639.20	1540.82	2.984
85	56.24	100.00	489.53	143.00	124.28	1618.88	1520.41	2.984
86	55.71	100.00	490.05	143.00	126.68	1598.32	1500.00	2.984
87	56.24	100.00	489.00	143.00	121.80	1639.42	1540.82	2.984
88	52.03	100.00	490.05	143.00	122.05	1639.22	1540.82	2.984
89	52.55	100.00	490.05	143.00	122.13	1639.24	1540.82	2.984
90	53.61	100.00	490.58	143.00	126.78	1598.21	1500.00	2.984
91	52.03	100.00	490.58	143.00	124.50	1618.68	1520.41	2.985
92	51.50	100.00	491.11	143.00	126.87	1598.11	1500.00	2.985
93	56.76	100.06	489.00	143.00	124.11	1618.97	1520.41	2.985
94	52.55	100.00	489.53	143.00	119.67	1659.78	1561.22	2.985
95	52.55	100.00	489.00	143.00	117.20	1680.31	1581.63	2.985
96	54.66	100.00	489.00	143.00	119.53	1659.88	1561.22	2.985
97	54.66	100.00	489.53	143.00	122.01	1639.34	1540.82	2.985
98	56.24	100.00	490.05	143.00	126.76	1598.34	1500.00	2.985
99	53.08	100.00	490.05	143.00	122.21	1639.26	1540.82	2.986

Critical Failure Surface (circle 1)

Intersects: XL: 51.50 YL: 100.00 XR: 489.00 YR: 143.00
Centre: XC: 125.11 YC: 1598.19 Radius: R: 1500.00

Generated failure surface: (20 points)

51.50	100.00	74.70	99.04	97.91	98.44	121.13	98.20	144.35	98.32
167.57	98.79	190.78	99.63	213.97	100.83	237.13	102.38	260.28	104.29
283.38	106.57	306.46	109.19	329.48	112.18	352.46	115.52	375.39	119.22
398.25	123.27	421.05	127.68	443.78	132.43	466.43	137.54	489.00	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 43 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	51.50	0.52	-2.4	5.00	5.00	3	100.00	18.0	72.92	32.30	16.03	1.01
2	56.50	12.80	-2.4	9.10	9.11	3	100.00	18.0	1712.55	799.30	190.04	1.01
3	65.60	34.63	-2.4	9.10	9.11	3	100.00	18.0	4606.73	2162.75	508.83	1.01
4	74.70	74.80	-1.5	11.61	11.61	3	100.00	18.0	9927.22	4668.88	857.49	1.00
5	86.31	108.22	-1.5	11.61	11.61	3	100.00	18.0	14340.25	6755.06	1238.29	1.00
6	97.91	140.64	-0.6	11.61	11.61	3	100.00	18.0	18612.04	8776.41	1604.47	1.00
7	109.52	171.99	-0.6	11.61	11.61	3	100.00	18.0	22733.26	10732.93	1959.67	1.00
8	121.13	202.32	0.3	11.61	11.61	3	100.00	18.0	26709.45	12624.81	2299.61	1.00
9	132.74	231.59	0.3	11.61	11.61	3	100.00	18.0	30536.97	14451.28	2629.18	1.00

10	144.35	259.75	1.2	11.61	11.61	3	100.00	18.0	34209.16	16211.98	2942.90	1.00
11	155.96	286.92	1.2	11.61	11.61	3	100.00	18.0	37740.84	17907.80	3246.79	1.00
12	167.57	312.91	2.1	11.60	11.61	3	100.00	18.0	41106.62	19538.14	3534.29	1.00
13	179.17	337.97	2.1	11.60	11.61	3	100.00	18.0	44341.00	21102.94	3812.49	1.00
14	190.78	220.72	3.0	7.16	7.17	3	100.00	18.0	28928.20	13791.54	4025.55	1.00
15	197.94	257.36	3.0	8.01	8.02	1	150.00	22.0	33714.35	16080.70	4188.98	0.99
16	205.95	268.32	3.0	8.01	8.02	1	150.00	22.0	35149.96	16765.44	4367.48	0.99
17	213.97	394.81	3.8	11.27	11.29	1	150.00	22.0	51719.64	24691.33	4564.99	0.99
18	225.23	414.50	3.8	11.27	11.29	1	150.00	22.0	54299.38	25922.92	4792.86	0.99
19	236.50	521.27	4.7	13.50	13.55	1	150.00	22.0	67861.52	31368.64	4992.71	0.99
20	250.00	402.06	4.7	10.28	10.31	1	150.00	22.0	52022.71	23244.19	5027.56	0.99
21	260.28	440.68	5.6	11.55	11.61	1	150.00	22.0	57000.56	25457.15	4891.83	0.99
22	271.83	427.55	5.6	11.55	11.61	1	150.00	22.0	55281.48	24634.35	4744.08	0.99
23	283.38	412.71	6.5	11.54	11.61	1	150.00	22.0	53337.82	23746.08	4578.60	0.99
24	294.92	397.54	6.5	11.54	11.61	1	150.00	22.0	51351.42	22793.77	4407.79	0.99
25	306.46	380.63	7.4	11.51	11.61	1	150.00	22.0	49137.62	21776.89	4219.66	0.99
26	317.97	363.45	7.4	11.51	11.61	1	150.00	22.0	46886.13	20695.44	4025.89	0.99
27	329.48	374.46	8.3	12.52	12.65	1	150.00	22.0	48265.32	21243.64	3805.54	0.99
28	342.00	295.34	8.3	10.46	10.57	2	0.00	35.0	37969.22	16644.68	3561.99	0.98
29	352.46	304.36	9.2	11.46	11.61	2	0.00	35.0	38946.12	17064.03	3326.99	0.98
30	363.93	283.17	9.2	11.46	11.61	2	0.00	35.0	36034.84	15724.82	3078.10	0.98
31	375.39	260.29	10.0	11.43	11.61	2	0.00	35.0	32910.82	14321.48	2812.64	0.97
32	386.82	237.13	10.0	11.43	11.61	2	0.00	35.0	29754.57	12853.87	2542.58	0.97
33	398.25	176.46	10.9	9.37	9.55	2	0.00	35.0	21955.34	9427.34	2282.92	0.97
34	407.63	159.48	10.9	9.37	9.55	2	0.00	35.0	19657.17	8348.24	2043.54	0.97
35	417.00	63.67	10.9	4.05	4.13	2	0.00	35.0	7800.34	3273.87	1876.00	0.97
36	421.05	160.63	11.8	11.36	11.61	2	0.00	35.0	19635.38	8067.01	1679.15	0.97
37	432.42	133.60	11.8	11.36	11.61	2	0.00	35.0	16256.54	6343.73	1388.84	0.97
38	443.78	83.58	12.7	8.72	8.94	2	0.00	35.0	10106.92	3672.60	1121.07	0.97
39	452.50	24.79	12.7	3.00	3.08	5	0.00	45.0	2636.42	1009.76	839.86	0.95
40	455.50	73.14	12.7	10.93	11.21	2	0.00	35.0	8716.04	2580.83	768.68	0.97
41	466.43	28.52	13.6	6.03	6.20	2	0.00	35.0	3329.74	669.47	528.13	0.97
42	472.46	14.47	13.6	4.13	4.25	1	150.00	22.0	1635.28	132.72	372.01	1.00
43	476.60	18.61	13.6	12.40	12.76	1	150.00	22.0	2046.67	0.00	147.87	1.00
		9768.33			441.19				1260996.50			

X-S Area: 9768.33 Path Length: 441.19 X-S Weight: 1260996.50

Project: Bennett Pit
File: C:\Galena Models\Bennett Case South B Rec Rapid Drawdown-EQ.gmf Processed: 15 Apr 2025 08:47:50

DATA: Analysis 1 - Case South B - Reclamation - Rapid Drawdown - Pseudostatic

Material Properties (5 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Overburden

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	150.00	22.0	110.00	Auto
Saturated:	150.00	22.0	131.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Sand and Gravel

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	35.0	110.00	Auto
Saturated:	0.00	35.0	125.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Weathered Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	100.00	18.0	125.00	Auto
Saturated:	100.00	18.0	141.00	Auto

Material: 4 (Mohr-Coulomb Isotropic) - Stable Bedrock

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	2000.00	20.0	125.00	Auto
Saturated:	2000.00	20.0	141.00	Auto

Material: 5 (Mohr-Coulomb Isotropic) - Slurry Wall

	Cohesion	Phi	UnitWeight	Ru
Unsaturated:	0.00	45.0	100.00	Auto
Saturated:	0.00	45.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (9 profiles)

Profile: 1 (2 points)	Material beneath: 1 - Overburden				
0.00	143.00	452.50	143.00		
Profile: 2 (3 points)	Material beneath: 2 - Sand and Gravel				
300.00	100.00	417.00	139.00	452.50	139.00
Profile: 3 (2 points)	Material beneath: 3 - Weathered Bedrock				
0.00	100.00	452.50	100.00		
Profile: 4 (2 points)	Material beneath: 4 - Stable Bedrock				
0.00	97.00	452.50	97.00		
Profile: 5 (2 points)	Material beneath: 5 - Slurry Wall				
452.50	143.00	455.50	143.00		
Profile: 6 (2 points)	Material beneath: 1 - Overburden				
455.50	143.00	510.00	143.00		
Profile: 7 (2 points)	Material beneath: 2 - Sand and Gravel				
455.50	139.00	510.00	139.00		
Profile: 8 (2 points)	Material beneath: 3 - Weathered Bedrock				
455.50	100.00	510.00	100.00		
Profile: 9 (2 points)	Material beneath: 4 - Stable Bedrock				
452.50	97.00	510.00	97.00		

Slope Surface (4 points)

0.00	100.00	56.50	100.00	250.00	143.00	510.00	143.00

Phreatic Surface (4 points)

0.00	100.00	56.50	100.00	236.50	140.00	510.00	140.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R

Intersects: XL: 56.50 YL: 100.00 XR: 494.00 YR: 143.00

Centre: XC: 80.81 YC: 2099.85 Radius: R: 2000.00

Earthquake Force

Pseudo-static earthquake (seismic) coefficient: 0.070

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	10.00	10.00	1000.00
Trial positions within range:	20	20	50

- -

RESULTS: Analysis 1 - Case South B - Reclamation - Rapid Drawdown - Pseudostatic

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Surface Search using Multiple Circle Generation Techniques

Initial failure surface approximation - Factor of Safety: 1.783

Analysis Summary

There were: 17516 successful analyses from a total of 20001 trial failure surfaces
2485 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.69

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	51.50	100.00	489.00	143.00	125.11	1598.19	1500.00	1.687	<-- Critical Surface
2	52.03	100.00	489.00	143.00	125.20	1598.21	1500.00	1.688	
3	52.55	100.00	489.00	143.00	125.28	1598.24	1500.00	1.688	
4	53.08	100.00	489.00	143.00	125.37	1598.26	1500.00	1.689	
5	51.50	100.00	489.53	143.00	125.55	1598.17	1500.00	1.689	
6	53.61	100.00	489.00	143.00	125.45	1598.28	1500.00	1.689	
7	52.03	100.00	489.53	143.00	125.64	1598.19	1500.00	1.690	
8	54.13	100.00	489.00	143.00	125.54	1598.30	1500.00	1.690	
9	51.50	100.00	489.00	143.00	123.09	1618.72	1520.41	1.690	

10	52.55	100.00	489.53	143.00	125.72	1598.21	1500.00	1.690
11	54.66	100.00	489.00	143.00	125.62	1598.32	1500.00	1.690
12	52.03	100.00	489.00	143.00	123.18	1618.74	1520.41	1.690
13	55.18	100.00	489.00	143.00	125.71	1598.34	1500.00	1.691
14	53.08	100.00	489.53	143.00	125.81	1598.24	1500.00	1.691
15	52.55	100.00	489.00	143.00	123.26	1618.76	1520.41	1.691
16	51.50	100.00	490.05	143.00	125.99	1598.15	1500.00	1.691
17	55.71	100.00	489.00	143.00	125.79	1598.36	1500.00	1.691
18	53.61	100.00	489.53	143.00	125.90	1598.26	1500.00	1.691
19	52.03	100.00	490.05	143.00	126.08	1598.17	1500.00	1.692
20	54.13	100.00	489.53	143.00	125.98	1598.28	1500.00	1.692
21	51.50	100.00	489.53	143.00	123.54	1618.70	1520.41	1.692
22	52.55	100.00	490.05	143.00	126.16	1598.19	1500.00	1.692
23	54.66	100.00	489.53	143.00	126.07	1598.30	1500.00	1.692
24	52.03	100.00	489.53	143.00	123.62	1618.72	1520.41	1.692
25	54.13	100.00	489.00	143.00	123.51	1618.82	1520.41	1.693
26	53.08	100.00	490.05	143.00	126.25	1598.21	1500.00	1.693
27	51.50	100.00	489.00	143.00	121.08	1639.24	1540.82	1.693
28	55.18	100.00	489.53	143.00	126.15	1598.32	1500.00	1.693
29	53.61	100.00	489.00	143.00	123.43	1618.80	1520.41	1.693
30	54.66	100.00	489.00	143.00	123.59	1618.84	1520.41	1.693
31	52.55	100.00	489.53	143.00	123.70	1618.74	1520.41	1.693
32	53.08	100.00	489.00	143.00	123.34	1618.78	1520.41	1.693
33	56.24	100.00	489.00	143.00	125.87	1598.38	1500.00	1.693
34	51.50	100.00	490.58	143.00	126.43	1598.13	1500.00	1.693
35	53.61	100.00	490.05	143.00	126.34	1598.24	1500.00	1.693
36	55.71	100.00	489.53	143.00	126.23	1598.34	1500.00	1.693
37	53.08	100.00	489.53	143.00	123.79	1618.76	1520.41	1.693
38	52.03	100.00	489.00	143.00	121.16	1639.26	1540.82	1.693
39	52.03	100.00	490.58	143.00	126.52	1598.15	1500.00	1.694
40	55.18	100.00	489.00	143.00	123.67	1618.86	1520.41	1.694
41	56.24	100.00	489.53	143.00	126.32	1598.36	1500.00	1.694
42	54.13	100.00	490.05	143.00	126.42	1598.26	1500.00	1.694
43	51.50	100.00	490.05	143.00	123.98	1618.68	1520.41	1.694
44	56.76	100.06	489.00	143.00	126.15	1598.45	1500.00	1.694
45	52.55	100.00	489.00	143.00	121.24	1639.28	1540.82	1.694
46	52.55	100.00	490.58	143.00	126.60	1598.17	1500.00	1.694
47	54.66	100.00	490.05	143.00	126.51	1598.28	1500.00	1.694
48	55.71	100.00	489.00	143.00	123.75	1618.88	1520.41	1.694
49	52.03	100.00	490.05	143.00	124.06	1618.70	1520.41	1.695
50	53.08	100.00	490.58	143.00	126.69	1598.19	1500.00	1.695
51	53.08	100.00	489.00	143.00	121.32	1639.30	1540.82	1.695
52	55.18	100.00	490.05	143.00	126.59	1598.30	1500.00	1.695
53	52.55	100.00	490.05	143.00	124.15	1618.72	1520.41	1.695
54	56.24	100.00	489.00	143.00	123.83	1618.90	1520.41	1.695
55	51.50	100.00	491.11	143.00	126.87	1598.11	1500.00	1.695
56	54.66	100.00	489.53	143.00	124.04	1618.82	1520.41	1.695
57	52.03	100.00	489.53	143.00	121.60	1639.24	1540.82	1.695
58	51.50	100.00	489.53	143.00	121.52	1639.22	1540.82	1.695
59	53.61	100.00	490.58	143.00	126.78	1598.21	1500.00	1.695
60	54.13	100.00	489.53	143.00	123.95	1618.80	1520.41	1.695
61	55.71	100.00	490.05	143.00	126.68	1598.32	1500.00	1.695
62	55.18	100.00	489.53	143.00	124.12	1618.84	1520.41	1.695
63	53.61	100.00	489.00	143.00	121.40	1639.32	1540.82	1.695
64	53.08	100.00	490.05	143.00	124.23	1618.74	1520.41	1.696

65	53.61	100.00	489.53	143.00	123.87	1618.78	1520.41	1.696
66	52.03	100.00	491.11	143.00	126.96	1598.13	1500.00	1.696
67	54.13	100.00	490.58	143.00	126.86	1598.24	1500.00	1.696
68	56.24	100.00	490.05	143.00	126.76	1598.34	1500.00	1.696
69	52.55	100.00	489.53	143.00	121.69	1639.26	1540.82	1.696
70	53.61	100.00	490.05	143.00	124.31	1618.76	1520.41	1.696
71	51.50	100.00	490.58	143.00	124.42	1618.66	1520.41	1.696
72	54.13	100.00	489.00	143.00	121.48	1639.34	1540.82	1.696
73	55.71	100.00	489.53	143.00	124.20	1618.86	1520.41	1.696
74	52.55	100.00	491.11	143.00	127.04	1598.15	1500.00	1.696
75	54.66	100.00	490.58	143.00	126.95	1598.26	1500.00	1.696
76	52.03	100.00	490.58	143.00	124.50	1618.68	1520.41	1.697
77	53.08	100.00	489.53	143.00	121.77	1639.28	1540.82	1.697
78	51.50	100.00	489.00	143.00	119.06	1659.76	1561.22	1.697
79	56.76	100.06	489.53	143.00	126.60	1598.43	1500.00	1.697
80	54.66	100.00	489.00	143.00	121.56	1639.36	1540.82	1.697
81	53.08	100.00	491.11	143.00	127.13	1598.17	1500.00	1.697
82	56.24	100.00	489.53	143.00	124.28	1618.88	1520.41	1.697
83	55.18	100.00	490.58	143.00	127.03	1598.28	1500.00	1.697
84	52.55	100.00	490.58	143.00	124.59	1618.70	1520.41	1.697
85	51.50	100.00	491.63	143.00	127.31	1598.08	1500.00	1.697
86	53.61	100.00	489.53	143.00	121.85	1639.30	1540.82	1.697
87	52.03	100.00	489.00	143.00	119.14	1659.78	1561.22	1.697
88	53.61	100.00	491.11	143.00	127.22	1598.19	1500.00	1.697
89	55.18	100.00	489.00	143.00	121.64	1639.38	1540.82	1.697
90	55.71	100.00	490.58	143.00	127.12	1598.30	1500.00	1.697
91	53.08	100.00	490.58	143.00	124.67	1618.72	1520.41	1.698
92	52.03	100.00	491.63	143.00	127.39	1598.11	1500.00	1.698
93	55.18	100.00	490.05	143.00	124.56	1618.82	1520.41	1.698
94	52.55	100.00	490.05	143.00	122.13	1639.24	1540.82	1.698
95	52.03	100.00	490.05	143.00	122.05	1639.22	1540.82	1.698
96	54.66	100.00	490.05	143.00	124.48	1618.80	1520.41	1.698
97	54.13	100.00	491.11	143.00	127.30	1598.21	1500.00	1.698
98	52.55	100.00	489.00	143.00	119.22	1659.80	1561.22	1.698
99	56.76	100.06	489.00	143.00	124.11	1618.97	1520.41	1.698

Critical Failure Surface (circle 1)

Intersects: XL: 51.50 YL: 100.00 XR: 489.00 YR: 143.00
Centre: XC: 125.11 YC: 1598.19 Radius: R: 1500.00

Generated failure surface: (20 points)

51.50	100.00	74.70	99.04	97.91	98.44	121.13	98.20	144.35	98.32
167.57	98.79	190.78	99.63	213.97	100.83	237.13	102.38	260.28	104.29
283.38	106.57	306.46	109.19	329.48	112.18	352.46	115.52	375.39	119.22
398.25	123.27	421.05	127.68	443.78	132.43	466.43	137.54	489.00	143.00

Slice Geometry and Properties - Critical Failure Surface (circle 1, 43 slices)

Slice	X-S	Base						PoreWater	Normal	Test
X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	51.50	0.52	-2.4	5.00	5.00	3	100.00	18.0	72.92	32.30	17.12	1.01
2	56.50	12.80	-2.4	9.10	9.11	3	100.00	18.0	1712.55	799.30	191.46	1.01
3	65.60	34.63	-2.4	9.10	9.11	3	100.00	18.0	4606.73	2162.75	510.83	1.01
4	74.70	74.80	-1.5	11.61	11.61	3	100.00	18.0	9927.22	4668.88	859.14	1.01
5	86.31	108.22	-1.5	11.61	11.61	3	100.00	18.0	14340.25	6755.06	1240.36	1.01

6	97.91	140.64	-0.6	11.61	11.61	3	100.00	18.0	18612.04	8776.41	1605.47	1.00
7	109.52	171.99	-0.6	11.61	11.61	3	100.00	18.0	22733.26	10732.93	1960.83	1.00
8	121.13	202.32	0.3	11.61	11.61	3	100.00	18.0	26709.45	12624.81	2298.97	1.00
9	132.74	231.59	0.3	11.61	11.61	3	100.00	18.0	30536.97	14451.28	2628.46	1.00
10	144.35	259.75	1.2	11.61	11.61	3	100.00	18.0	34209.16	16211.98	2939.75	1.00
11	155.96	286.92	1.2	11.61	11.61	3	100.00	18.0	37740.84	17907.80	3243.37	1.00
12	167.57	312.91	2.1	11.60	11.61	3	100.00	18.0	41106.62	19538.14	3527.88	0.99
13	179.17	337.97	2.1	11.60	11.61	3	100.00	18.0	44341.00	21102.94	3805.65	0.99
14	190.78	220.72	3.0	7.16	7.17	3	100.00	18.0	28928.20	13791.54	4015.35	0.99
15	197.94	257.36	3.0	8.01	8.02	1	150.00	22.0	33714.35	16080.70	4175.56	0.99
16	205.95	268.32	3.0	8.01	8.02	1	150.00	22.0	35149.96	16765.44	4353.56	0.99
17	213.97	394.81	3.8	11.27	11.29	1	150.00	22.0	51719.64	24691.33	4546.27	0.99
18	225.23	414.50	3.8	11.27	11.29	1	150.00	22.0	54299.38	25922.92	4773.33	0.99
19	236.50	521.27	4.7	13.50	13.55	1	150.00	22.0	67861.52	31368.64	4967.45	0.98
20	250.00	402.06	4.7	10.28	10.31	1	150.00	22.0	52022.71	23244.19	5001.28	0.98
21	260.28	440.68	5.6	11.55	11.61	1	150.00	22.0	57000.56	25457.15	4861.43	0.98
22	271.83	427.55	5.6	11.55	11.61	1	150.00	22.0	55281.48	24634.35	4714.45	0.98
23	283.38	412.71	6.5	11.54	11.61	1	150.00	22.0	53337.82	23746.08	4545.38	0.98
24	294.92	397.54	6.5	11.54	11.61	1	150.00	22.0	51351.42	22793.77	4375.59	0.98
25	306.46	380.63	7.4	11.51	11.61	1	150.00	22.0	49137.62	21776.89	4184.46	0.98
26	317.97	363.45	7.4	11.51	11.61	1	150.00	22.0	46886.13	20695.44	3991.99	0.98
27	329.48	374.46	8.3	12.52	12.65	1	150.00	22.0	48265.32	21243.64	3769.35	0.98
28	342.00	295.34	8.3	10.46	10.57	2	0.00	35.0	37969.22	16644.68	3513.30	0.95
29	352.46	304.36	9.2	11.46	11.61	2	0.00	35.0	38946.12	17064.03	3276.83	0.95
30	363.93	283.17	9.2	11.46	11.61	2	0.00	35.0	36034.84	15724.82	3031.55	0.95
31	375.39	260.29	10.0	11.43	11.61	2	0.00	35.0	32910.82	14321.48	2766.07	0.95
32	386.82	237.13	10.0	11.43	11.61	2	0.00	35.0	29754.57	12853.87	2500.25	0.95
33	398.25	176.46	10.9	9.37	9.55	2	0.00	35.0	21955.34	9427.34	2241.52	0.94
34	407.63	159.48	10.9	9.37	9.55	2	0.00	35.0	19657.17	8348.24	2006.18	0.94
35	417.00	63.67	10.9	4.05	4.13	2	0.00	35.0	7800.34	3273.87	1841.41	0.94
36	421.05	160.63	11.8	11.36	11.61	2	0.00	35.0	19635.38	8067.01	1645.28	0.94
37	432.42	133.60	11.8	11.36	11.61	2	0.00	35.0	16256.54	6343.73	1359.85	0.94
38	443.78	83.58	12.7	8.72	8.94	2	0.00	35.0	10106.92	3672.60	1094.90	0.94
39	452.50	24.79	12.7	3.00	3.08	5	0.00	45.0	2636.42	1009.76	813.90	0.90
40	455.50	73.14	12.7	10.93	11.21	2	0.00	35.0	8716.04	2580.83	748.84	0.94
41	466.43	28.52	13.6	6.03	6.20	2	0.00	35.0	3329.74	669.47	511.63	0.93
42	472.46	14.47	13.6	4.13	4.25	1	150.00	22.0	1635.28	132.72	355.23	0.97
43	476.60	18.61	13.6	12.40	12.76	1	150.00	22.0	2046.67	0.00	135.64	0.97
		---			---				---			
	X-S Area:	9768.33	Path Length:		441.19		X-S Weight:		1260996.50			

APPENDIX D

CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

September 1, 2016

Mr. JC York, P.E.
J&T Consulting, Inc.
305 Denver Avenue, Suite D
Fort Lupton, CO 80621

Subject: Subsurface and Laboratory Results
Bennett Property Gravel Site
Weld County, Colorado
Project No. 16.3066

Dear Mr. York:

Enclosed are boring logs and laboratory test results for the subsurface study at the project titled "Bennett Property Gravel Site" located at the northeast corner of Weld County Road (WCR) 25 and 22-1/2 between Platteville and Fort Lupton, Colorado. The site is bound by WCR 25 to the west, WCR 22-1/2 to the south, the South Platte River to the east, and farmland to the north. The study was conducted to assist in determining the nature and extent of potential gravel resources.

Subsurface conditions were investigated by drilling nine borings at the locations indicated in Figure 1. Boring locations were determined by others prior to drilling. The borings were advanced using an AP-1000 percussion hammer Becker drill rig with a 5 inch inner diameter dual wall steel drive pipe. This allows for continuous recovery of the subsurface materials. Bulk samples of the subsurface materials were collected from each boring at various intervals.

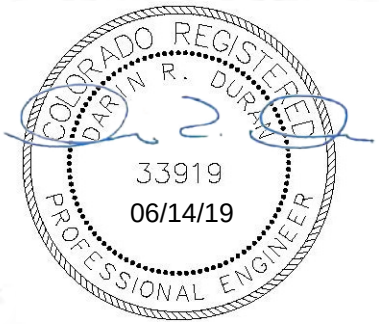
The subsurface conditions indicated 3 to 8 feet of topsoil over 27 to 48 feet of overburden soils, over bedrock. The overburden soils consisted of sands with varying amount of gravel, sandy gravel, and clay lenses. The clay lenses were encountered in Borings B-2 and B-4 at depths of 16 and 32 feet, respectively, and were a foot or less in thickness. Bedrock was encountered at depths of 32 to 52 feet and consisted of claystone, siltstone, and sandstone with lenses of lignite. In general, the top 1 to 3 feet of the bedrock was weathered. Groundwater was encountered at depths of 5 to 11 feet at the time of drilling. These observations represent conditions at the time and location of field exploration and may not be indicative of other times or other locations. Groundwater can be expected to fluctuate with various seasonal, irrigation, water level in the South Platte River, and weather conditions. A more complete description of subsurface conditions is shown in Figure 2 with Key to Symbols.

Samples were returned to the Cesare laboratory where they were visually classified and appropriate testing assigned to specific samples to evaluate grain size distribution of the bulk samples collected. Laboratory test results are presented in Table 1 and Appendix A.

7108 South Alton Way, Building B • Centennial, Colorado 80112 • www.cesareinc.com
Phone 303-220-0300 • Fax 303-220-0442

If you have any questions or comments in regards to this information, please feel free to contact our office.

Sincerely,
CESARE, INC.



Darin R. Duran, P.E.
Principal, Geotechnical Engineering Manager

DRD/ksm

Attachments

CESARE, INC.
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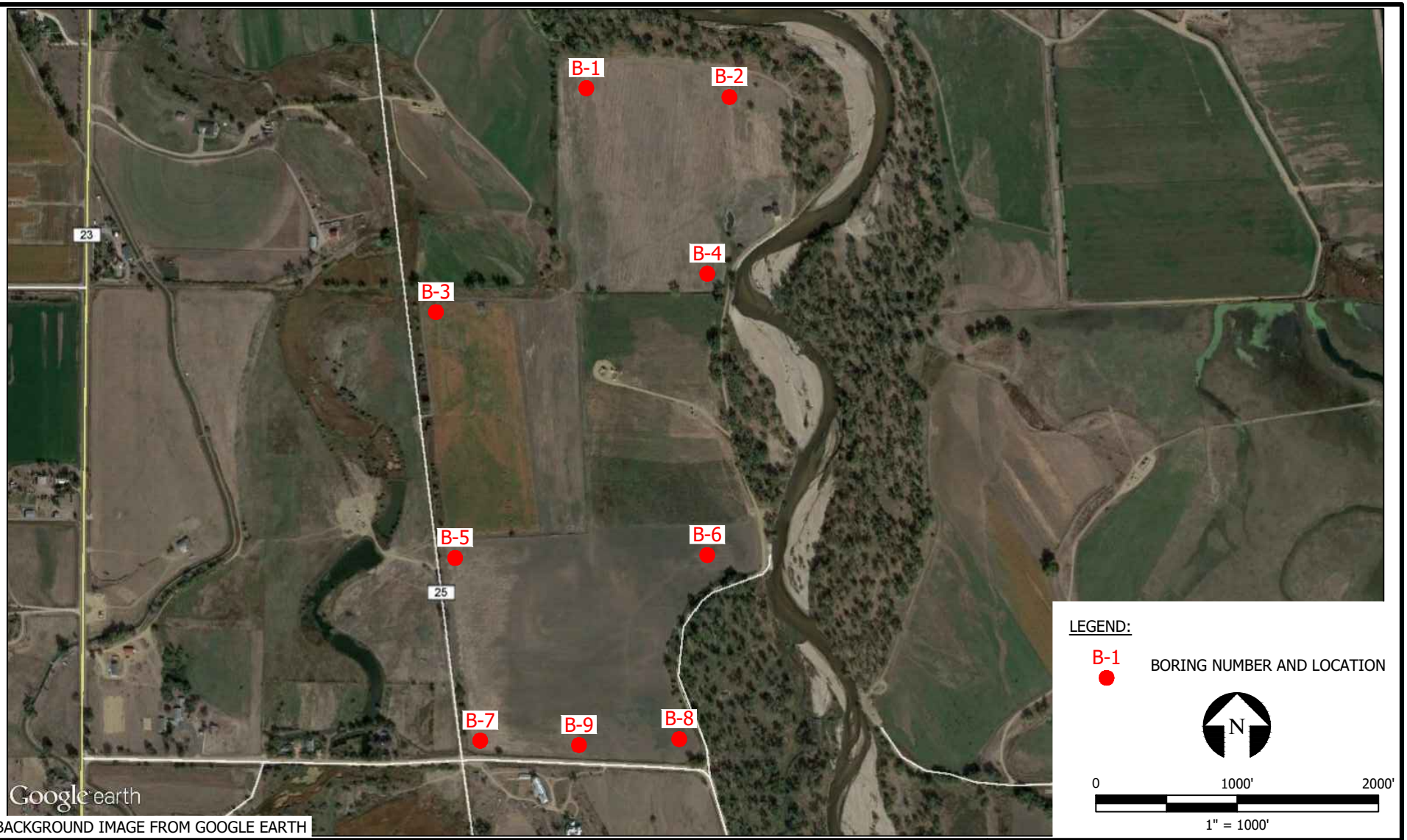
TABLE 1
Summary of Laboratory Test Results
Bennett Property Gravel Site
Project No. 16.3066

Sample Location		Gradation			
Boring	**Depth (feet)**	**Gravel (%)**	**Sand (%)**	**Silt/ Clay (%)**	**Material Type**
B-1	10-20	23	75	2	SAND, with gravel, well graded (SW; A-1-b)
B-1	36-40	62	34	4	GRAVEL, with sand, poorly graded (GP; A-1-a)
B-6	20-30	39	59	2	SAND, with gravel, poorly graded (SP; A-1-a)
B-6	30-40	47	50	3	SAND, with gravel, poorly graded (SP; A-1-a)
B-7	8-20	44	53	3	SAND, with gravel, poorly graded (SP; A-1-a)
B-7	20-27	18	80	2	SAND, with gravel, poorly graded (SP; A-1-a)

H:\Projects\2016\Frederick Projects\16.3000\16.3066.A Bennett Property Gravel Site\ACAD\Boring Location Map.dwg 8/18/2016 2:48 PM



BACKGROUND IMAGE FROM GOOGLE EARTH

PROJECT NO:	16.3066		
PROJECT NAME:	Bennett Property Gravel Site		
DRAWN BY:	FPS	CHECKED BY:	DDR
DWG DATE:	08.18.16	REV. DATE:	--

FIGURE 1
Boring Location Map

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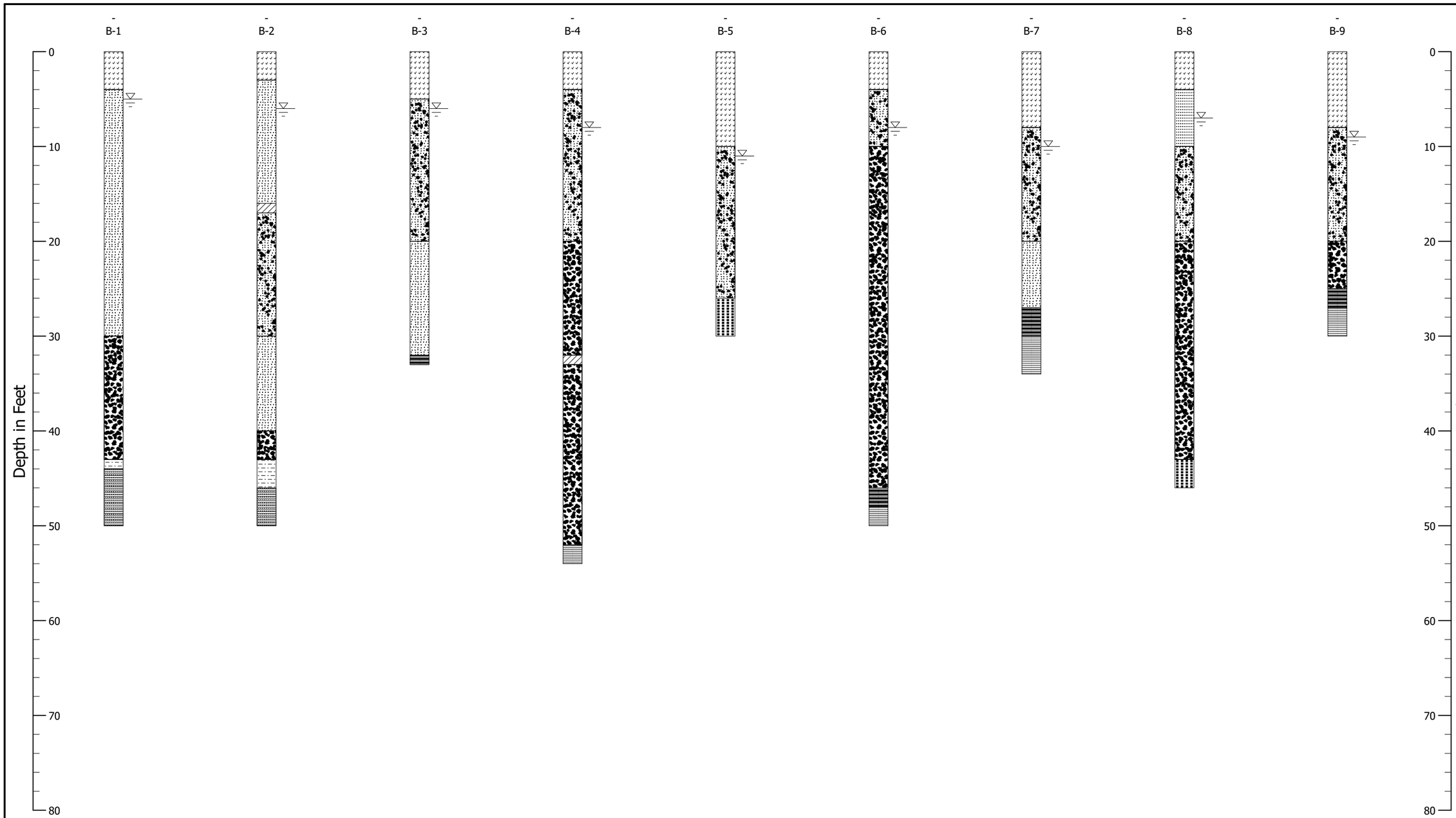

PROJECT NO:	16.3066
PROJECT NAME:	Bennett Property Gravel Site
DWG DATE:	8/31/2016

FIGURE 2

Logs of Borings

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KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	TOPSOIL; CLAY, sandy, moist, brown.
	SAND, with occasional gravel, wet, well graded, brown (SW; A- 1-b).
	SAND, with gravel, poorly to well graded, wet, brown (SP. SW; A-1-a, A-1-b).
	CLAY, sandy, silty, very moist to moist, with occasional iron oxide staining, brown (CL; A-6).
	SAND, with gravel and occasional cobbles, poorly graded ,moist to wet, poorly graded, brown (SP; A-1-a).
	GRAVEL, with sand and cobbles, poorly graded, wet, brown (GP, A-1-a).
	WEATHERED CLAYSTONE, moist, laminated, with iron oxide staining and lignite, brown to gray.
	WEATHERED SHALE, clayey, moist, brown to gray.
	CLAYSTONE, moist, gray.
	SHALE, clayey, moist, gray.
	LIGNITE, clayey, moist, black.

Symbol	Description
	SANDSTONE, wet, tan.
Misc. Symbols	
	Water level during drilling

Notes:

1. Exploratory borings B-1 through B-9 were drilled on August 8th and 9th, 2016, using an AP-1000 percussion hammer Becker drill rig with a 5-inch inner diameter dual wall steel drive pipe.

2. Groundwater was encountered at depths of 5 to 11 feet below ground surface in all borings during drilling. For safety purposes, borings were backfilled at the completion of the study.

3. Contacts between soil units are approximate and may be gradational.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.
Project No. 16.3066.

APPENDIX A

Laboratory Test Results

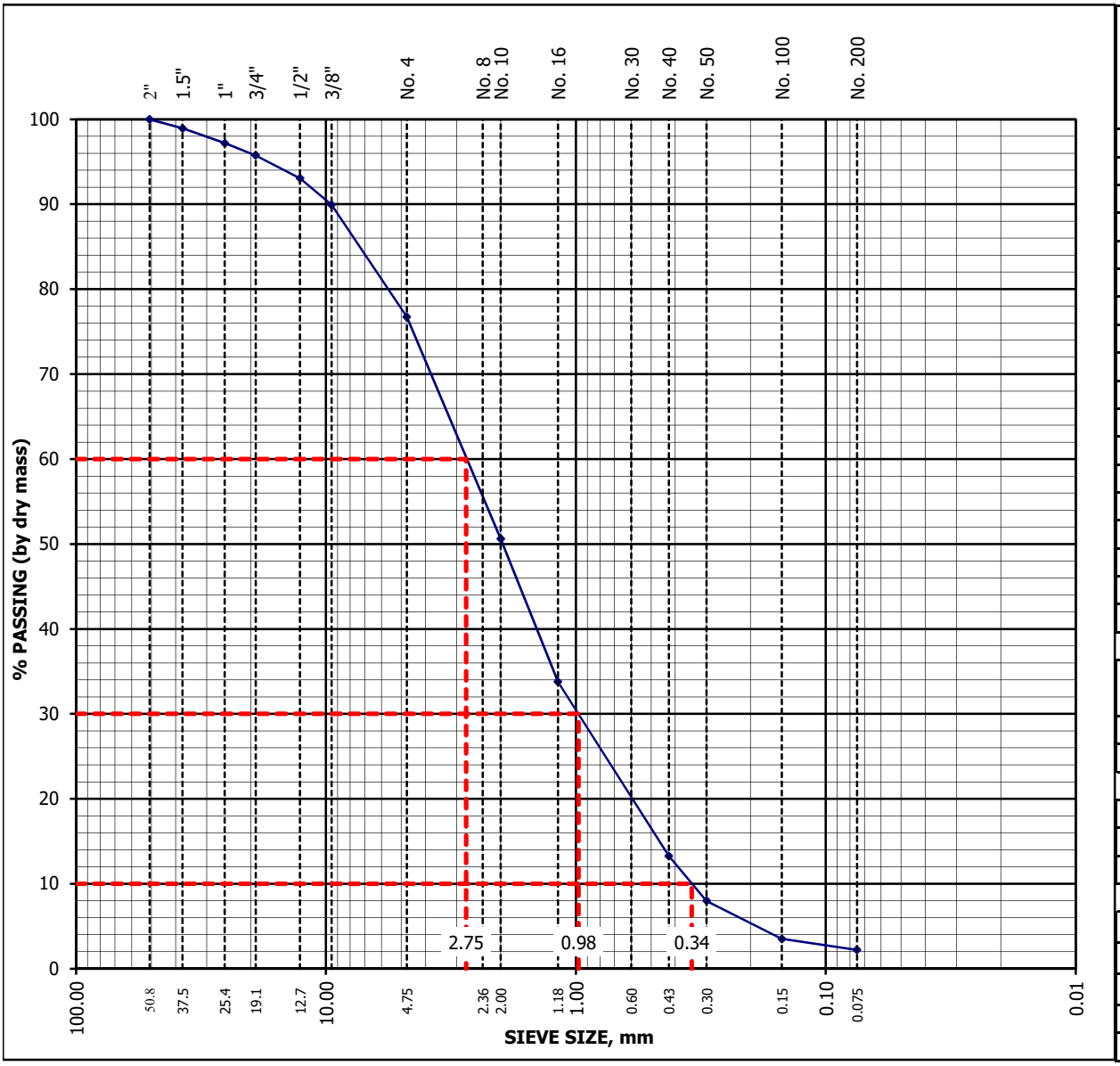
CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162093	Reviewer:	D. Duran
Sample Location:	B-1 at 10' to 20'		
Visual Description:	SAND, with gravel, brown		

AASHTO M 145 Classification: **A-1-b** **Group Index:** _____

Unified Soil Classification System (ASTM D 2487): **(SW)** **Well graded sand with gravel**



Sieve Size	% Passing
2"	100
1.5"	99
1"	97
3/4"	96
1/2"	93
3/8"	90
#4	77
#8	
#10	51
#16	34
#30	
#40	13
#50	8
#100	4
#200	2.2

Moisture (M) & Density (D)	
M, %:	0.2
D, pcf:	

LL	
PL	
PI	

D_{60}	2.75
D_{30}	0.98
D_{10}	0.34
Cu	**7.99**
Cc	**1.01**

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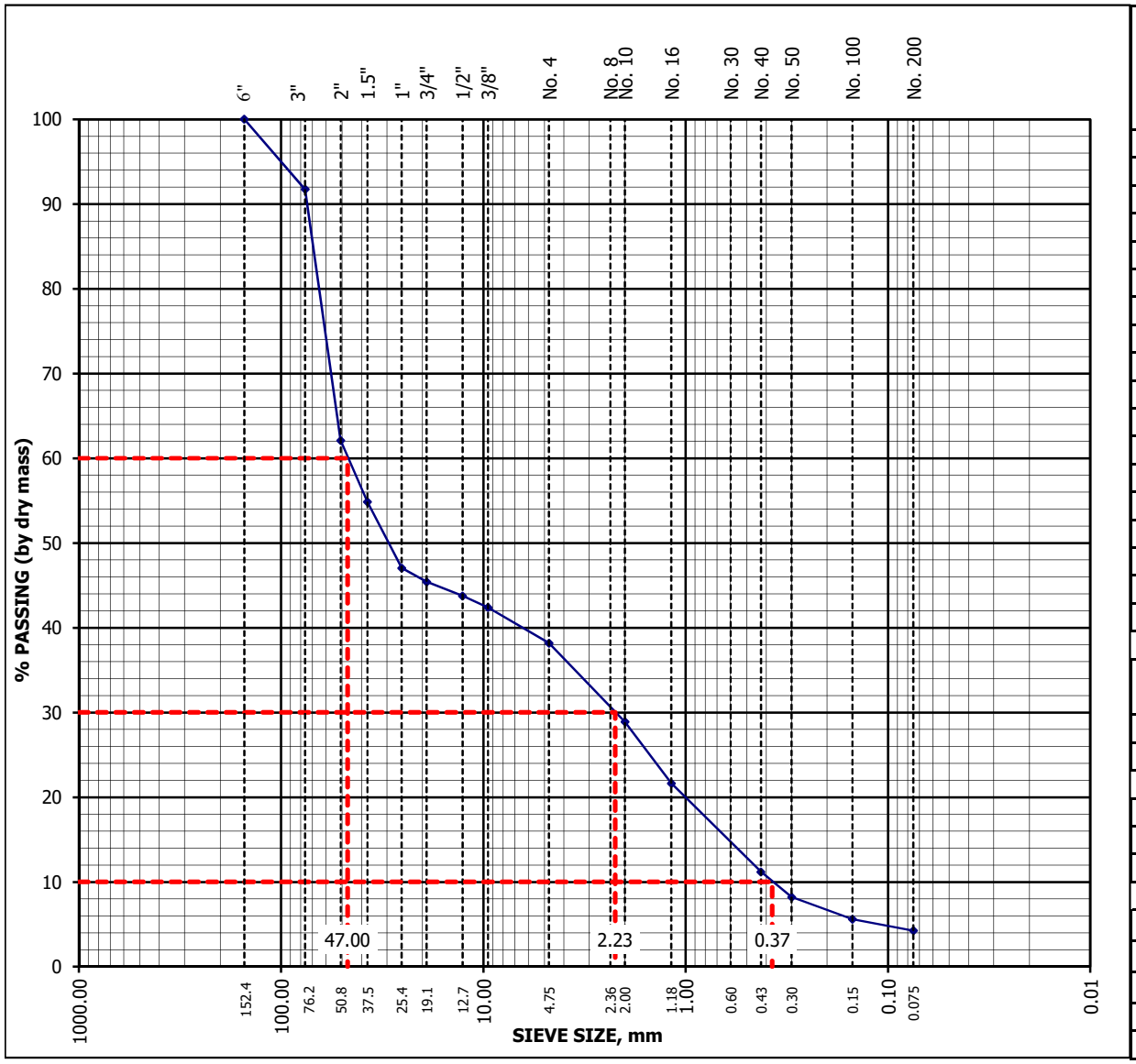
Geotechnical Engineers & Construction Materials Consultants

GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162094	Reviewer:	D. Duran
Sample Location:	B-1 at 36' to 40'		
Visual Description:	GRAVEL, with sand, light brown		

AASHTO M 145 Classification: A-1-a **Group Index:**

Unified Soil Classification System (ASTM D 2487): (GP) **Poorly graded gravel with sand**



Sieve Size	% Passing
6"	100
3"	92
2"	62
1.5"	55
1"	47
3/4"	45
1/2"	44
3/8"	42
#4	38
#8	
#10	29
#16	22
#30	
#40	11
#50	8
#100	6
#200	4.2

Moisture (M) & Density (D)	
M, %:	0.2
D, pcf:	

LL	
PL	
PI	

D_{60}	47.00
D_{30}	2.23
D_{10}	0.37
Cu	**125.67**
Cc	**0.28**

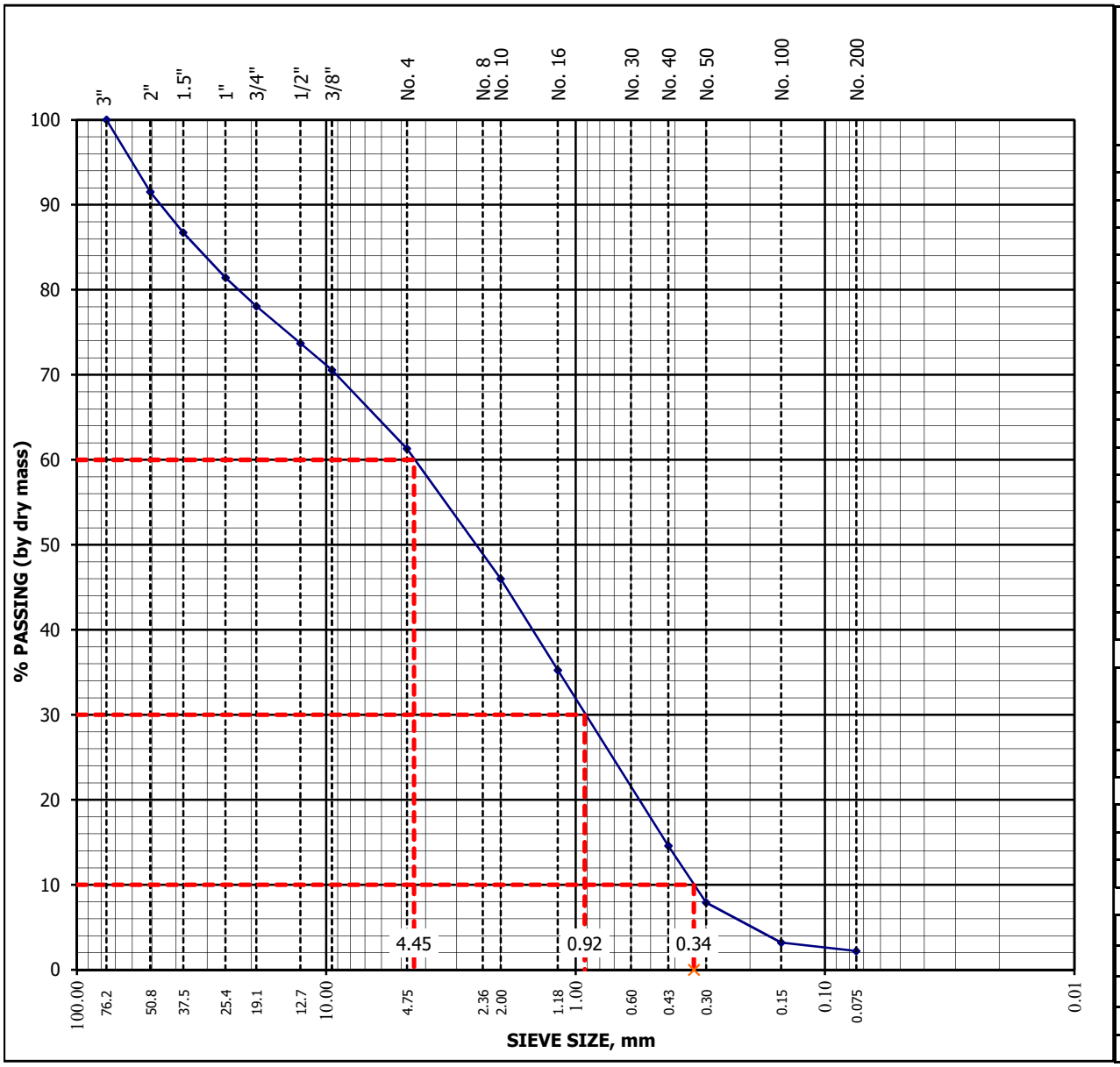
CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162095	Reviewer:	D. Duran
Sample Location:	B-6 at 20' to 30'		
Visual Description:	SAND, with gravel, light brown		

AASHTO M 145 Classification: **A-1-a** **Group Index:** _____

Unified Soil Classification System (ASTM D 2487): **(SP)** **Poorly graded sand with gravel**



Sieve Size	% Passing
3"	
2"	92
1.5"	87
1"	81
3/4"	78
1/2"	74
3/8"	71
#4	61
#8	
#10	46
#16	35
#30	
#40	15
#50	8
#100	3
#200	2.2

Moisture (M) & Density (D)	
M, %:	2.0
D, pcf:	

LL	
PL	
PI	

D_{60}	4.45
D_{30}	0.92
D_{10}	0.34
Cu	**13.24**
Cc	**0.57**

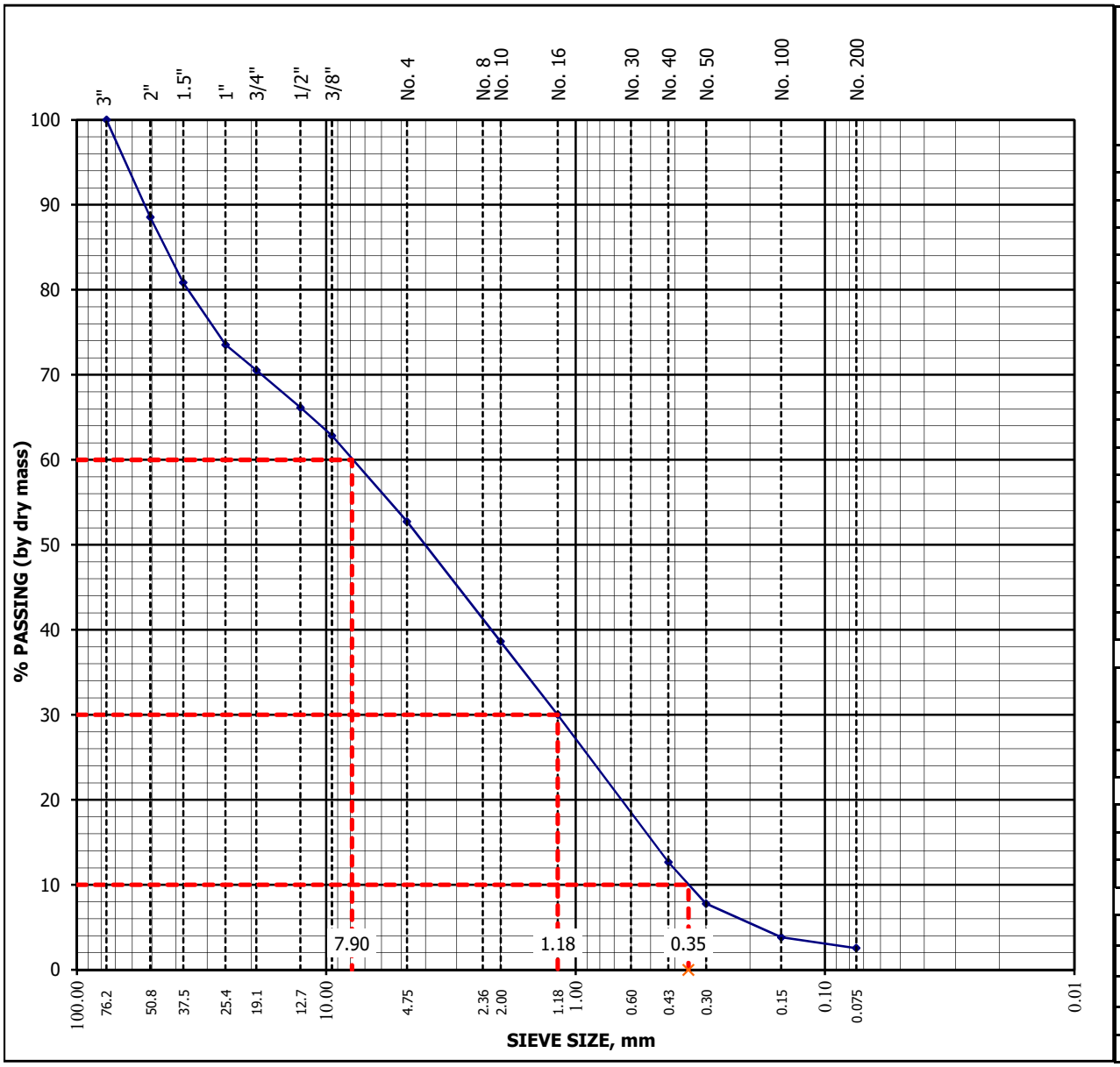
CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162096	Reviewer:	D. Duran
Sample Location:	B-6 at 30' to 40'		
Visual Description:	SAND, with gravel, light brown		

AASHTO M 145 Classification: **A-1-a** **Group Index:** _____

Unified Soil Classification System (ASTM D 2487): **(SP)** **Poorly graded sand with gravel**



Sieve Size	% Passing
3"	
2"	89
1.5"	81
1"	74
3/4"	71
1/2"	66
3/8"	63
#4	53
#8	
#10	39
#16	30
#30	
#40	13
#50	8
#100	4
#200	2.6

Moisture (M) & Density (D)	
M, %:	0.7
D, pcf:	

LL	
PL	
PI	

D_{60}	7.90
D_{30}	1.18
D_{10}	0.35
Cu	**22.38**
Cc	**0.50**

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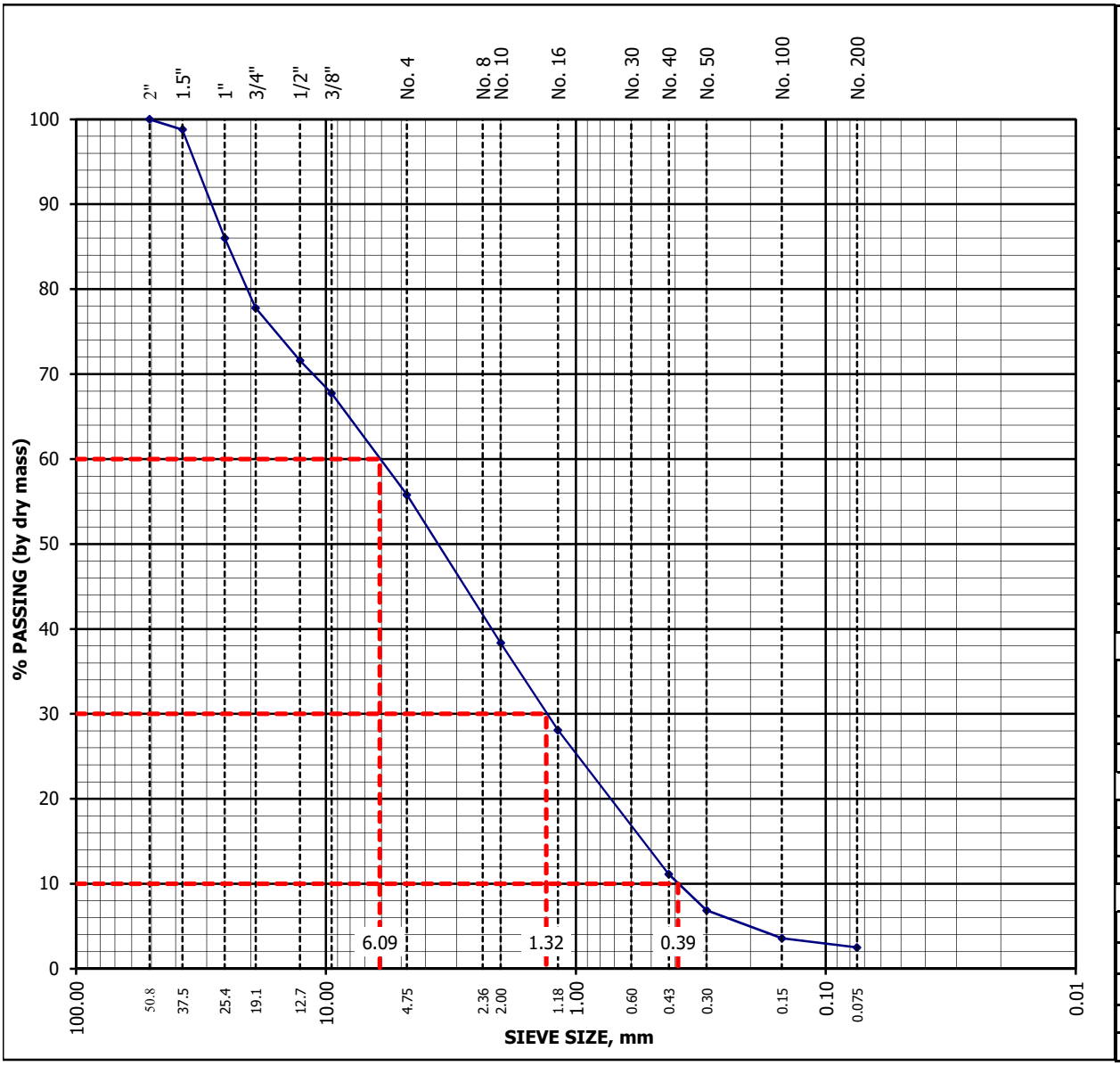
GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162092	Reviewer:	D. Duran
Sample Location:	B-7 at 8' to 20'		
Visual Description:	SAND, with gravel, light brown		

AASHTO M 145 Classification: **A-1-a** **Group Index:** _____

Unified Soil Classification System (ASTM D 2487): **(SP)** **Poorly graded sand with gravel**



Sieve Size	% Passing
2"	100
1.5"	99
1"	86
3/4"	78
1/2"	72
3/8"	68
#4	56
#8	
#10	38
#16	28
#30	
#40	11
#50	7
#100	4
#200	2.5

Moisture (M) & Density (D)	
M, %:	0.4
D, pcf:	

LL	
PL	
PI	

D_{60}	6.09
D_{30}	1.32
D_{10}	0.39
Cu	**15.62**
Cc	**0.73**

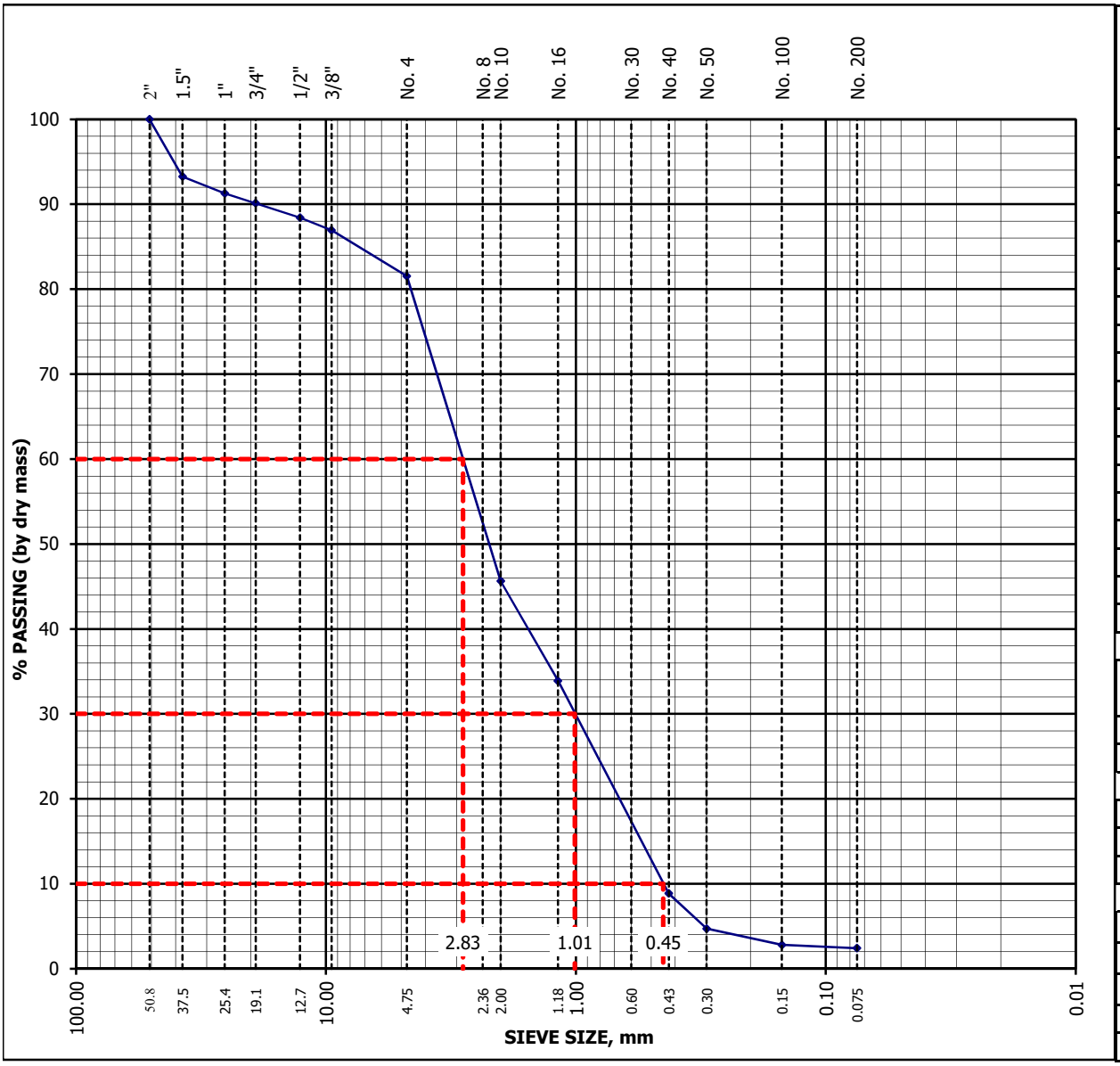
CESARE, INC.
Geotechnical Engineers & Construction Materials Consultants

GRADATION PLOT - SOIL & AGGREGATE

Project Number:	16.3066, J&T Consulting	Date:	25-Aug-16
Project Name:	Bennett Property Gravel Site	Technician:	F. Sperberg/N. Dillon
Lab ID Number:	F162098	Reviewer:	D. Duran
Sample Location:	B-7 at 20' to 27'		
Visual Description:	SAND, with gravel, light brown		

AASHTO M 145 Classification: **A-1-a** **Group Index:** _____

Unified Soil Classification System (ASTM D 2487): **(SP)** **Poorly graded sand with gravel**



Sieve Size	% Passing
2"	100
1.5"	93
1"	91
3/4"	90
1/2"	88
3/8"	87
#4	82
#8	
#10	46
#16	34
#30	
#40	9
#50	5
#100	3
#200	2.4

Moisture (M) & Density (D)	
M, %:	0.2
D, pcf:	

LL	
PL	
PI	

D_{60}	2.83
D_{30}	1.01
D_{10}	0.45
Cu	**6.33**
Cc	**0.81**

APPENDIX E

Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
USGS Map, Oct. 2002rev