Rock Fall Study
Warm Springs Village
Warm Springs Avenue
Boise, Idaho

Prepared For:
Mr. Bill Clark
Warm Springs Enterprises, LLC
420 Main Street, Suite 204
Boise, Idaho 83702

Prepared By:
STRATA, A Professional Services Corporation
8653 West Hackamore Drive
Boise, Idaho 83709
P. 208.376.8200
F. 208.376.8201

August 26, 2016

STRATA
A Professional Services Corporation
Integrity from the Ground Up

August 26, 2016
File: BO15233A

Mr. Bill Clark
Warm Springs Enterprises, LLC
420 Main Street, Suite 204
Boise, Idaho 83702

RE: **Rock Fall Study**
Warm Springs Village
Warm Springs Avenue
Boise, Idaho

Dear Bill:

Strata, A Professional Services Corporation (STRATA) has completed our Rock Fall Study to assist Warm Springs Enterprises, LLC in addressing geotechnical concerns raised by Boise City Planning and Development Services for the proposed Warm Springs Village Development located at 2750 South Warm Springs Avenue in Boise, Idaho. The City of Boise Planning and Development requires a rock fall analysis for the steep hillside located to the north and east of the proposed development area known as the Warm Springs Mesa Landslide. The upslope hillside portion of the site currently is owned by the City of Boise Parks and Recreation and is a local favorite hiking area. The City is concerned the current condition of the existing slope and the presence of sandstone boulders on the slope represent a potential hazard for residential development at the base of the slope. This letter report addresses rock fall hazards, whereas slope stability hazards will be addressed in a separate study. Strata was authorized to accomplish this study in January 2015.

Project Understanding

We understand you are planning a 67 lot residential subdivision on an approximate 11-acre parcel located on the former Gate City Steel property. Of the 67 lots, approximately 11 lots are planned near the toe of the subject slope located to the north and east. The slope above the project site varies from approximately 1.5H:1V (horizontal to vertical) to 3H:1V. The slope surface contains large sandstone boulders that have been deposited by gravity over geologic time and are associated with the ancient Warm Springs Mesa Landslide. The boulders pose a concern with respect to rock toppling and rock fall into the buildable lots. The length of the slope in question is approximately 1,000 feet and has a vertical elevation gain of approximately 200 feet above the relatively flat development area. Our geotechnical rock fall study is limited to the area of concern shown as Plate 1, *Rock Fall Study*.

Project Approach

To prepare our rock fall study, we accomplished the following tasks:

1. Contacted Jason Taylor, P.E. from the City of Boise, and Julia Grant with Boise Parks and Recreation to discuss geotechnical concerns for the project and to obtain a temporary permit license to access the property for the purpose of our rock fall study and test pit exploration for our slope stability study.

2. Made an initial site reconnaissance in January 2015 to understand the site topography and orientation of the boulders.
3. Reviewed aerial topography from the City of Boise GIS system to evaluate critical steep slopes for the rock fall study area.
4. Made site visits in February 2015 to measure boulders with adverse downslope orientation.
5. Performed rock fall analyses using Colorado Rock Fall Simulation Program (CRSP) to evaluate the potential for boulders to encroach into the proposed development area.
6. Developed remedial measures to reduce the potential for boulder encroachment into the residential lots.
7. Met with you and the project team to discuss results of our study.
8. Prepared this letter report.

Geologic Background

The rock fall study area discussed in this letter is a portion of the northwest toe of the ancient Warm Springs Mesa Landslide. The slide is inactive as mapped by Holenbaugh (1973). The Warm Springs Mesa landslide is an approximately 300-acre mass movement. The ancient landslide material moved laterally approximately 1,200 feet to the northwest. The landslide toe is underlain by the Boise River alluvium.

The northwestern portion of the landslide toe abuts the proposed Warm Springs Village development (former Gate City Steel property). Other landslide deposits, possibly associated with the Warm Springs Mesa slide, are mapped by Holenbaugh (1973), and Othberg and Stanford (1994) on the slope bordering the subject site to the northeast.

To the best of our knowledge, no landslide debris or mass are located on the subject property. However, it is possible future landsliding could impact this property if the slide mass is reactivated.

Faults

Several Boise Front faults are mapped within 2.5 miles to the east of the site. These Miocene-aged, northwest-trending normal faults bordering the northeast margin of the Western Snake River Plain are down to the southwest. The length of slip is approximately 3,000 feet. Opinions differ as to the fault activity; Zollweg (1999) lists the faults as potentially active, while Woodward (1972) did not find evidence for surface faulting in the deposits dated from 10,000 to 500,000 years old. Additionally, geomorphic features related to faulting suggest little or no activity in the past 500,000 years. It is believed these fault systems and their associated movement have facilitated a number of the landslides on the Boise Front.

The closest earthquake epicenter is recorded approximately 31 miles to the north-northwest via the Squaw Creek Fault. The earthquake registered a Magnitude 3.2 on April 3, 1978. The Probable Ground Acceleration PGA is 0.15g at the subject site associated with this fault.

Site Description

The site for the rock fall study limits is located northeast of the proposed Warm Springs Village development area, as shown on Plate 1. The site area varies in topographic steepness from approximately 1.5H:1V to approximately 3H:1V. The study area varies from approximately elevation 2745 to 2945, based on the City of Boise topographic information.

An over-steepened slope area is located approximately in the center of the rock fall study limits, as shown on Plate 1. This location may have been excavated from former construction activities on the former Gate City Steel site. The area has continued to ravel and slough over time, creating soil colluvium at the base of the over-steepened slope.

The former Penitentiary Canal, which is currently abandoned, traverses across the study area approximately halfway up the slope. The canal is approximately 3 to 5 feet in depth and has an earth berm on the downhill side of the canal. We observed small boulders collected within the canal as shown on Photograph 1 in Appendix A. The ground surface in the study area contains numerous sandstone boulders, which vary considerably in size. Some boulders are as large as 25 feet in length with thicknesses of 3 to 5 feet. The boulders are generally blocky and rectangular in shape. The ground surface consists predominantly of clayey and silty sand soil. Vegetation cover consists of native grasses, shrubs, and occasional trees.

Slope Topography

We downloaded the City of Boise GIS 2-foot contour aerial topography to evaluate the slope aperture throughout the rock fall study area. We observed 2 critically steep slope areas. The first is located in the south, and extends from proposed Lot 49 easterly and up slope through the tram trail shown as *Critical Steep Slope Alignment*, Section B-B' on Plate 1. The topography for this cross section is shown on Plate 2, Critical Section B-B'. Photograph 2 in Appendix A shows the lower portion of this slope.

The second critical slope area is located in the center of the study limits, and is designated as *Over-Steep Slope Area* on Plate 1. This area appears to have been caused by previous excavation activities on the former Gate City Steel site with continual sloughing and raveling of the soil associated with this slope as shown on Photographs 3 and 4 in Appendix A. These critical steep slope areas were identified in the field based on topography and proximity to the proposed development.

Field Reconnaissance

In February 2015 STRATA made a number of site visits to observe and measure boulders in the critical steep slope topographic areas, as identified in the above section. We documented boulders based on their size, shape, orientation, and soil embedment. Generally, the boulders were blocky and rectangular in shape. The size of the most critical boulders, along the steep alignments, varied up to a size of 13 foot long by 8 foot wide by 4 ½ foot in depth. The boulder orientation were evaluated with respect to their downslope position. Boulders that had orientations that are parallel or steeper than the slope are considered unfavorable and prone to toppling. We also observed whether the boulders appeared to be embedded significantly into soil slopes. Photographs 5 and 6 in Appendix A show boulders with potentially unfavorable orientations, located along the critical steep slope alignment Section B-B' in the southern portion of the study area.

Rock Fall Analyses

STRATA utilized the *Colorado Rock Fall Simulation Program* (CRSP) software to evaluate potential rock fall events based on our observations of boulders compiled during our site reconnaissance. CRSP is the industry's standard for rock fall analysis and uses statistical probability based on boulder size, shape, steepness of slope, and slope surface texture. In order to evaluate the potential rockfall hazard, we utilized existing topographic information along the critically steep cross section B-B'. Additionally the range of boulder sizes documented on the slopes above the planned development are program inputs. Together this data is statistically evaluated to help establish the potential risk of rocks encroaching into the development area. In is important to recognize, the software does not establish the probability that boulders will be dislodged and move; it assumes movement occurs. Movement can be initiated by any number of events such as, but not limited to: erosion, slope instability, earthquakes, or the like. The results of our analyses show that the largest boulders could encroach in the development area, and had bounce heights up to 3.75 feet as they enter the proposed development area. The results of our analyses are presented in Appendix B.

The highest probability of rock fall events impacting the planned lots below are realized between lots 46 through 56. However, there remains a probability of damaging rock fall events for the development's northern portion as well. Based on our observations and the inactive status of the Warm Springs Mesa landslide as mapped by Holenbaugh (1973) individual large boulders are unlikely to be set in motion, however, boulders have migrated onto Warm Springs Avenue in 2015 from Warm Springs Mesa likely caused by erosion. Therefore, while the probability of an individual rock being set in motion is low, if rocks are set in motion, boulder encroachment can occur into the planned development area. The risks of boulder encroachment are significant. Property damage is the most likely risk that may be realized, however, anticipated rock size, speed, and bounce height can prove lethal to residents.

We also evaluated the boulders that were located above the over-steep slope area in the central portion of the site as shown on Photographs 3 and 4. It appears that this current slope will continue to slough and ravel over time, potentially causing

undermining of these boulders. Our opinion is that there is a higher probability of mobilizing these boulders due to the ongoing erosion. The following section presents remedial measures for rock fall mitigation and soil sloughing, as identified in our analyses.

Rock Fall Mitigation Measures

The key to reducing risks associated with rock fall events is to reduce the potential for movement through securing the boulders likely to move or to construct barriers that reduce the speed, and possibly capture the boulders. We understand that in much of the area of concern, Boise City Parks does not allow proactive bolting or other stabilization measures to reduce the potential for movement. However, it appears you have access to the over-steepened slope area where there is ongoing sloughing and erosion that increases the potential for rock fall. Therefore, it is our opinion that boulders immediately above the over-steepened slope be removed. Photographs of the boulders of concern, known as the *Critical Boulder Area* on Plate 1, are shown in Photographs 3 and 4 in Appendix A. Methods to remove the boulders could consist of drilling and splitting via chemical injection, drilling and blasting the boulders or using a crane to hoist the boulders off the slope. Additionally, the sloughing of the soil from the slopes should be mitigated from encroaching into the development area.

To mitigate the potential for boulder encroachment in the development area, we performed additional CRSP analyses to evaluate rock fall hazard and possible mitigation techniques to mitigate boulder encroachment. Our analyses showed that a 5 foot-high berm or 5-foot-deep catchment ditch must be constructed at the slope toe in the southern portion of the *Rock Fall Study* area. The results of our analyses are presented in Appendix B. A 3-foot berm or catchment ditch should be constructed at the toe of slope in the north portion of this study area. The recommended limits of the berm or catchment ditch are shown on Plate 1. Plate 3 shows alternate methods for construction of berms or catchment ditches.

Evaluation Limitations

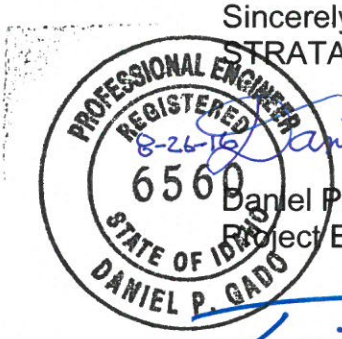
This letter report is prepared to evaluate rock fall potential in the designated Rock Fall Study area above the proposed Warm Springs Village development in Boise, Idaho. Our services consist of professional opinions made in accordance with generally accepted geotechnical engineering principles and practices as they exist in southern Idaho at this time. We specifically note that soil and rock conditions, as well as the existing slope conditions will vary over time. While we evaluated rock fall hazard referencing current recognized standards, rock fall is a natural geologic occurrence and rock fall events or slope conditions which we have not considered may exist at some time in the future. Such events may result in rock falls larger than we modeled in our analyses. Further, no analysis and resulting mitigation measures can fully protect against rock falls. Our opinion is that prospective lot owners, especially those located at the slope toe along the northeast side of the development, receive this document during their purchase evaluation. Providing this document in an effort of “full disclosure” and for information only, will aid in the education of the engineering you have invested in along

with its associated limitations. Further, it imparts to owners the respective risks of living at the base of mountainous terrain, as these are their risks, not yours, the City of Boise's, or your design teams.

This letter report is prepared exclusively for the use of Warm Springs Enterprises and design team for the project as described. We cannot be responsible for any other use of this document. This acknowledgment is in lieu of all express or implied warranties.

We appreciate the opportunity to assist you with the rock fall study for the Warm Springs Village Development. If you have questions please contact us.

Sincerely,
STRATA



Daniel P. Gado, P.E.
Project Engineer

Travis J. Wambeke, P.E.
Principal Engineer

DPG/TJW/tb

The following plates and appendices accompany this letter:

Plate 1: Rock Fall Study
Plate 2: Critical Section B-B'
Plate 3: Rock Fall Catchment Options
Appendix A: Photographic Documentation
Appendix B: CRSP Rock Fall Analyses

MESA RESERVE TRAIL

CRITICAL STEEP SLOPE ALIGNMENT

ROCK FALL STUDY LIMIT

3' BERM OR 3' CATCHMENT DITCH APPROXIMATE LIMITS

5' BERM OR 5' CATCHMENT DITCH APPROXIMATE LIMITS

5' DEEP BY 5' WIDE CATCHMENT CHANNEL

ABANDONED PENITENTIARY CANAL

#14 Tram Trail

CRITICAL BOULDER AREA

OVER STEEP SLOPE AREA

APPROXIMATE TOE OF SLOPE

APPROXIMATE FORMER UST REMEDIATION LIMITS

APPROXIMATE FORMER GATE CITY STEEL DEVELOPMENT

East Windsong Drive

13 PRIVATE ROAD

4 PRIVATE ALLEY

68 PRIVATE ALLEY

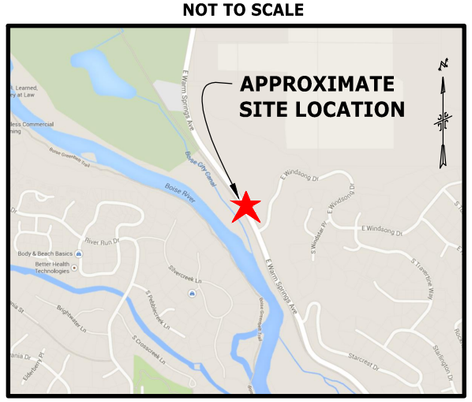
39 PRIVATE ALLEY

East Warm Springs Avenue

PLS 4899

VICINITY MAP

NOT TO SCALE



DRAWING DATE: 8-26-2016

DRAWING BY: MAT | CHECKED BY: DPG

ROCK FALL STUDY
Warm Springs Village
Warm Springs Avenue
Boise, Idaho

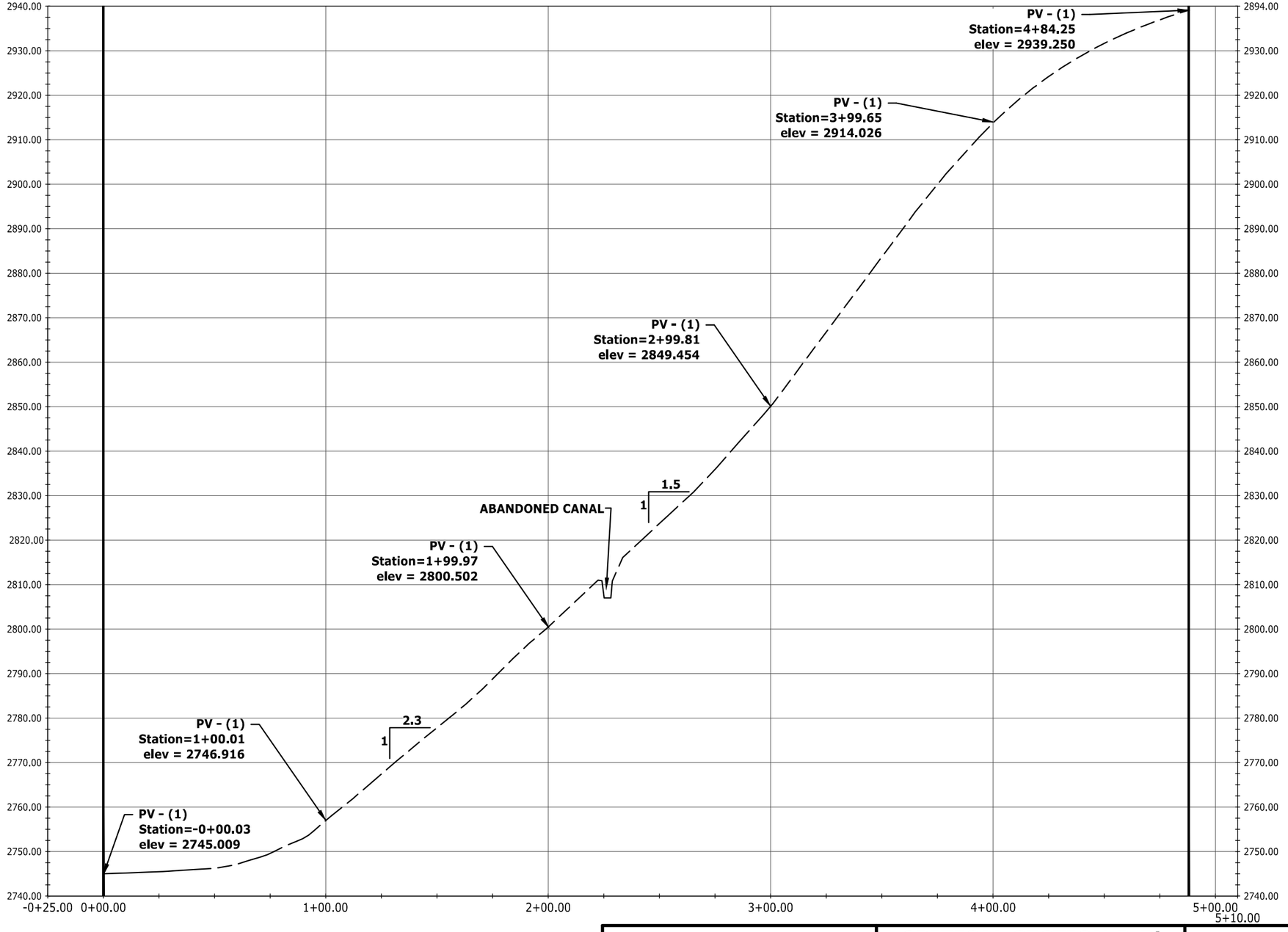
0 60 120 240

SCALE: 1 inch = 120 feet

STRATA
A PROFESSIONAL SERVICES CORPORATION
Integrity from the Ground Up

Client WARM SPRINGS ENTERPRISES | Project No. BO15233A | PLATE 1

REFERENCE: Aerial Image Provided by Google Earth. Site plan rovided by RiverRidge Engineering, April 2016.



8/26/2016 1:16:46 PM - V:\STRATA - IDAHO PROJECTS\STRATA - BOISE PROJECTS\2015 PROJECTS\BO15233A - WARM SPRINGS VILLAGE\DRAFTING\BO15233A PLATES.DWG - MARIE TAYLOR

CRITICAL SECTION B-B'
ROCK FALL STUDY
Warm Springs Village
Warm Springs Avenue
Boise, Idaho

DRAWING DATE: 8-26-2016

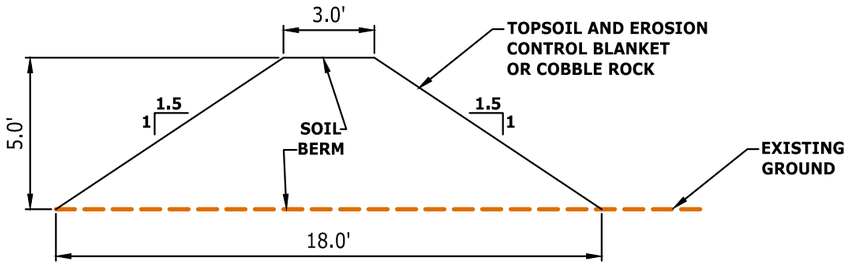
DRAWING BY: MAT | CHECKED BY: DPG

0 25 50 100

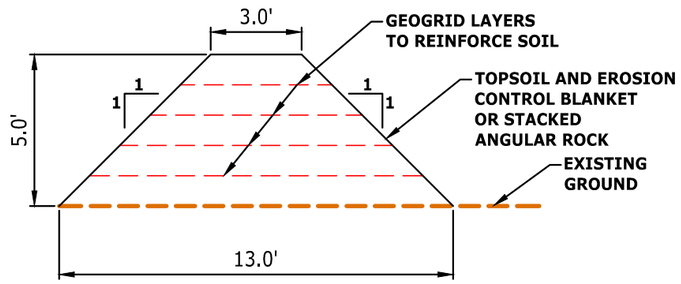
SCALE: 1 inch = 50 feet

STRATA
A PROFESSIONAL SERVICES CORPORATION
Integrity from the Ground Up

Client WARM SPRINGS ENTERPRISES | Project No. BO15233A | PLATE 2

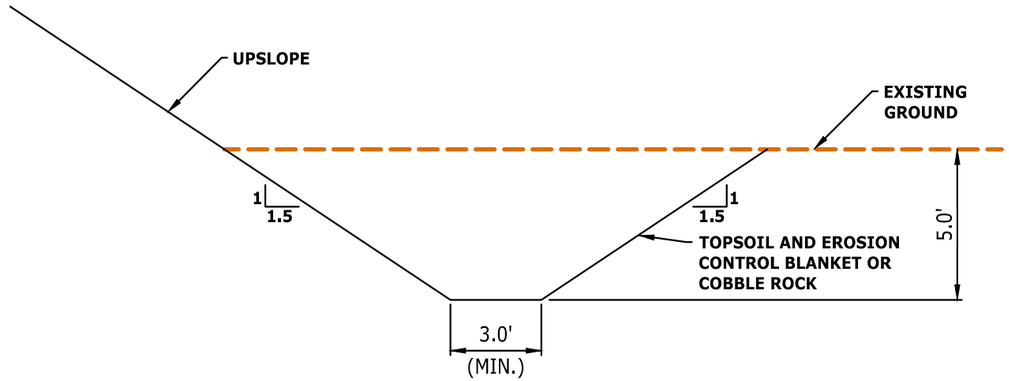


SOIL BERM



REINFORCED SOIL BERM

SCALE: 1 inch = 5 feet



ROCKFALL CATCHMENT DITCH

SCALE: 1 inch = 5 feet

DRAWING DATE: 8-26-2016

DRAWING BY: MAT | CHECKED BY: DPG

ROCK FALL CATCHMENT OPTIONS
Warm Springs Village
Warm Springs Avenue
Boise, Idaho

SCALE: 1 inch = AS SHOWN

STRATA
A PROFESSIONAL SERVICES CORPORATION
Integrity from the Ground Up

Client WARM SPRINGS ENTERPRISES | Project No. BO15233A | PLATE 3

APPENDIX A

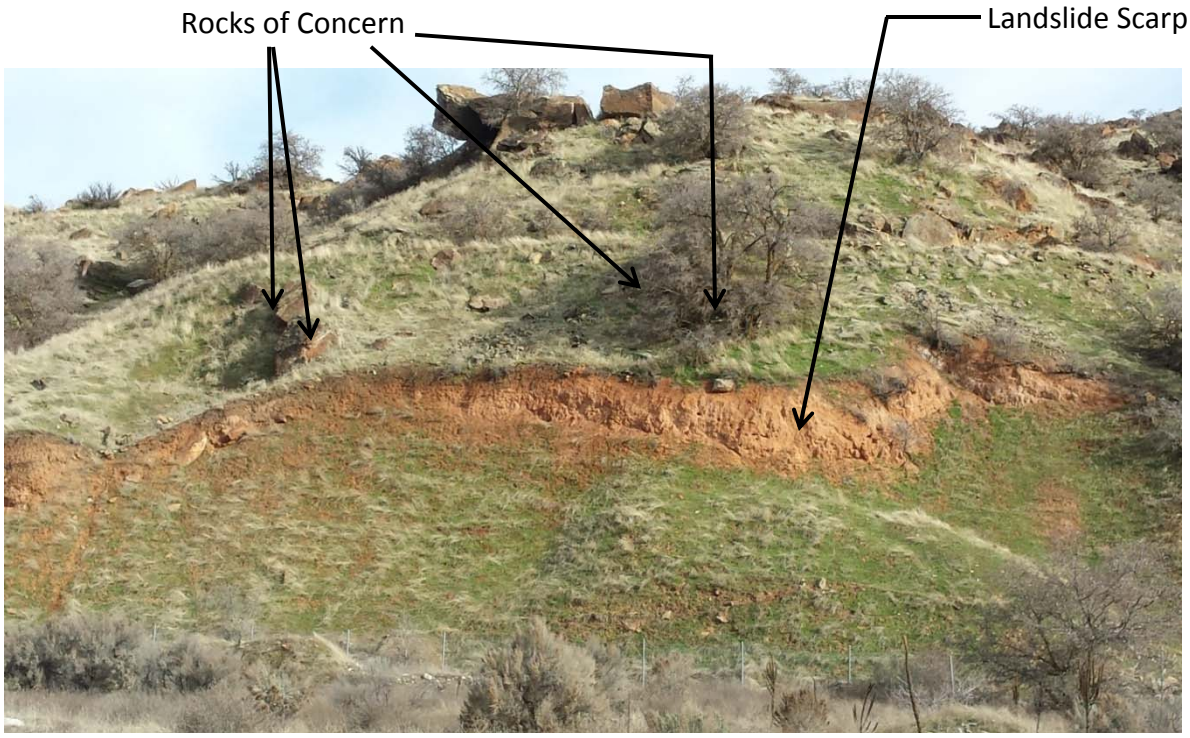
Photograph 1 – Former Abandoned Penitentiary Canal (Note Catchment of Rock Fall)

Rock Fall Study
Warm Springs Village
Boise, Idaho

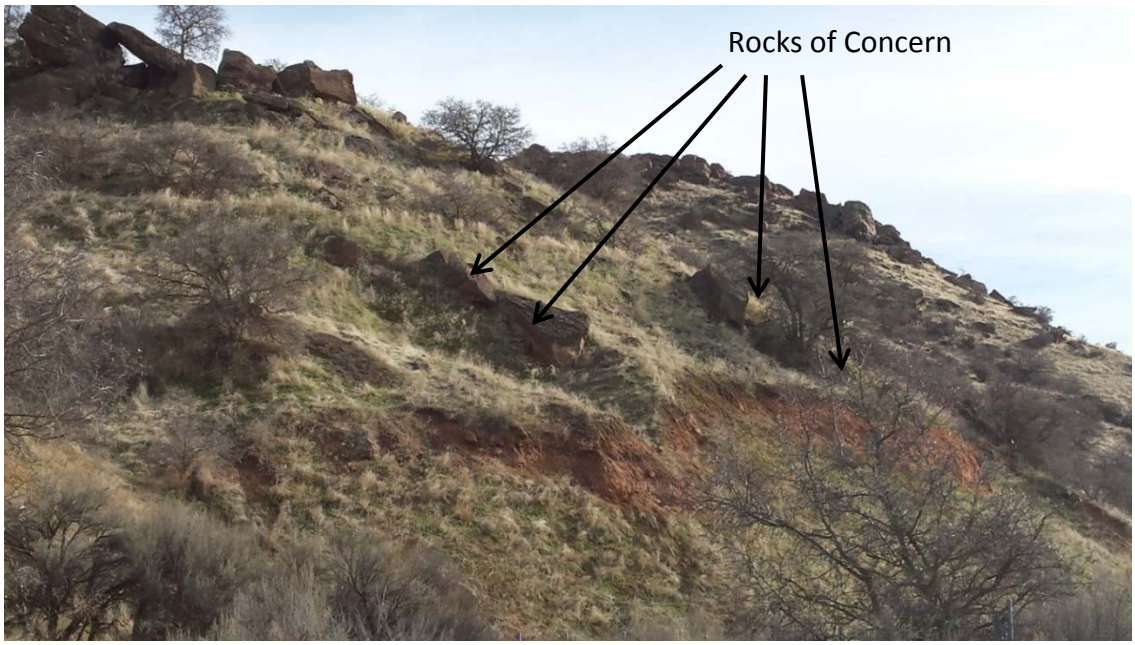
STRATA
A Professional Services Corporation
Integrity from the Ground Up

Warm Springs Enterprises
BO15233A

Photograph 2 - Lower Portion of Critical Steep Slope Alignment



Photograph 3 – Over-Steep Slope Area

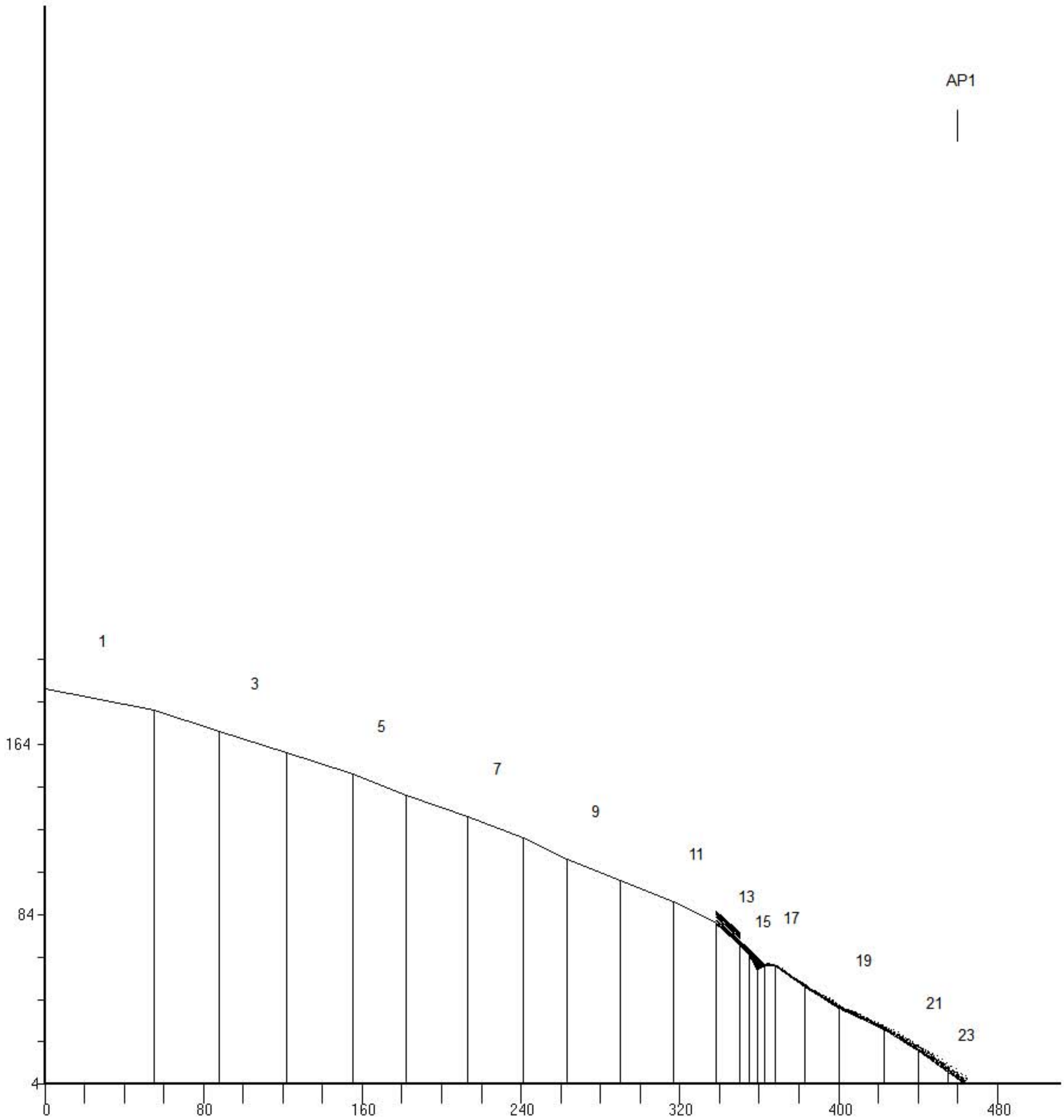


Photograph 4 Over-Steep Slope Area

Photograph 5 – Boulders Along Critical Slope Alignment

Photograph 6 – Large Boulder Along Critical Slope Alignment

APPENDIX B


AP1
1
3
5
7
9
11
13
15
17
19
21
23
164
84
4
0
80
160
240
320
400
480

CRSP Input File -V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Cross Section B.bmp

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 24
Analysis Point 1 X-Coordinate: 460
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 100
Initial Y-Base Starting Zone Coordinate: 70

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	3	.75	.2	0	190	55	180
2	3	.75	.2	55	180	88	170
3	3	.75	.2	88	170	122	160
4	3	.75	.2	122	160	155	150
5	3	.75	.2	155	150	182	140
6	3	.75	.2	182	140	213	130
7	3	.75	.2	213	130	241	120
8	3	.75	.2	241	120	263	110
9	3	.75	.2	263	110	290	100
10	3	.75	.2	290	100	317	90
11	3	.75	.2	317	90	338	80
12	3	.75	.2	338	80	350	70
13	3	.75	.2	350	70	355	65
14	3	.75	.2	355	65	359	58
15	3	.75	.2	359	58	363	60
16	3	.75	.2	363	60	368	60
17	3	.75	.2	368	60	383	50
18	3	.75	.2	383	50	400	40
19	3	.75	.2	400	40	423	30
20	3	.75	.2	423	30	440	20
21	3	.75	.2	440	20	455	10
22	3	.75	.2	455	10	463	5

23	3	.75	.2	463	5	464	4
24	3	.75	.2	464	4	465	4

CRSP Simulation Specifications: Used with V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Cross Section B.bmp

Total Number of Rocks Simulated: 10000
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 24
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 11.5 ft
Thickness: 4.5 ft

CRSP Analysis Point 1 Data - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Cross Section B.bmp

Analysis Point 1: X = 460, Y = 7

Total Rocks Passing Analysis Point: 31

Cumulative Probability	Velocity (ft/sec)	Energy (ft-lb)	Bounce Ht. (ft)
50%	29.77	1454293	0.66
75%	32.13	1634572	3.04
90%	34.25	1796722	5.18
95%	35.53	1894070	6.47
98%	36.96	2003327	7.91

Velocity (ft/sec)	Bounce Height (ft)	Kinetic Energy (ft-lb)
Maximum: 35.91	Maximum: 3.75	Maximum: 1903746
Average: 29.77	Average: 1.11	Average: 1454293
Minimum: 22.22	G. Mean: .66 Std. Dev.:	267001
Std. Dev.: 3.49	Std. Dev.: 3.53	

Remarks:

CRSP Data Collected at End of Each Cell - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Cross Section B.bmp

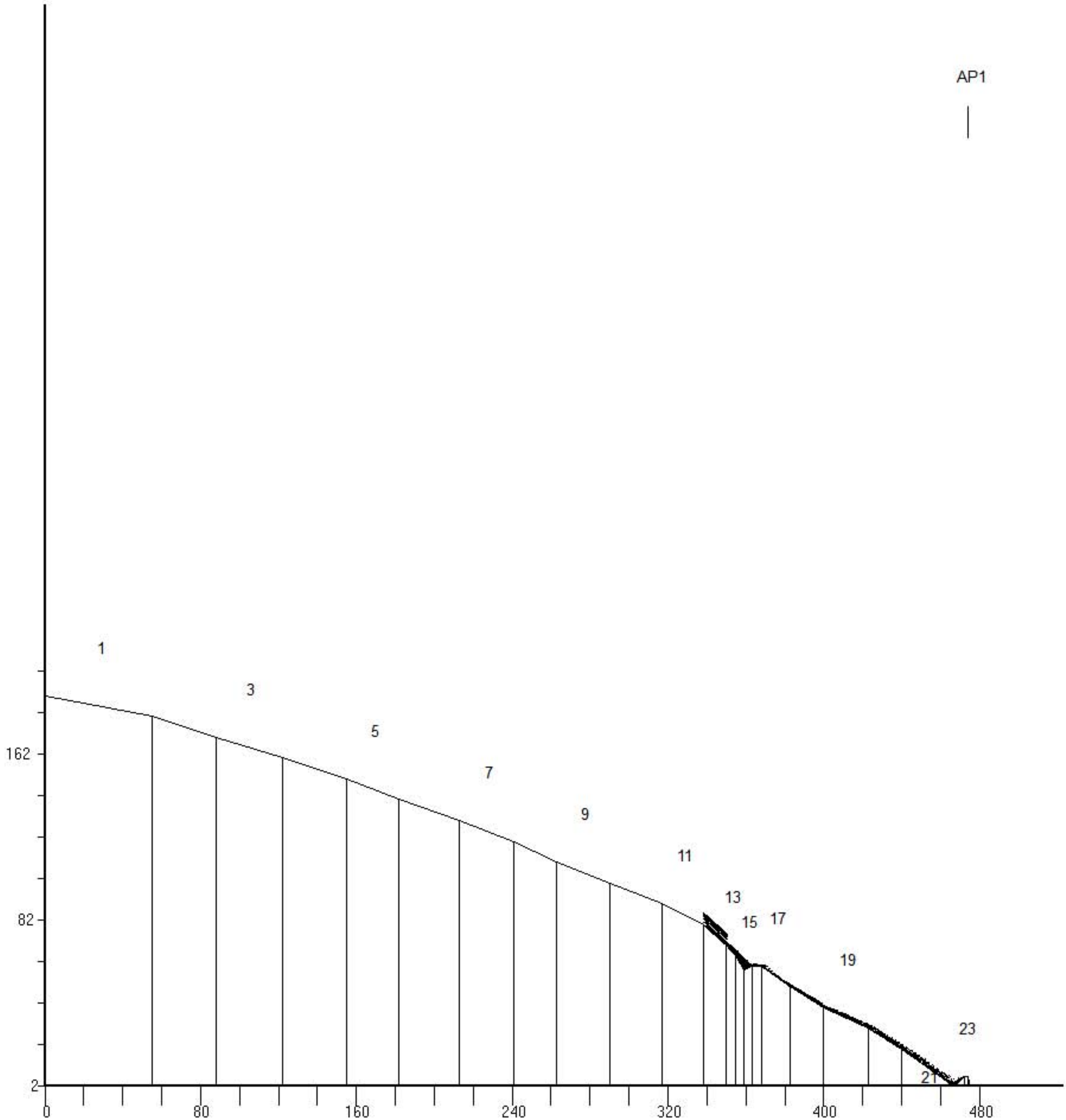
Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	No rocks	past end of cell			
2	No rocks	past end of cell			
3	No rocks	past end of cell			
4	No rocks	past end of cell			
5	No rocks	past end of cell			
6	No rocks	past end of cell			
7	No rocks	past end of cell			
8	No rocks	past end of cell			
9	No rocks	past end of cell			
10	No rocks	past end of cell			
11	No rocks	past end of cell			
12	23	14	3.48	6	0
13	28	19	2.93	3	0
14	35	25	3.23	6	2
15	27	5	2.37	1	0
16	14	4	2.16	0	0
17	20	15	1.91	1	0
18	26	21	2.27	2	0
19	26	21	2.67	2	0
20	30	25	2.72	2	0
21	37	29	3.7	4	1
22	39	30	3.7	4	1
23	40	31	3.56	4	1
24	36	25	6.54	4	0

CRSP Rocks Stopped Data - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Cross Section B.bmp

X Interval	Rocks Stopped
0 To 10 ft	6667
10 To 20 ft	0
20 To 30 ft	0
30 To 40 ft	0
40 To 50 ft	0
50 To 60 ft	0
60 To 70 ft	0

70 To 80 ft	0
80 To 90 ft	0
90 To 100 ft	0
100 To 110 ft	0
110 To 120 ft	0
120 To 130 ft	0
130 To 140 ft	0
140 To 150 ft	0
150 To 160 ft	0
160 To 170 ft	0
170 To 180 ft	0
180 To 190 ft	0
190 To 200 ft	0
200 To 210 ft	0
210 To 220 ft	0
220 To 230 ft	0
230 To 240 ft	0
240 To 250 ft	0
250 To 260 ft	0
260 To 270 ft	0
270 To 280 ft	0
280 To 290 ft	0
290 To 300 ft	0
300 To 310 ft	0
310 To 320 ft	0
320 To 330 ft	0
330 To 340 ft	0
340 To 350 ft	0
350 To 360 ft	1349
360 To 370 ft	1953
370 To 380 ft	0
380 To 390 ft	0
390 To 400 ft	0
400 To 410 ft	0
410 To 420 ft	0
420 To 430 ft	0
430 To 440 ft	0
440 To 450 ft	0
450 To 460 ft	0
460 To 465 ft	0


AP1
1
3
5
7
9
11
13
15
17
19
21
23
162
82
2
0
80
160
240
320
400
480

CRSP Input File -V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Rockfall analysis B-B' with berm.dat

Input File Specifications

Units of Measure: U.S.
Total Number of Cells: 24
Analysis Point 1 X-Coordinate: 474
Analysis Point 2 X-Coordinate: 0
Analysis Point 3 X-Coordinate: 0
Initial Y-Top Starting Zone Coordinate: 100
Initial Y-Base Starting Zone Coordinate: 70

Remarks:

Cell Data

Cell No.	S.R.	Tang. C.	Norm. C.	Begin X	Begin Y	End X	End Y
1	3	.75	.2	0	190	55	180
2	3	.75	.2	55	180	88	170
3	3	.75	.2	88	170	122	160
4	3	.75	.2	122	160	155	150
5	3	.75	.2	155	150	182	140
6	3	.75	.2	182	140	213	130
7	3	.75	.2	213	130	241	120
8	3	.75	.2	241	120	263	110
9	3	.75	.2	263	110	290	100
10	3	.75	.2	290	100	317	90
11	3	.75	.2	317	90	338	80
12	3	.75	.2	338	80	350	70
13	3	.75	.2	350	70	355	65
14	3	.75	.2	355	65	359	58
15	3	.75	.2	359	58	363	60
16	3	.75	.2	363	60	368	60
17	3	.75	.2	368	60	383	50
18	3	.75	.2	383	50	400	40
19	3	.75	.2	400	40	423	30
20	3	.75	.2	423	30	440	20
21	3	.7	.18	440	20	467	2
22	3	.7	.18	467	2	472	7

23	3	.7	.18	472	7	474	7
24	3	.85	.25	474	7	475	2

CRSP Simulation Specifications: Used with V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Rockfall analysis B-B' with berm.dat

Total Number of Rocks Simulated: 10000
Starting Velocity in X-Direction: 1 ft/sec
Starting Velocity in Y-Direction: -1 ft/sec
Starting Cell Number: 1
Ending Cell Number: 24
Rock Density: 165 lb/ft^3
Rock Shape: Discoidal
Diameter: 11.5 ft
Thickness: 4.5 ft

CRSP Analysis Point 1 Data - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Rockfall analysis B-B' with berm.dat

Analysis Point 1: X = 474, Y = 7

NO ROCKS PAST ANALSYSIS POINT 1

CRSP Data Collected at End of Each Cell - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Rockfall analysis B-B' with berm.dat

Velocity Units: ft/sec Bounce Height Units: ft

Cell #	Max. Vel.	Avg. Vel.	S.D. Vel.	Max. Bounce Ht.	Avg. Bounce Ht.
1	No rocks	past end of cell			
2	No rocks	past end of cell			
3	No rocks	past end of cell			
4	No rocks	past end of cell			
5	No rocks	past end of cell			
6	No rocks	past end of cell			
7	No rocks	past end of cell			
8	No rocks	past end of cell			

9	No rocks	past end of cell			
10	No rocks	past end of cell			
11	No rocks	past end of cell			
12	23	14	3.55	6	0
13	28	19	2.98	3	0
14	34	25	3.2	6	2
15	26	5	2.63	1	0
16	13	5	2.41	0	0
17	23	16	1.92	1	0
18	25	20	2.49	2	0
19	28	22	3.07	2	0
20	28	25	2.13	2	1
21	35	30	3.4	3	1
22	No rocks	past end of cell			
23	No rocks	past end of cell			
24	No rocks	past end of cell			

CRSP Rocks Stopped Data - V:\CLIENTS\L\LEGACY DEVELOPMENT\BOP15006 Warm Springs - Legacy Development\Rockfall analysis B-B' with berm.dat

X Interval	Rocks Stopped
0 To 10 ft	6667
10 To 20 ft	0
20 To 30 ft	0
30 To 40 ft	0
40 To 50 ft	0
50 To 60 ft	0
60 To 70 ft	0
70 To 80 ft	0
80 To 90 ft	0
90 To 100 ft	0
100 To 110 ft	0
110 To 120 ft	0
120 To 130 ft	0
130 To 140 ft	0
140 To 150 ft	0
150 To 160 ft	0
160 To 170 ft	0
170 To 180 ft	0
180 To 190 ft	0
190 To 200 ft	0
200 To 210 ft	0
210 To 220 ft	0
220 To 230 ft	0
230 To 240 ft	0
240 To 250 ft	0
250 To 260 ft	0
260 To 270 ft	0
270 To 280 ft	0
280 To 290 ft	0

290 To 300 ft	0
300 To 310 ft	0
310 To 320 ft	0
320 To 330 ft	0
330 To 340 ft	0
340 To 350 ft	0
350 To 360 ft	1364
360 To 370 ft	1938
370 To 380 ft	0
380 To 390 ft	0
390 To 400 ft	0
400 To 410 ft	0
410 To 420 ft	0
420 To 430 ft	0
430 To 440 ft	0
440 To 450 ft	0
450 To 460 ft	0
460 To 470 ft	20
470 To 475 ft	11