COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

April 24, 2019

Mr. Ben Langenfeld
Greg Lewicki and Associates
3375 W. Powers Circle
Littleton, CO 80123

Re: Empire Aggregate, Inc.; Douglas Mountain Mine; M-2018-016;
112c Permit Application Amendment (AM-01) Geotechnical Model Adequacy Review

Mr. Langenfeld,

The Division of Reclamation, Mining and Safety (Division/DRMS) reviewed the content of the Empire Aggregate, Inc. 112c geotechnical stability exhibit for the Douglas Mountain Mine, File No. M-2018-016 application amendment (AM-01) and submits the following comments. The Division is required to make an approval or denial decision no later than April 30, 2019 therefore; a response to the following adequacy review concerns should be submitted to the Division as soon as possible.

The Division's second adequacy letter dated April 16, 2019 stated the Division did not receive the revised GALENA data tables by email as stated by the Applicant in the March 12, 2019 adequacy response letter. The Applicant resent an email dated March 18, 2019 to the Division containing the GALENA models.

The following list describes the information used by the Division as presented in the application amendment to evaluate the slope stability modeling for the proposed site:

- A single material type of sand and gravel, mixed grain size was used for the modeling.
- The source of the material properties used for the modeling; 45 degree friction angle, no cohesion, 110 lb/ft^3 unit weight was from the SME Mining Reference Handbook - Table 2.5.
- The final reclamation slope and pit floor elevation were modeled at a maximum 140 feet below the current surface elevation.
- The phreatic surface was modeled five (5) feet below the pit floor elevation.
- Seismic modeling was not performed by the Applicant.
- The Applicant performed a multiple model analysis based on the initial model results.

6.5 Geotechnical Stability Exhibit

1. The Division duplicated the Applicant's slope stability analysis using Clover Technologies Galena Slope Stability Analysis System, Version 7.1, to verify the Applicant's results. A table of the Applicant's and the Division's analysis results are below:

	Applicant's Galena Results	DRMS Galena Results	DRMS Galena Results
Analysis 1	3.04	3.04	2.29*
Analysis 2	2.55	2.55	1.92*
Analysis 3	2.11	2.11	1.59*
Analysis 4	2.00	2.00	1.51*

The Division typically accepts a lower friction angle for stability analysis models without laboratory strength test then was used by the Applicant. The Division's models indicated with an asterisk (*) were modeled with a reduced internal friction angle of 37 degrees.

The Division requires a factor of safety of 1.5 for static models utilizing generalized, assumed, or single test strength measurements for critical structures. Please reference Section 30.4 - Guidance for Stability Criteria and Use of Minimum Factors of Safety in the Policies of The Mined Land Reclamation Board, May 16, 2018 effective date. The Policy document is available on the Division's website at: https://mining.state.co.us/SiteCollectionDocuments/MLRB%20Policies%20Revised%20May%202018.pdf

The Division verified and accepts the Applicant's geotechnical model for the final reclamation slope configuration for static conditions. If groundwater is intercepted shallower than expected and/or the material differs from the expected properties, the Applicant must contact the Division immediately and reevaluate the stability analysis based on the updated information. Any transgression of the sloping criteria without prior evaluation and acceptance by the Division may be considered a violation of the permit if approved and issued.

2. The Applicant did not perform geotechnical modeling for the proposed final reclamation slope for seismic conditions. Please perform geotechnical modeling for the proposed reclamation slope for seismic conditions and provide the Division with the results for verification.

3. Please provide the Division with a copy of Table 2.5 from the SME Mining Reference Handbook.

4. The geotechnical stability model provided by the Applicant did not include the potential effects on the reclamation slope of the mapped landslide area located above the slope along the southeast portion of the mine site. Please estimate the potential forces from the landslide and include the forces in the static and seismic condition models for the final reclamation slope.

Please be advised the Douglas Mountain Mine application amendment may be deemed inadequate, and the application amendment may be denied on April 30, 2019, unless the above mentioned adequacy review items are addressed to the satisfaction of the Division. If more time is needed to complete the reply, the Division can grant an extension to the decision date. This will be done upon receipt of a written waiver of the Applicant's right to a decision by April 30, 2019 and request for additional time. This must be received no later than the deadline date.

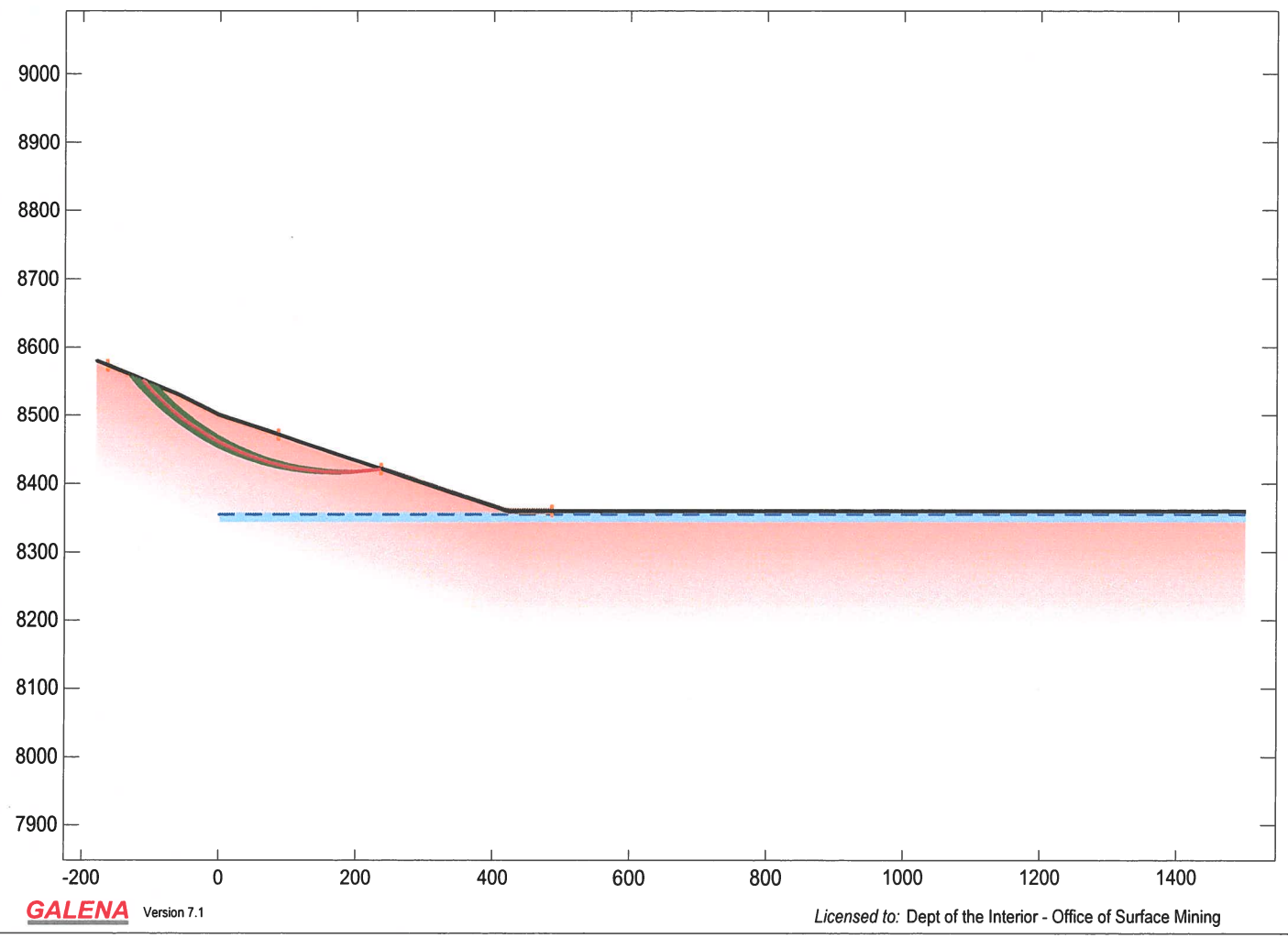
If you have any questions, please contact me at peter.hays@state.co.us or (303) 866-3567 Ext. 8124.

Sincerely,

Peter S. Hays
Environmental Protection Specialist

Enclosures – DRMS Galena models

Ec: Michael Cunningham; Division of Reclamation, Mining & Safety



Material Keys

1: Sand and gravel, mixed grain size

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

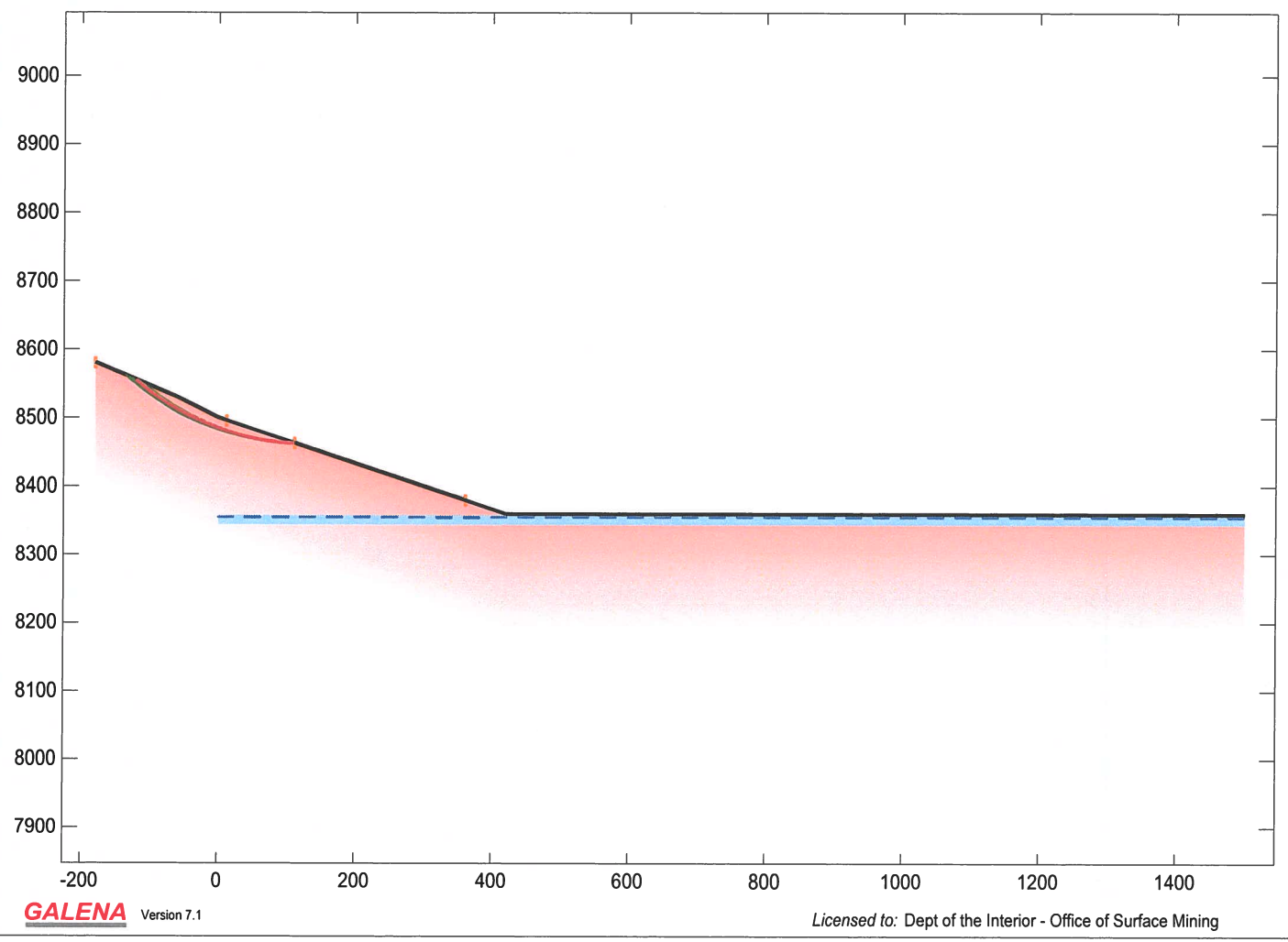
Results

Critical Factor of Safety: 3.04

Edited: 24 Apr 2019 *Processed:* 24 Apr 2019

Project Douglas Mountain Mine
45 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability 45 Degree.gmf



Material Keys

1: Sand and gravel, mixed grain size

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

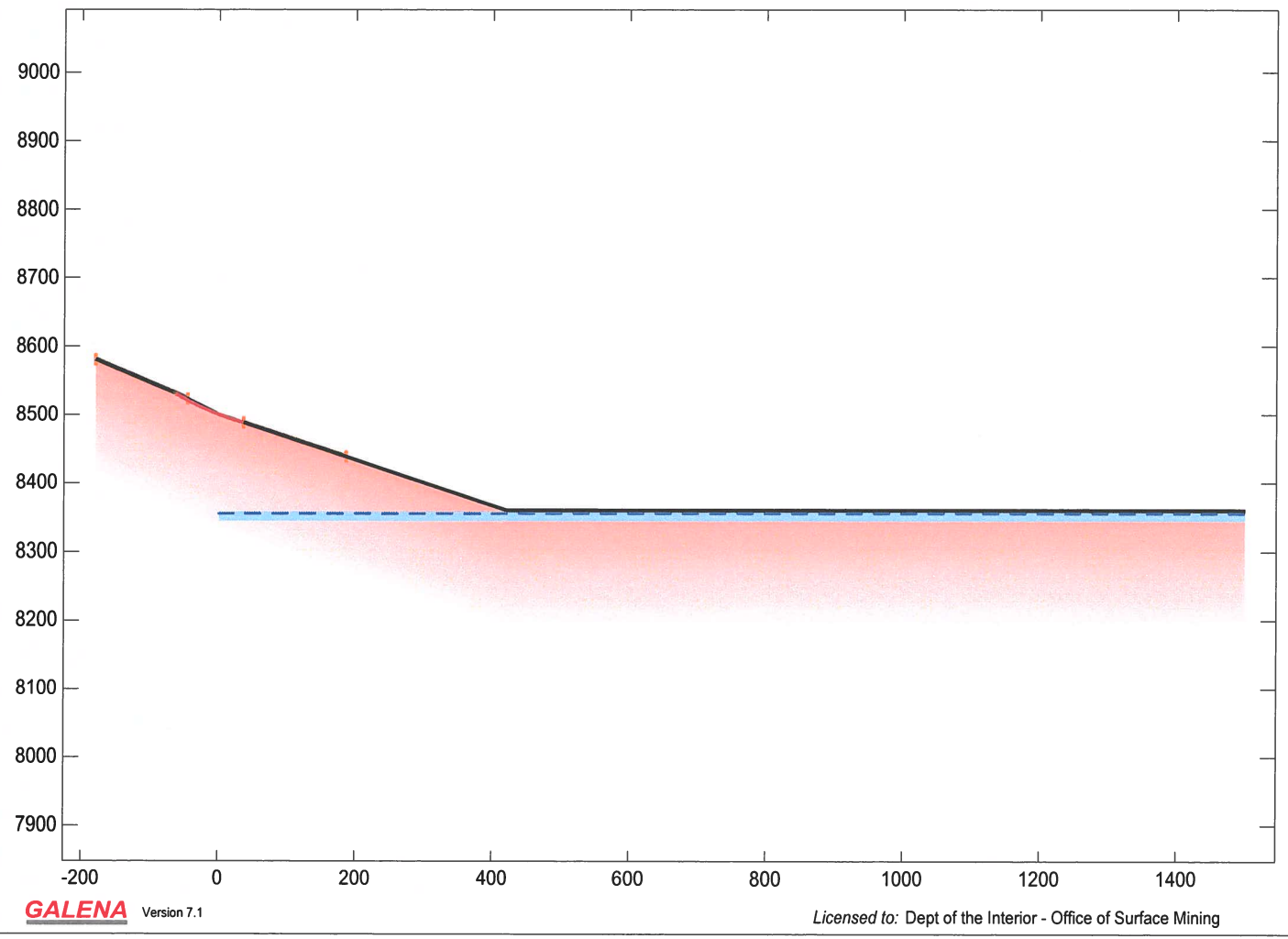
Results

Critical Factor of Safety: 2.55

Edited: 24 Apr 2019 *Processed:* 24 Apr 2019

Project Douglas Mountain Mine
45 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability 45 Degree.gmf



GALENA Version 7.1

Licensed to: Dept of the Interior - Office of Surface Mining

Material Keys

1: Sand and gravel, mixed grain size

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

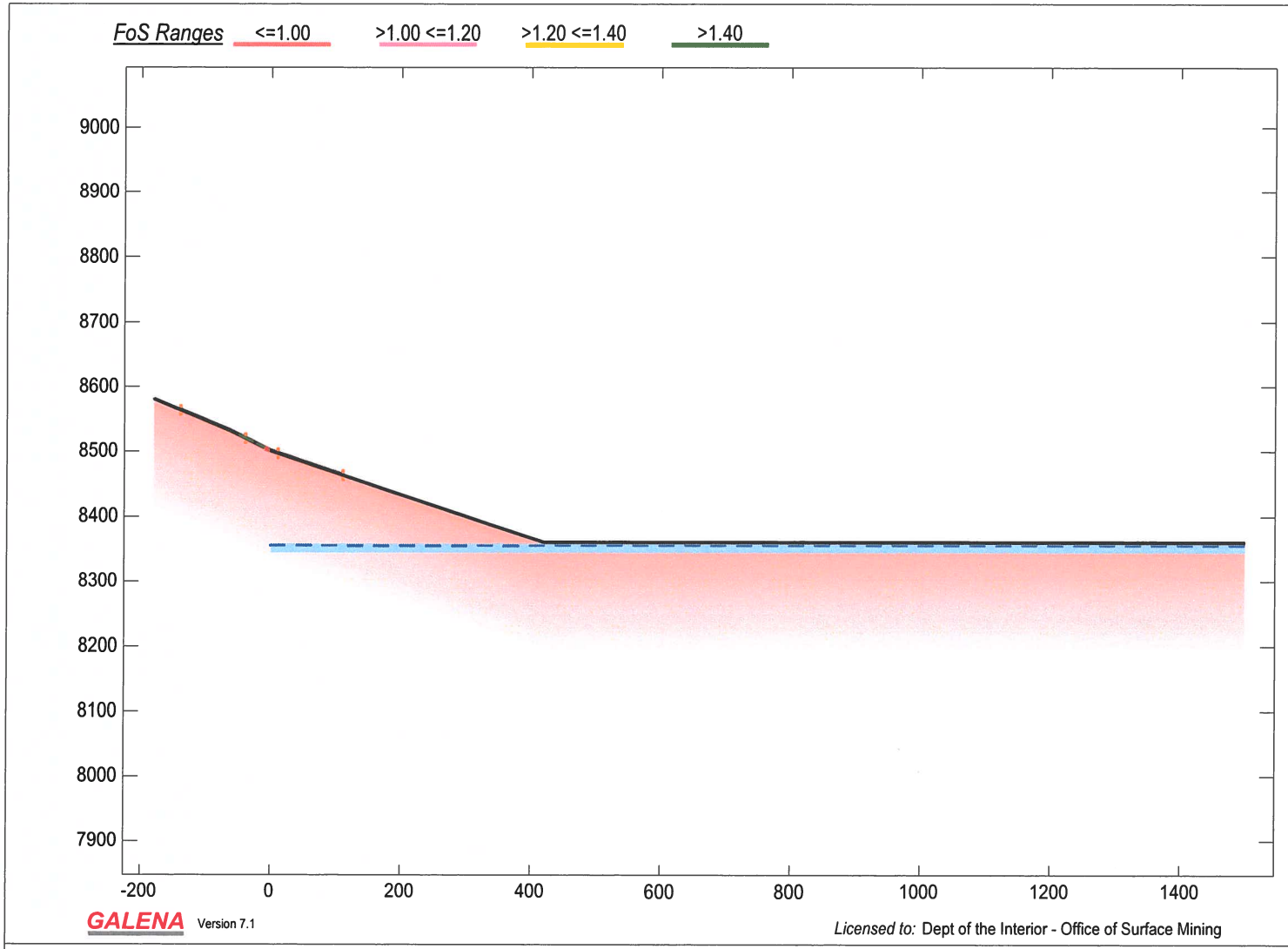
Results

Critical Factor of Safety: 2.11

Edited: 24 Apr 2019 *Processed:* 24 Apr 2019

Project Douglas Mountain Mine
45 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability 45 Degree.gmf



Material Keys

1: Sand and gravel, mixed grain size

Analysis 4

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

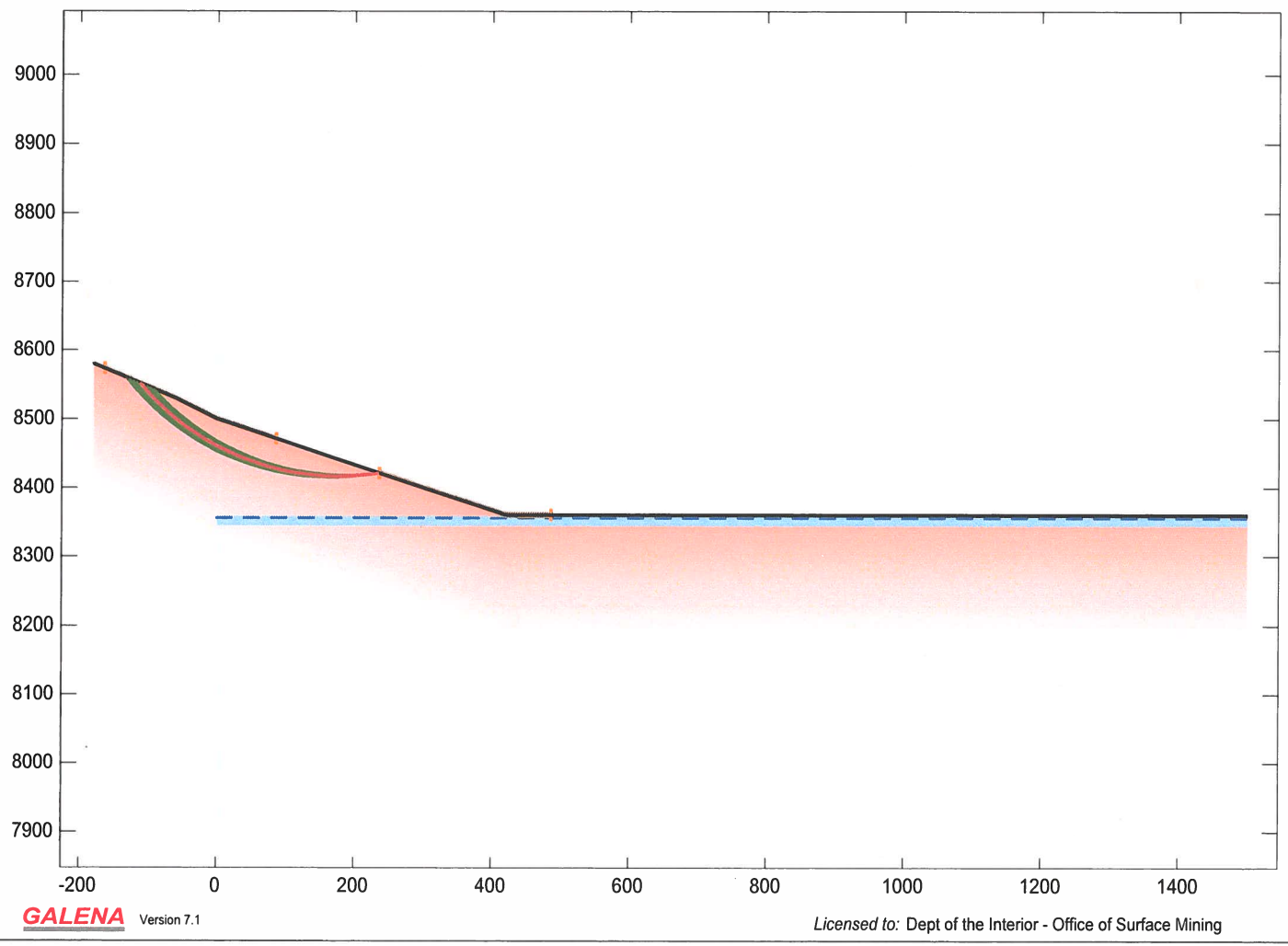
Results

Critical Factor of Safety: 2.00

Edited: 24 Apr 2019 *Processed:* 24 Apr 2019

Project Douglas Mountain Mine
45 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability 45 Degree.gmf



GALENA Version 7.1

Licensed to: Dept of the Interior - Office of Surface Mining

Material Keys

1: Sand and gravel, mixed grain size

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 2.29

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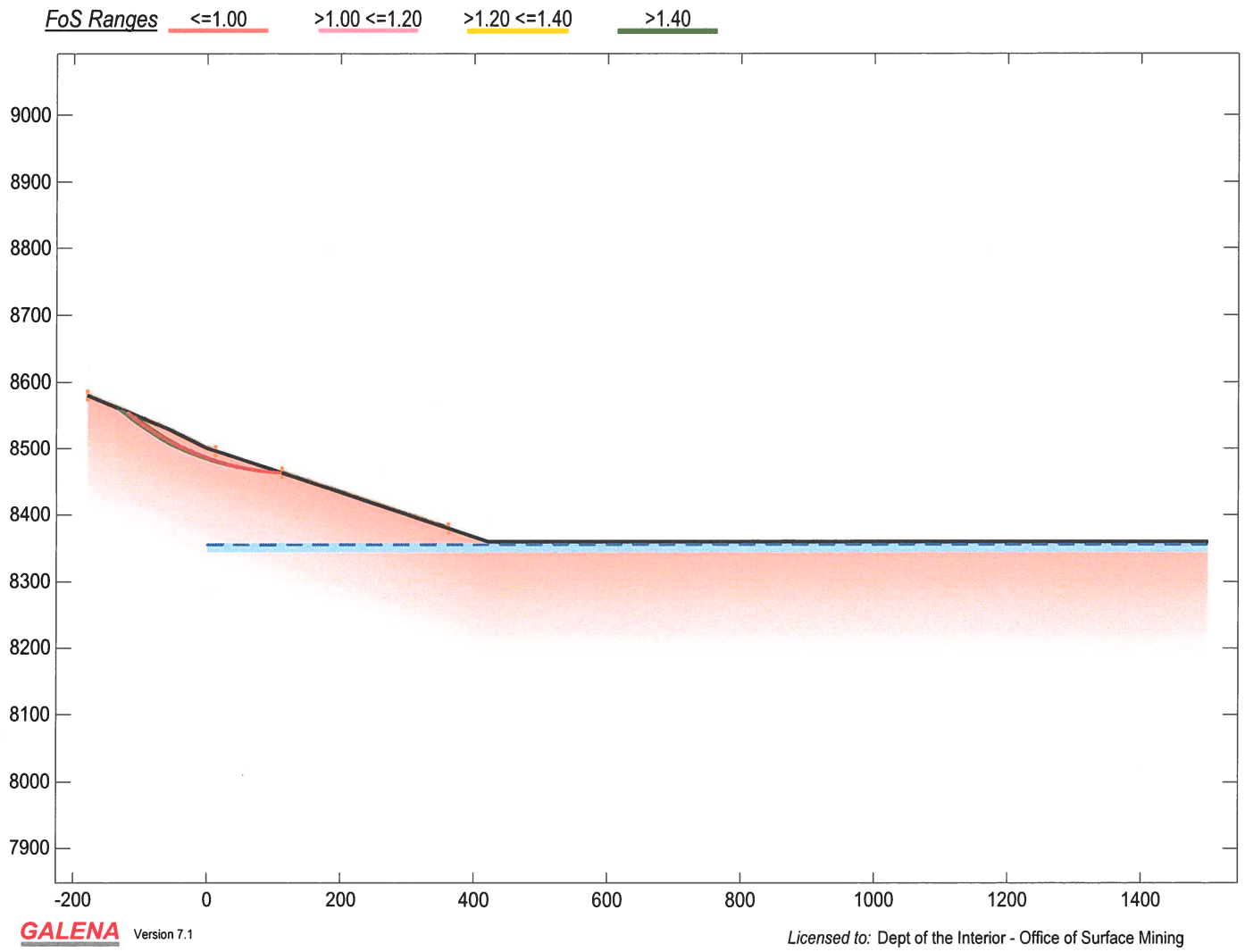
Project Douglas Mountain Mine
37 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability.gmf



GALENA Version 7.1

Licensed to: Dept of the Interior - Office of Surface Mining

Material Keys

1: Sand and gravel, mixed grain size

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

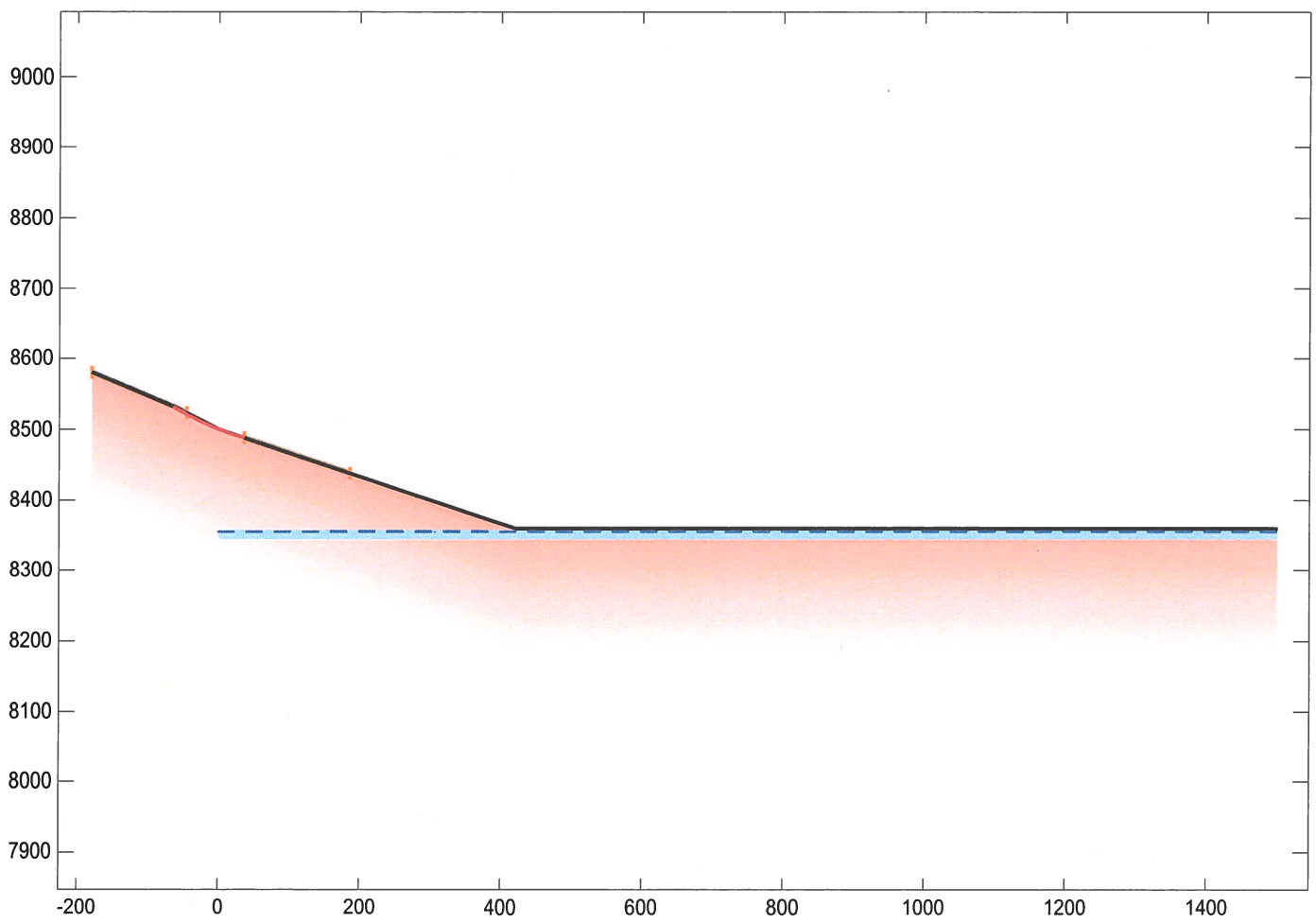
Results

Critical Factor of Safety: 1.92

Edited: 22 Apr 2019 *Processed:* 22 Apr 2019

Project Douglas Mountain Mine
37 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability.gmf



GALENA Version 7.1

Licensed to: Dept of the Interior - Office of Surface Mining

Material Keys

1: Sand and gravel, mixed grain size

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.59

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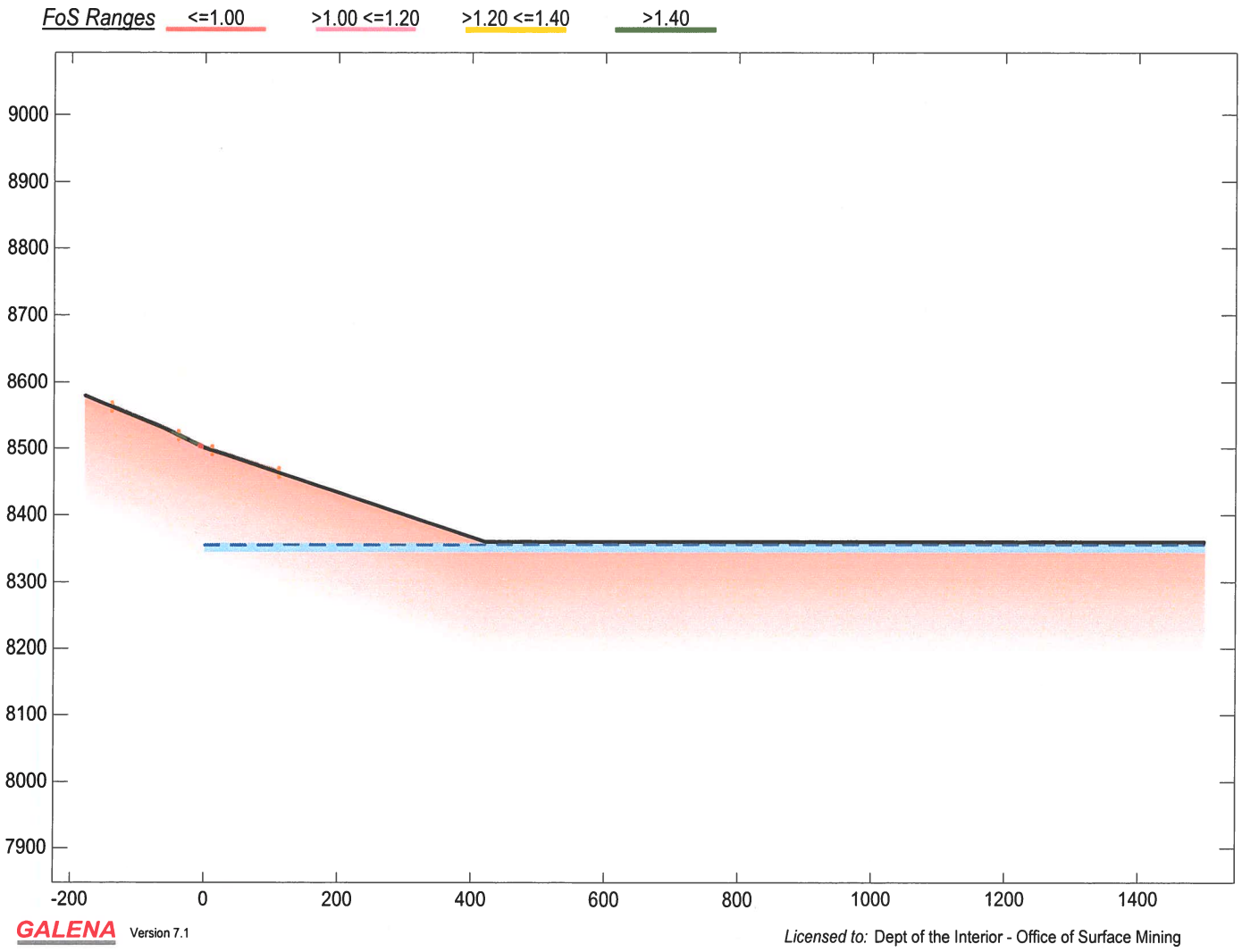
Project Douglas Mountain Mine
37 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability.gmf



Material Keys

1: Sand and gravel, mixed grain size

Analysis 4

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.51

Edited: 22 Apr 2019 *Processed:* 22 Apr 2019

Project Douglas Mountain Mine
37 degree friction angle

File: G:\My Driv...\DRMS Douglas Mountain Mine Slope Stability.gmf