

September 28, 2021

Email to [peter.hays@state.co.us](mailto:peter.hays@state.co.us)

Division of Reclamation, Mining and Safety  
c/o Peter Hays  
1313 Sherman Street, Room 215  
Denver, CO 80203

**Re: AFS Response to Walstrum Quarry M-1983-033 AM-09 Geotechnical Review #2**

Dear Peter:

Below please find the AFS response to Zach Trujillo's September 17, 2021 additional comment on Geotechnical Stability Exhibit. This response was prepared with input from Tetra Tech's engineers.

DRMS Geotech Comment:

*Under Section 1.0 of the Exhibit, discussion regarding the potential of natural geologic hazards within the Spur Amendment is mentioned along with mitigation options downslope. However, this discussion appears to be specific to areas within the pit and not along the undisturbed outcrops of the spur area. Please include the following comments with the Division's review for the Walstrum AM-09:*

- *Please provide additional details regarding if there are potential natural geologic hazards along the undisturbed outcrops of the proposed spur area along with any mitigation options if applicable.*
- *Additionally, please address the potential for rockfall along the undisturbed outcrops above the Highway 6 and Clear Creek corridor due to blasting and any mitigation options if applicable.*

AFS Response:

*"Rockfall is a significant natural hazard that affects the highway system. There are over 750 locations statewide recognized as having chronic rockfall hazards. It is important to recognize that rockfall is sporadic and unpredictable. Rockfall can occur at any time from almost any location along a slope. The purpose of implementing rockfall mitigation is to reduce the risk of rockfall at a specific location."*<sup>i</sup>

Potential natural geologic hazards in Clear Creek Canyon from Idaho Springs to Golden include rockfall along the relatively short distance of canyon in which the proposed Spur Amendment is located. The potential for rockfall exists on the steep slopes of the canyon (*Geologic Hazards in East-Central Clear Creek County, Colorado* by Mark S. Pelizza [1978] and *Attachment 10 in Response to Adequacy Review #1* [August 17, 2021]). Rockfall occurs through the continuous natural weathering of rocks as visible in the canyon especially after heavy rain and ice and snowmelt events. To address this potential, the Colorado Department of Transportation (CDOT) periodically performs rockfall mitigation work throughout the canyon including adjacent to the Existing Quarry and the Spur Amendment area in cooperation with AFS; this coordination will continue.

Risk of rockfall resulting from blasting will be minimal because the vibration caused by blasting within the mining area can be controlled by distance and blasting techniques that minimize vibration. The relatively high frequency of blast vibrations causes the waves to attenuate over much shorter distances than earthquake signature vibrations and confine any damage to manageable distances. See *Geotechnical Stability Exhibit* for discussion on ground vibration during blasting, pages 32-34 of Section 6.5.6 (Pit Geometry and Mining Practices).

Blasting has been safely performed within the Existing Quarry for the past 30 years. There have been no incidents of rockfall on undisturbed slopes outside of the Existing Quarry. See Attachment 1, cross-sections 1 and 2 for cross-sections of mined areas and undisturbed outcrops along Highway 6 in the Existing Quarry. As shown in cross-section 1, blasting in the Existing Quarry was conducted within approximately 425 horizontal feet of Highway 6 with an average 1.2H:1V outcrop. Cross-section 2 shows a similar case where blasting was completed within approximately 650 horizontal feet of Highway 6 with an average 1.2H:1V outcrop.

In contrast, the mining area of the Spur Amendment is typically 750 feet to 1,500 feet from the closest area of concern (i.e., Highway 6 or Clear Creek, whichever is closer), with the exception of the ravine on the north side of the oxbow (near Tunnel 6) which is approximately 500 feet from Clear Creek. See Attachment 1, cross-sections 3-6 for cross-sections of the proposed Spur Amendment area along Highway 6 and Clear Creek; these cross-sections show the expansive buffer between the mining area and the Spur Amendment permit boundary. In addition to showing the horizontal and vertical distance from the mining to the area of concern, an example of mining at the 7,800-foot level is shown reflecting the “mining from behind” approach that will minimize the potential for rockfall on the outcrops. Also, locations where temporary rockfall berms may be placed (downslope from mining) are shown. The separation of the mining area from Highway 6 or Clear Creek is shown in the cross sections, as follows:

- Cross-section 3 shows mining occurring a minimum of 750 horizontal feet from Highway 6 with an average 1.3H:1V outcrop.
- Cross-section 4 shows mining occurring a minimum of 1,500 horizontal feet from Clear Creek with an average 1.7H:1V outcrop. The area closest to the creek has a steeper 1H:1V slope, but that slope is 900 feet from the nearest mining area.
- Cross-section 5 shows mining occurring a minimum of 500 horizontal feet from Clear Creek with an average 2.5H:1V outcrop.
- Cross-section 6 shows mining occurring a minimum of 800 horizontal feet from Clear Creek with an average 1.8H:1V outcrop.

In summary, the cross-sections show that mining in the Spur Amendment will be similar to mining in the Existing Quarry. However, the slopes in the Spur Amendment tend to be longer and less steep than the examples from the Existing Quarry (generally less steep than 1.5H:1V in the Spur vs. 1.2H:1V in the Existing Quarry), and the mining will generally be done further from Highway 6 and Clear Creek.

In order to mitigate the risk of rockfall, AFS commits to four actions:

1. Conduct only controlled blasting techniques within 50 feet of the Affected Area line (on the southern/downslope side of the mining area), with blasts designed to minimize vibration and overbreak. The rock type and quality will be monitored to optimize performance of the blasts. Furthermore, the Spur Amendment has a notably higher Rock Mass Rating (RMR) than the area previously blasted in the Existing Quarry; this will result in less overbreak and vibration. These

measures are already planned on the north side of the property line that abuts Mr. Young's property in order to protect any structures within 200 feet of the property line (see *Geotechnical Stability Exhibit* for discussion on pages 32-34 of Section 6.5.6).

2. Inspect the land within 50 feet downslope of the Extraction Limits for loose rocks and mitigate by removal of the loose rocks within the 50-foot zone. Prior to laying out a blast, should modifications be required, the blast site and projected area of influence will be stabilized with mechanical equipment by mining from behind.
3. Continue to cooperate with CDOT to assess rockfall along the Spur boundary and mitigate where necessary. This is a routine and ongoing activity that CDOT does in many locations throughout Clear Creek Canyon.
4. Install a seismic monitor in the Spur Amendment area to monitor blasting vibration levels.

If you have any questions, please contact me at 303-913-6583.

Sincerely,



Joel Bolduc  
Land and Environment Manager

Encl:

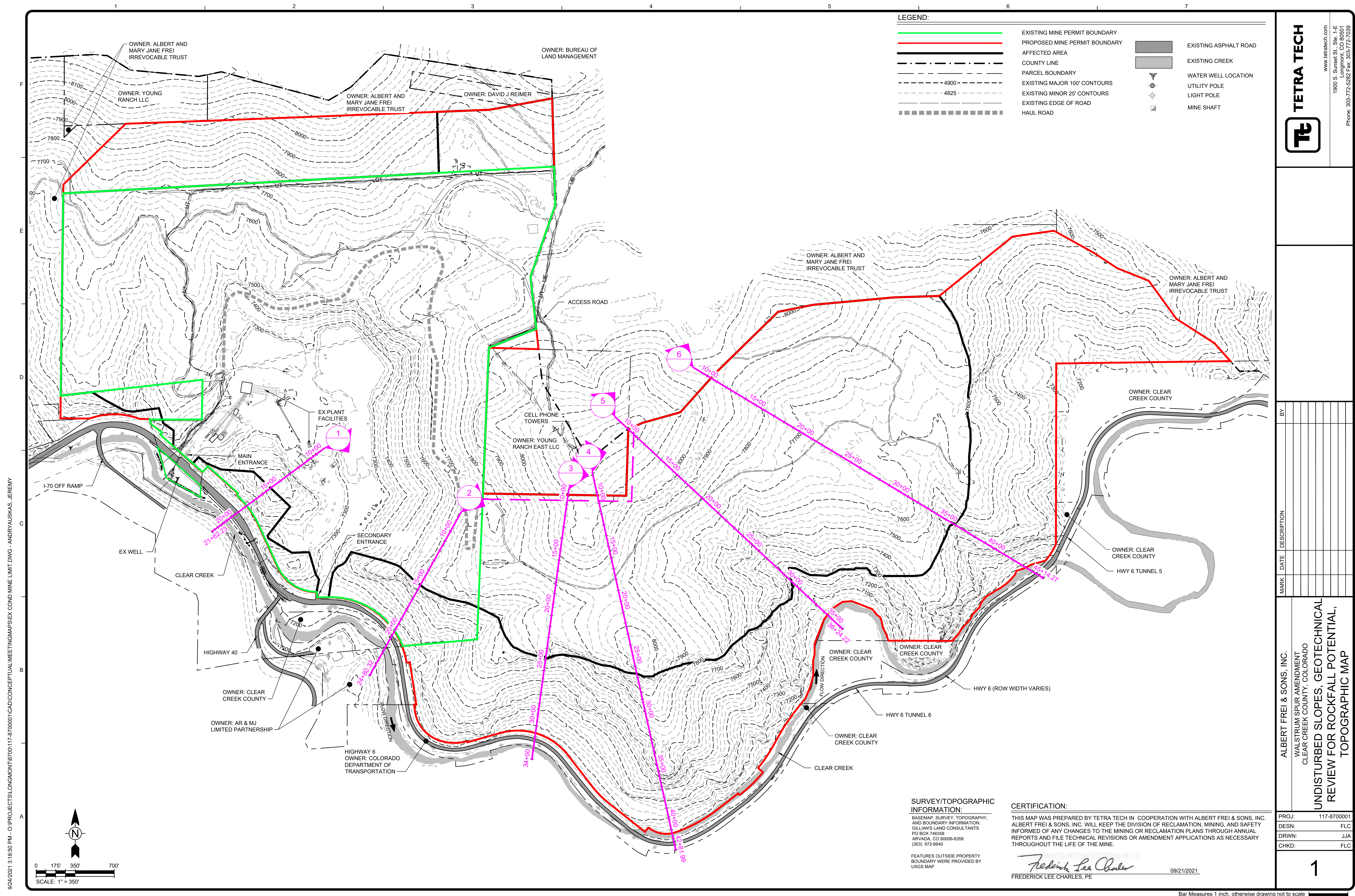
Attachment 1 – Rockfall Topographic Map and Cross-Sections

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<sup>i</sup> <https://www.codot.gov/business/designsupport/materials-and-geotechnical/programs/geohaz/rockfall>

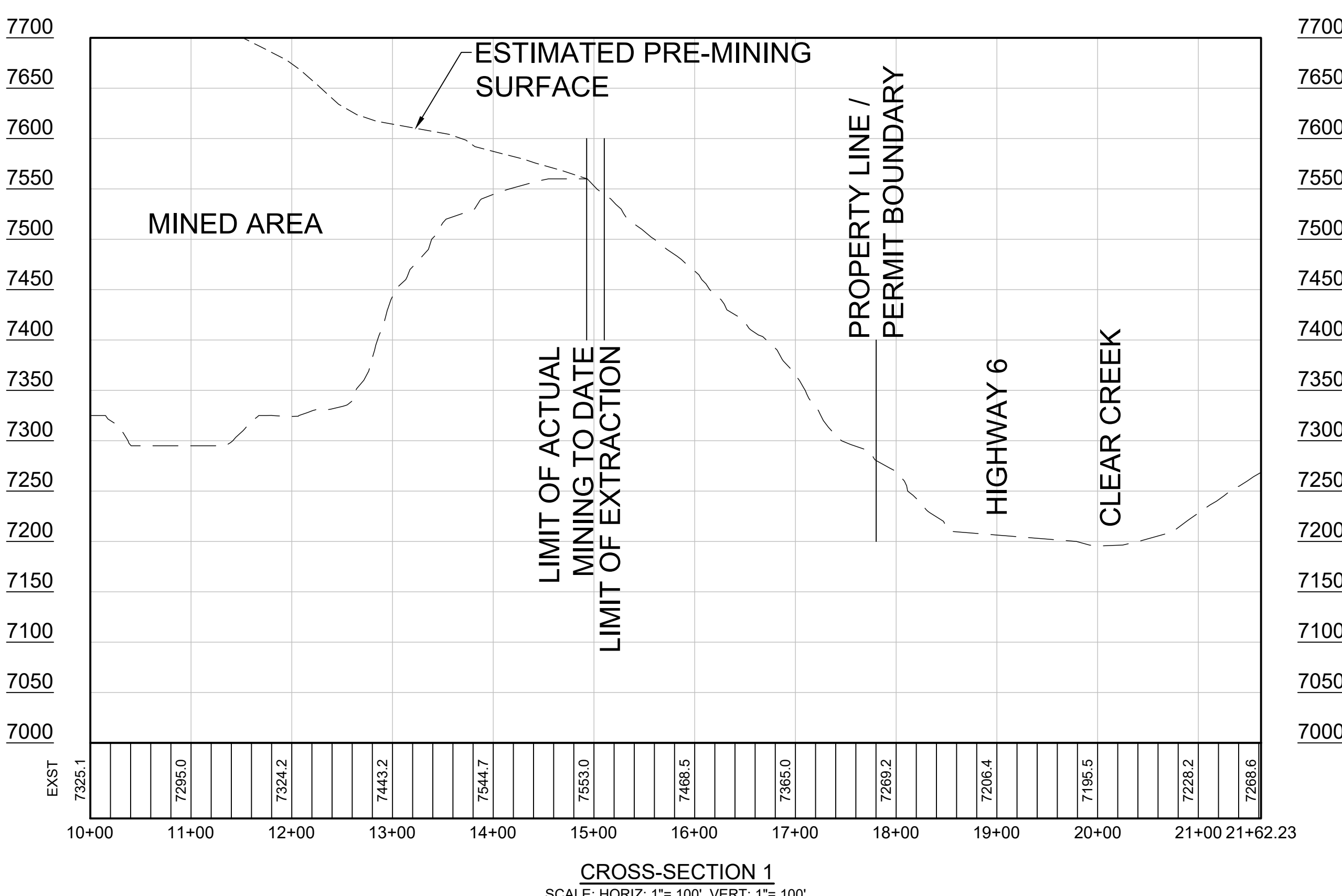
Attachment 1  
to Geotechnical Adequacy Review #2  
Rockfall Topographical Map and Cross-Sections








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FREDERICK LEE CHARLES, PE

Bar Measures 1 inch, otherwise drawing not to scale

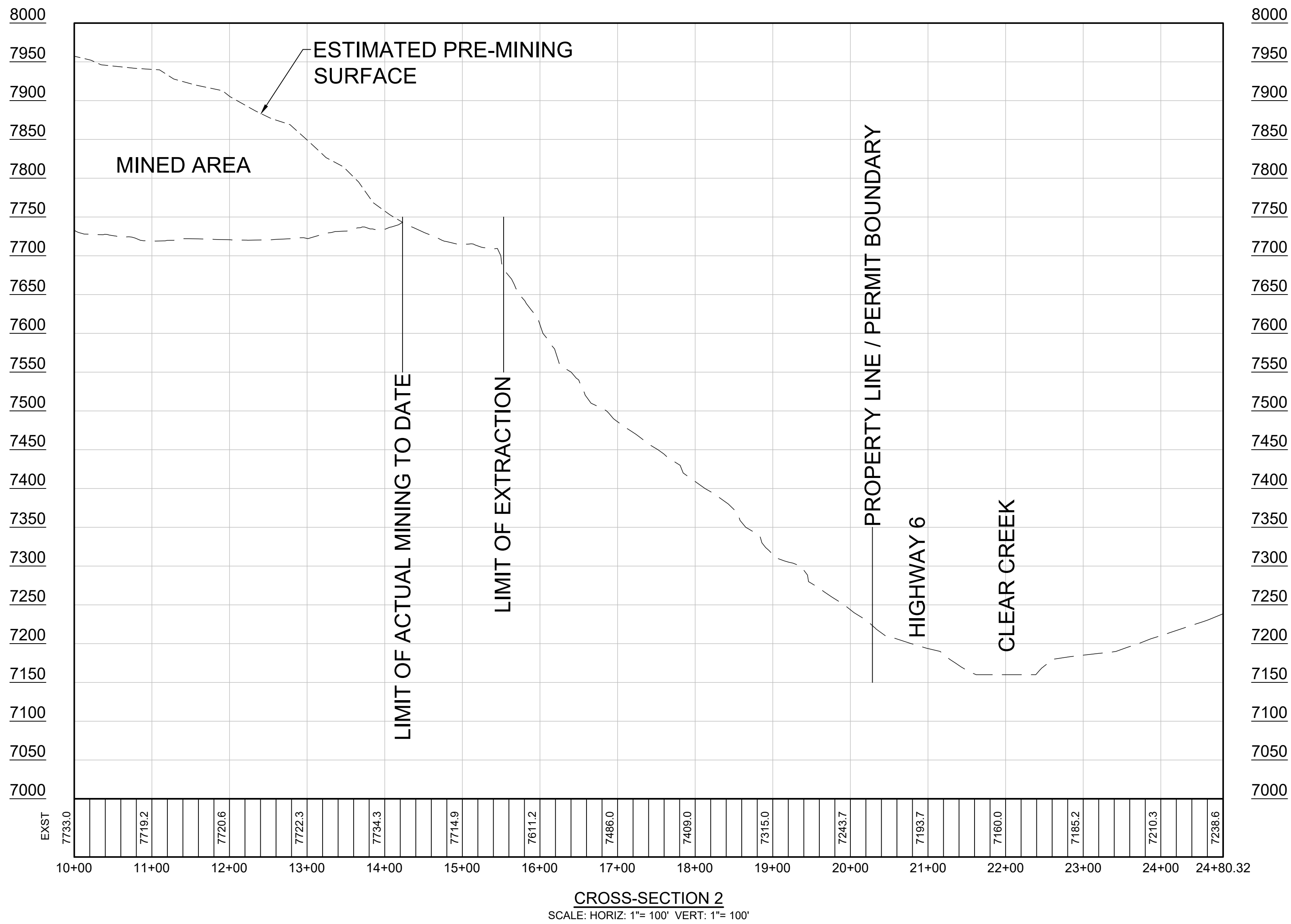
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# CROSS-SECTION 2



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*Frederick Lee Charles*  
FREDERICK LEE CHARLES, PE

09/21/2021

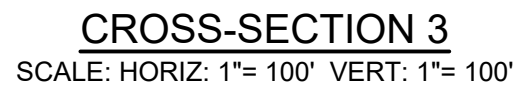


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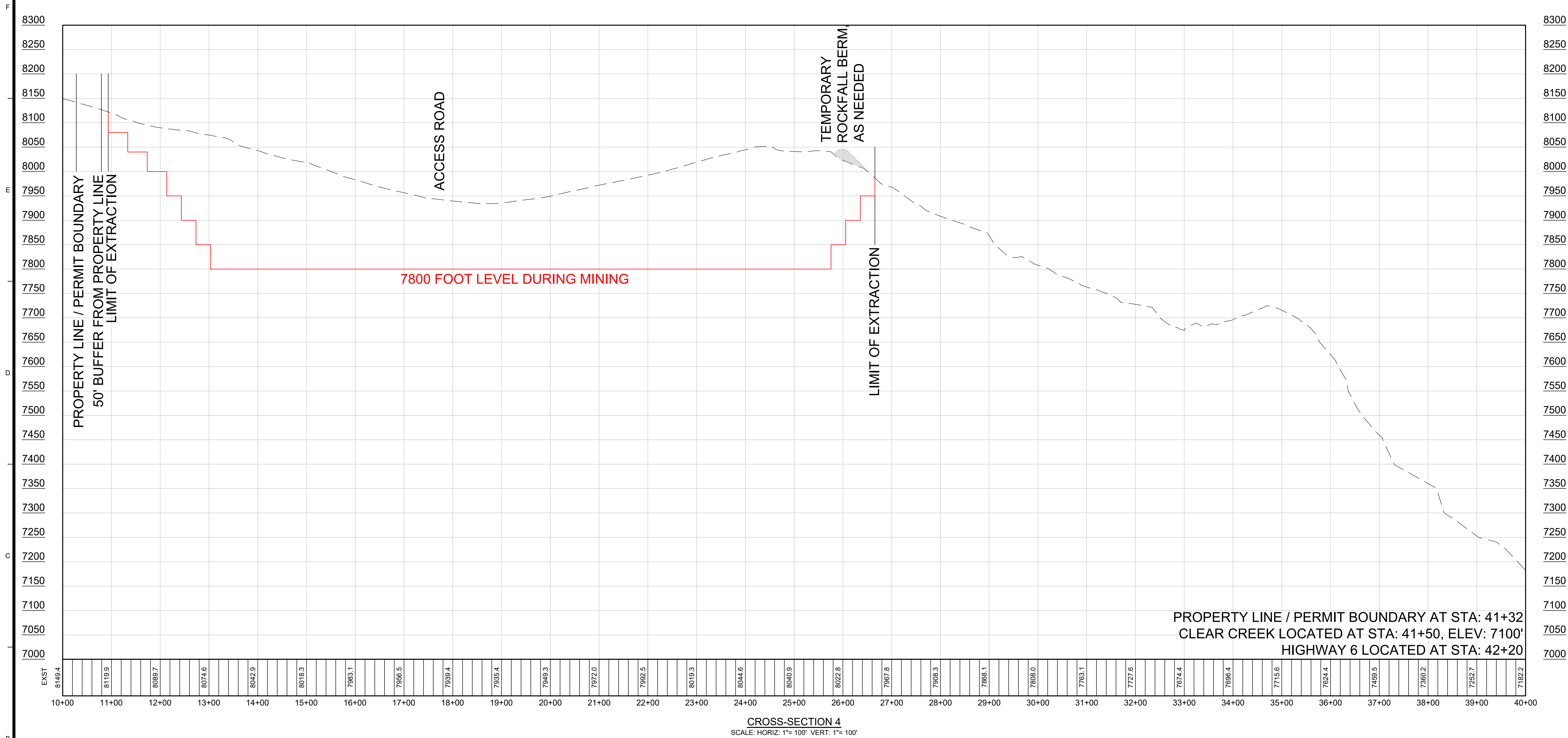
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*Frederick Lee Charles*  
FREDERICK LEE CHARLES, PE  
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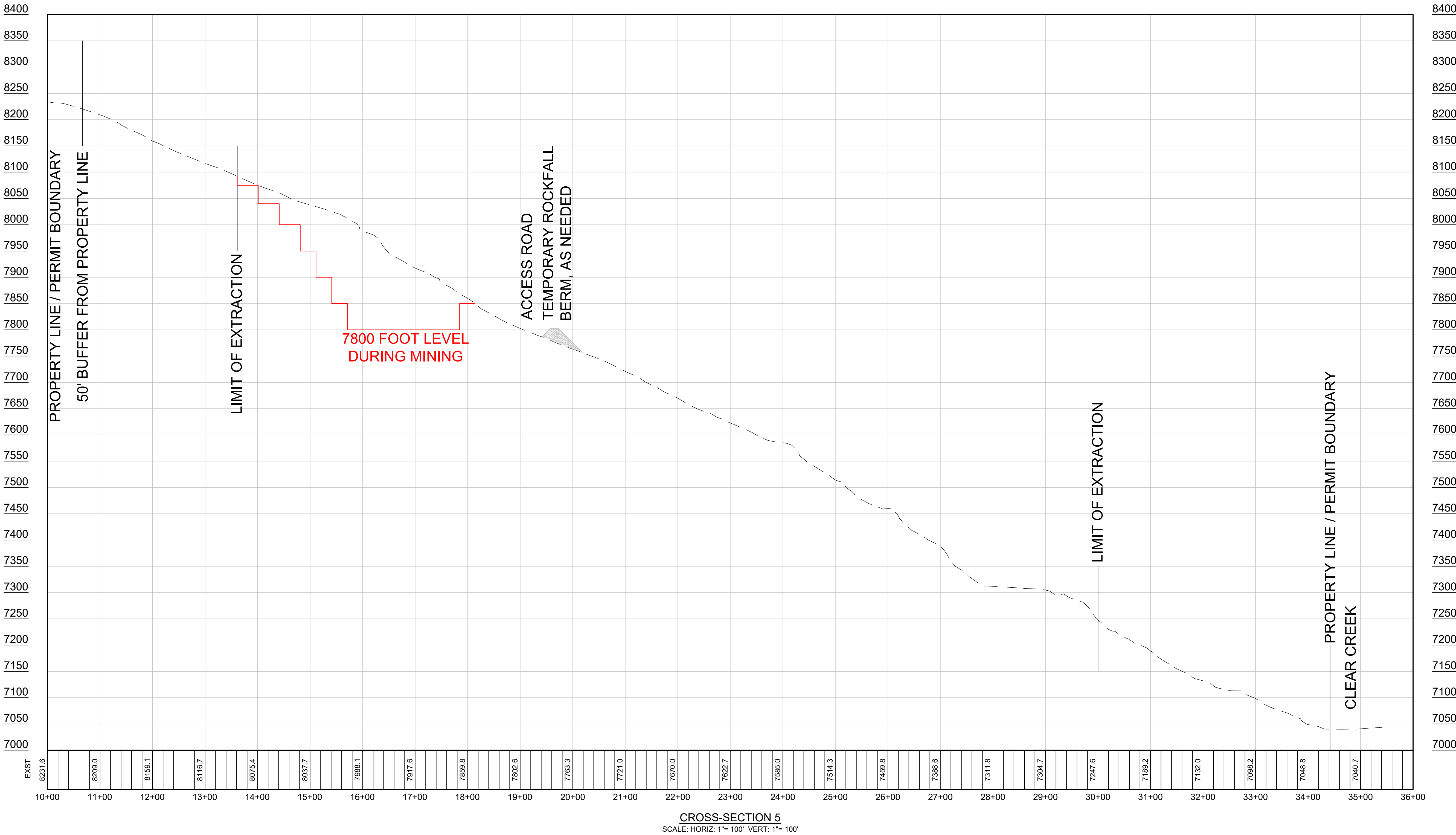
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*Frederick Lee Charles*  
FREDERICK LEE CHARLES, PE

09/21/2021

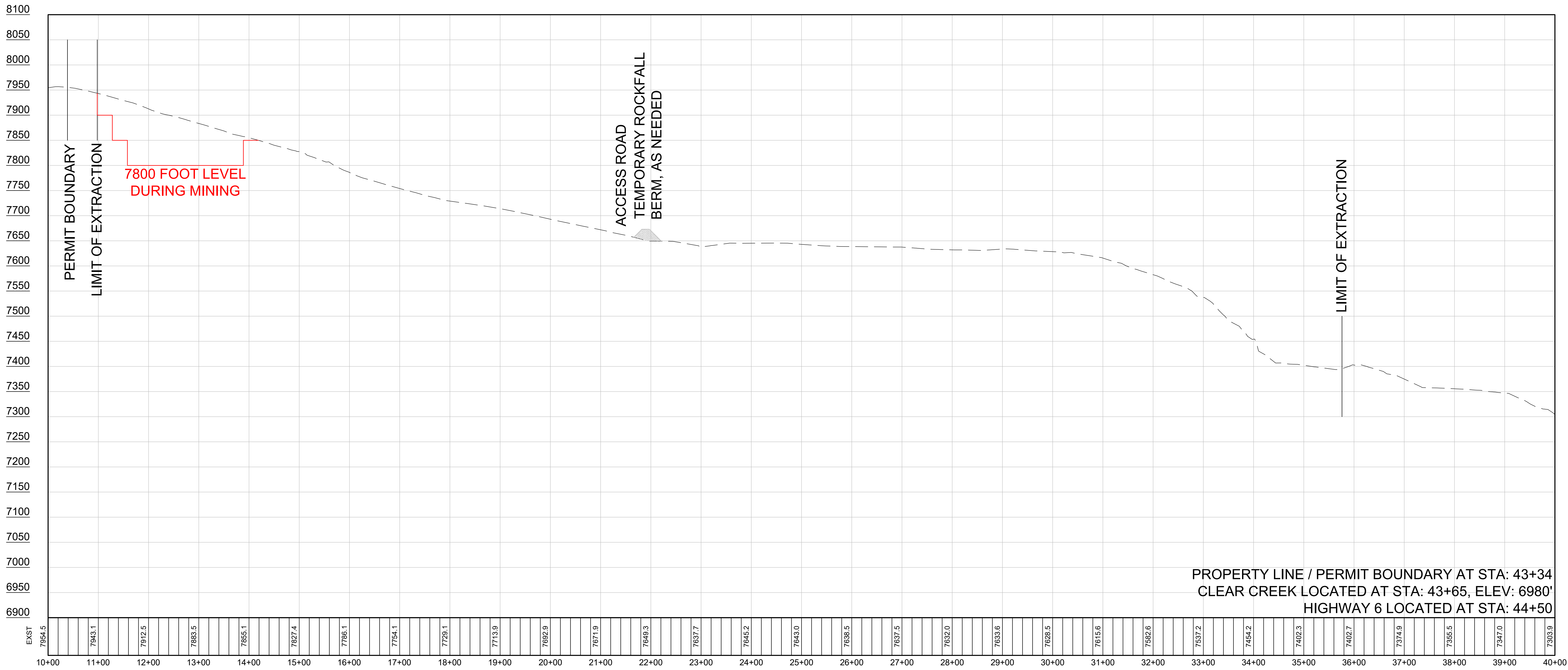
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# CROSS-SECTION 6

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CROSS-SECTION 6  
SCALE: HORIZ: 1"= 100' VERT: 1"= 100'

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THROUGHOUT THE LIFE OF THE MINE.

*Frederick Lee Charles*  
FREDERICK LEE CHARLES, PE  
09/21/2021

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CHKD:	FLC



Attachment 2  
Exhibit R Receipt of Proof of Filing  
(revised 9/29/2021)



35715 HIGHWAY 40  
BUILDING B, SUITE 120  
EVERGREEN, CO 80439  
MAIN: (303) 289-1837

September 29, 2021

**Delivery via Hand Delivery and Email to bcorbett@clearcreekcounty.us**

Clear Creek County  
c/o Ms. Brenda Corbett, Clerk & Recorder  
405 Argentine Street  
Georgetown, CO 80444

***Re: Notice of Revised Application for a Mined Land Reclamation Permit Amendment***

Dear Brenda:

Enclosed is a copy of the following revised documents relating to the permit amendment application for the Walstrum Mine, M-1983-033 hand delivered to you on April 16, 2021:

Geotech Adequacy Review #2 Response dated 9/28/2021  
Attachment 1 – Rockfall Topographical Map and Cross-Sections  
Attachment 2 – Exhibit R Receipt of Proof of Filing (revised 9/29/2021)

Please acknowledge receipt of these revised items by signing in the appropriate space provided below and return a signed copy of the Notice to the person delivering it. We need to submit proof of delivery to the Division of Reclamation, Mining & Safety as proof of filing these revised items.

Sincerely,

Al Frei, Jr,  
President

RECEIVED THIS 30<sup>th</sup> DAY OF September, 2021

Clear Creek County Clerk & Recorder

By:

Name:

Title:

Virginia Plett  
VIRGINIE FLETT  
Deputy Clerk

