



COLORADO
**Division of Reclamation,
Mining and Safety**
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, CO 80203

MEMORANDUM

Date: December 1, 2020

To: Patrick Lennberg; Division of Reclamation, Mining & Safety

From: Peter Hays; Division of Reclamation, Mining & Safety

Re: **Native/Pierre Mine; M-1977-321; Kidd Engineering Report for 1224 Ruppel Street;
Geotechnical Review Memo**

The Division of Reclamation, Mining and Safety (Division/DRMS) reviewed the Kidd Engineering (Kidd) report dated August 8, 2020 for the alleged house damages at 1224 Ruppel Street, Pueblo, CO 81001 due to Summit Brick's nearby mining operation.

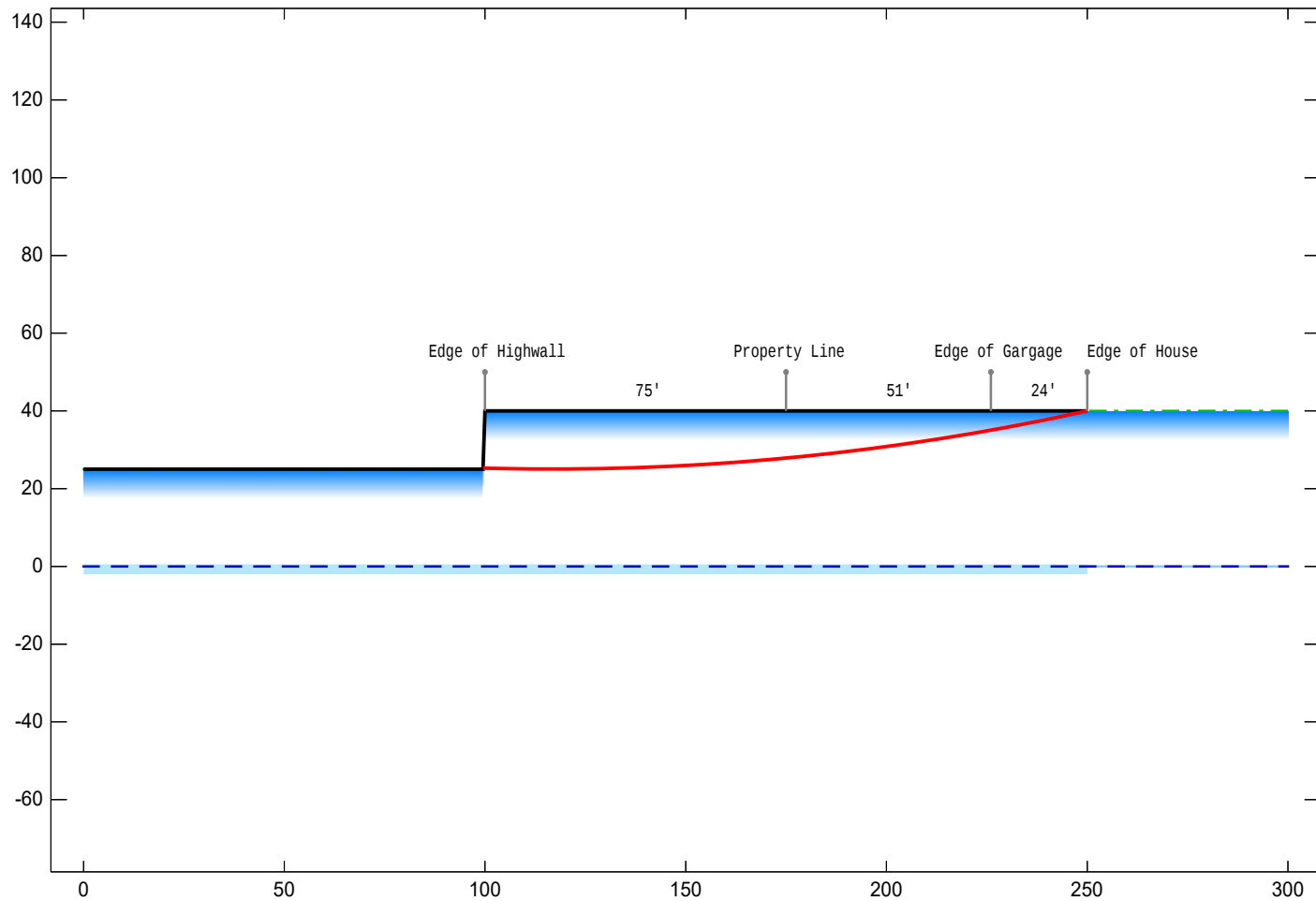
The Division modeled a slope stability analysis using Clover Technologies Galena Slope Stability Analysis System, Version 7.2, based on the information presented in the Kidd report with generic clay soil properties. The analysis resulted in a Factor of Safety (FOS) of 6.05 from the south edge of the house to the existing mining highwall. A copy of the results from the analysis are attached.

In accordance with Table 1 - Recommended Factors of Safety for Slope Stability Analysis for Operations and Reclamation within Section 30.4 of the Policies of the Mined Land Reclamation Board (MLRB) effective May 16, 2018, the Division would require a factor of safety (FOS) of 1.5 for critical structures in static conditions utilizing generalized strength measurements in the analysis.

Based on the information presented in the report and the results of the Division's slope stability analysis, the Division agrees with the conclusions of the Kidd report that the house damages appear to be caused by differential settlement and are not due to the mining operation.

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





GALENA Version 7.2

Material Keys

1: Clay

Analysis 1

Single Stability Analysis
Method: Bishop Simplified
Surface: Circular

Results

Factor of Safety: 6.05

Edited: 1 Dec 2020 Processed: 1 Dec 2020

Project Native/Pierre
1224 Ruppel Street House

File: G:\My Drive\1 - My Projects Google\8 Galena - Stability Analysis Models\NativePierre\1224 Ruppel.gmf

Dept of the Interior - Office of Surface Mining

Project: Native/Pierre
 File: G:\My Drive\1 - My Projects Google\8 Galena - Stability Analysis Models\NativePierre\1224 Ruppel.gmf
 Processed: 01 Dec 2020 08:00:32

DATA: Analysis 1 - 1224 Ruppel Street House

Material Properties (1 material)

Material: 1 (Mohr-Coulomb Isotropic) - Clay
 Cohesion Phi UnitWeight Ru
 200.00 22.0 116.00 Auto

Water Properties

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

Material Profiles (1 profile)

Profile: 1 (2 points) Material beneath: 1 - Clay
 0.00 40.00 300.00 40.00

Slope Surface (4 points)

0.00 25.00 99.50 25.00 100.00 40.00 250.00 40.00

Phreatic Surface (2 points)

0.00 0.00 300.00 0.00

Failure Surface

Circular surface defined by: XL,XR,R

Intersects: XL: 99.51 YL: 25.30 XR: 250.00 YR: 40.00
 Centre: XC: 116.79 YC: 626.07 Radius: R: 601.02

RESULTS: Analysis 1 - 1224 Ruppel Street House

Bishop Simplified Method of Analysis - Circular Failure Surface

Factor of Safety: 6.05

Slice Geometry and Properties (38 slices)

Slice	X-Left	X-S	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	99.50	58.96	81.0	4.00	25.53	1	200.00	22.0	6839.13	0.00	1056.63	4.49	
2	103.50	59.16	-1.3	3.99	3.99	1	200.00	22.0	6862.89	0.00	1723.82	1.00	
3	107.49	59.42	-0.5	3.99	3.99	1	200.00	22.0	6892.52	0.00	1729.01	1.00	
4	111.48	59.56	-0.5	3.99	3.99	1	200.00	22.0	6908.83	0.00	1733.10	1.00	
5	115.47	59.60	0.3	3.99	3.99	1	200.00	22.0	6913.34	0.00	1732.15	1.00	
6	119.46	59.53	0.3	3.99	3.99	1	200.00	22.0	6905.13	0.00	1730.09	1.00	
7	123.45	59.34	1.0	3.99	3.99	1	200.00	22.0	6883.44	0.00	1723.00	1.00	
8	127.43	59.06	1.0	3.99	3.99	1	200.00	22.0	6850.75	0.00	1714.82	1.00	
9	131.42	58.65	1.8	3.99	3.99	1	200.00	22.0	6803.84	0.00	1701.62	1.00	
10	135.41	58.16	1.8	3.99	3.99	1	200.00	22.0	6746.68	0.00	1687.30	1.00	
11	139.40	57.53	2.5	3.99	3.99	1	200.00	22.0	6673.67	0.00	1668.01	1.00	
12	143.38	56.83	2.5	3.99	3.99	1	200.00	22.0	6592.02	0.00	1647.59	1.00	
13	147.37	55.98	3.3	3.98	3.99	1	200.00	22.0	6494.02	0.00	1622.24	1.00	
14	151.35	55.07	3.3	3.98	3.99	1	200.00	22.0	6388.01	0.00	1595.73	1.00	
15	155.34	54.00	4.1	3.98	3.99	1	200.00	22.0	6264.45	0.00	1564.33	1.00	
16	159.32	52.88	4.1	3.98	3.99	1	200.00	22.0	6134.10	0.00	1531.73	1.00	
17	163.30	51.60	4.8	3.98	3.99	1	200.00	22.0	5985.17	0.00	1494.32	1.00	
18	167.27	50.26	4.8	3.98	3.99	1	200.00	22.0	5830.65	0.00	1455.67	1.00	
19	171.25	48.77	5.6	3.97	3.99	1	200.00	22.0	5657.30	0.00	1412.27	1.00	
20	175.22	47.23	5.6	3.97	3.99	1	200.00	22.0	5478.67	0.00	1367.58	1.00	
21	179.19	45.52	6.3	3.97	3.99	1	200.00	22.0	5280.37	0.00	1318.22	1.00	
22	183.15	43.77	6.3	3.97	3.99	1	200.00	22.0	5077.71	0.00	1267.50	1.00	
23	187.12	41.86	7.1	3.96	3.99	1	200.00	22.0	4855.57	0.00	1212.22	1.00	
24	191.08	39.91	7.1	3.96	3.99	1	200.00	22.0	4629.06	0.00	1155.48	1.00	
25	195.04	37.78	7.9	3.95	3.99	1	200.00	22.0	4382.73	0.00	1094.31	1.00	
26	198.99	35.63	7.9	3.95	3.99	1	200.00	22.0	4132.58	0.00	1031.59	1.00	
27	202.94	33.30	8.6	3.94	3.99	1	200.00	22.0	3863.11	0.00	964.55	1.00	
28	206.89	30.94	8.6	3.94	3.99	1	200.00	22.0	3589.44	0.00	895.87	1.00	
29	210.83	28.42	9.4	3.94	3.99	1	200.00	22.0	3296.85	0.00	822.99	1.00	
30	214.77	25.86	9.4	3.94	3.99	1	200.00	22.0	2999.86	0.00	748.37	1.00	
31	218.70	23.14	10.1	3.93	3.99	1	200.00	22.0	2684.73	0.00	669.70	1.00	
32	222.63	20.39	10.1	3.93	3.99	1	200.00	22.0	2364.66	0.00	589.16	1.00	
33	226.56	17.48	10.9	3.92	3.99	1	200.00	22.0	2027.80	0.00	504.73	1.01	
34	230.48	14.52	10.9	3.92	3.99	1	200.00	22.0	1684.84	0.00	418.30	1.01	
35	234.39	11.44	11.7	3.91	3.99	1	200.00	22.0	1326.50	0.00	328.15	1.01	
36	238.30	8.28	11.7	3.91	3.99	1	200.00	22.0	960.91	0.00	235.85	1.01	
37	242.21	5.02	12.4	3.90	3.99	1	200.00	22.0	581.93	0.00	140.01	1.01	
38	246.10	1.67	12.4	3.90	3.99	1	200.00	22.0	193.98	0.00	41.88	1.01	

X-S Area:	----- 1586.53	Path Length:	----- 173.14	X-S Weight:	----- 184037.28
-----------	------------------	--------------	-----------------	-------------	--------------------
