STATE OF COLORADO

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Final Brown revised 110 for review

Robert Congdon <defiancestone11@gmail.com> Wed, Jul 2, 2025 at 9:39 AM
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Hopefully we can get this turned around soon. Thanks Robert

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Brown Quarry Revised 110.pdf
6453K

Defiance Quarry Mining Permit Application - Complete with Addendums

DEFIANCE QUARRY
CONSTRUCTION MATERIALS
REGULAR (110) LIMITED IMPACT
Brown Quarry
March 12th 2025

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6.3.1 EXHIBIT A – Legal Description and Location Map

The Defiance Stone project is located in the western portion of Eagle County, Colorado, in Section 34, Township 4 South, Range 86 West, of the 6th P.M., The project is approximately 1.5 miles northeast of Dotsero, Colorado north of the 1-70 corridor and east of the Dotsero Crater. Access to the properties is through taking Exit 133 on I-70, driving 2.5 miles north on BLM Road 8460. The project will utilize BLM Road 8466.

The topography in the area includes steep slopes and small mesas which exhibit vegetation communities that include open sagebrush, juniper woodlands, and mountain brush. The Eagle River flowing east to west lies about three miles south of the project. The Colorado River, flowing north to south lies about two miles west of the project. The Eagle River flows into the Colorado River about two miles southwest of the project.

Dotsero is an unincorporated community consisting of mostly homes and manufactured houses along the Eagle River. The community of Dotsero is located within a two-mile radius of the proposed Quarry.

Table A-1. Affected Area Boundary Coordinates

Area	Corner	Latitude	Longitude
Quarry	1	39.6542785°N	107.0258612°W
	2	39.6538896°N	107.0263890°W
	3	39.6549318°N	107.0274043°W
	4	39.6552507°N	107.0266945°W
Yard	1	39.6598340°N	107.0303612°W
	2	39.6598063°N	107.0299167°W
	3	39.6597571°N	107.0298933°W
	4	39.6596506°N	107.0299061°W
	5	39.6594980°N	107.0299581°W
	6	39.6594344°N	107.0299854°W
	7	39.6593993°N	107.0300092°W
	8	39.6594174°N	107.0303612°W
BLM Road	Start	39.6598044°N	107.0298088°W
	End	39.6598044°N	107.0298088°W
Two Track Haul Route	Start	39.6592901°N	107.0327709°W
	End	39.6592901°N	107.0327709°W

Note: BLM Road and Two Track Haul Route are linear features with multiple intermediate points defining the route path. Complete coordinate lists available in project mapping files.

6.3.2 EXHIBIT B – Site Description

(a) Vegetation and Soils

Soils

There are two soils types that will be affected by the mining operation. The Brown Quarry and most of the new road to the quarry is in the Torriorthents-Rock outcrop complex, 45 to 95 percent slopes. The Yard is located in the Earsman-Rock outcrop complex, 12 to 65 percent slopes. The typic subgroup is fied on the driest Torriorthents that are moderately deep or deep to hard rock. Soils that have weak cementation by silica are excluded from the typic subgroup because that feature is considered to indicate initial development of a duripan. The Torriorthents that have clayey texture, cracks, and a swelling type of clay are also excluded because they have so many similarities to the Torrerts.

Map Unit Setting
National map unit symbol: jq5n
Elevation: 6,000 to 8,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 42 to 44 degrees F
Frost-free period: 80 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition
Earsman and similar soils: 45 percent
Rock outcrop: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Earsman
Setting
Landform: Mountains
Landform position (three-dimensional): Mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from calcareous Limestone and/or residuum weathered from calcareous Limestone

Typical profile
H1 - 0 to 5 inches: very stony sandy loam
H2 - 5 to 19 inches: very channery sandy loam
H3 - 19 to 23 inches: unweathered bedrock

Properties and qualities
Slope: 12 to 65 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: PIYON-JUNIPER (null_15)
Hydric soil rating: No

Description of Rock Outcrop
Typical profile
H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities
Slope: 12 to 65 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components
Ansari
Percent of map unit: 10 percent
Hydric soil rating: No

Other soils
Percent of map unit: 5 percent
Hydric soil rating: No

Arle
Percent of map unit: 5 percent
Hydric soil rating: No

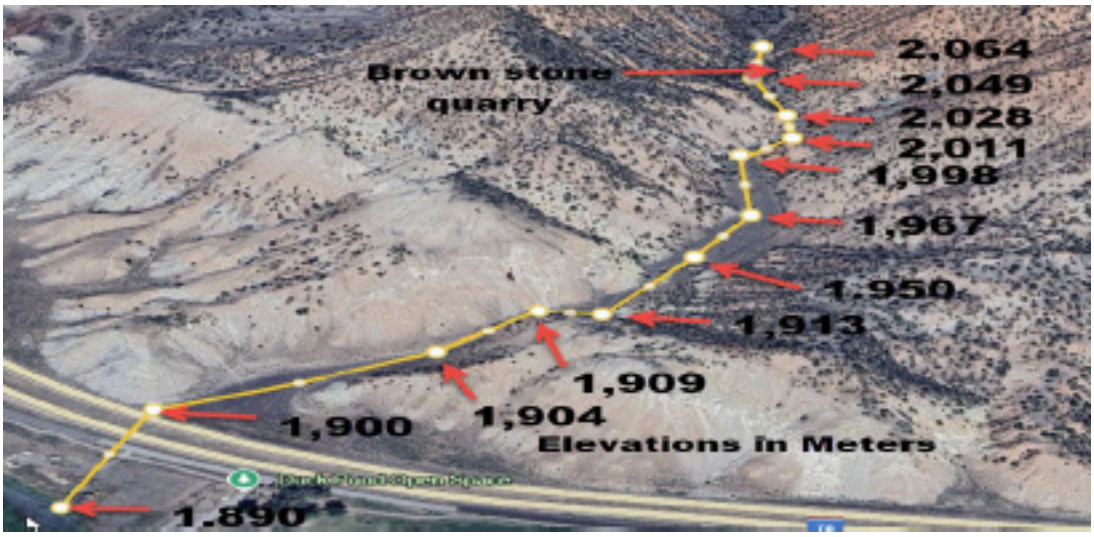
Data Source Information
Soil Survey Area: Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties Survey Area Data: Version 9, Sep 10, 2018

Vegetation

The access road to the Brown Quarry and the Brown Quarry itself lies in a canyon with steep walls and occasional small rock outcrops, dominated by pinon-juniper of moderate height (10-30 feet) with pockets of big sagebrush. The Yard is located in a degraded area dominated by rubber rabbitbrush and snakeweed. Elevations range from 6,650 feet at the base of Brown Quarry to 7,150 feet at the Yard. (Ref Cedar Creek raptor survey report, June 2018).

(b) Permanent Man-made Structures

There are no structures within two hundred feet of the Quarry or the road repair area. There is a power line that crosses over the access roads and terminates at the yard. Other than the Eagle River, there are no developed water resources in the area of the proposed operation. There are no active streams or springs, lakes, stock water ponds, ditches, reservoirs or aquifers that would receive drainage directly from the affected areas. With the lower drainage section flatting out most of the water will be absorbed into the ground. Drainage from the affected areas will ultimately rarely reach the Eagle River.



(c) **ADDENDUM – Rule 6.3.2(c) – Description of Water Resources in the Area**

The Brown Quarry is outside of any floodplains along the Eagle, River north of Gypsum, CO. Two ephemeral drainage channels pass through the affected area, to the east and west of

the quarry. These are shown on Map G-1. USGS StreamStats hydrological information can be found in Appendix 1. No groundwater will be interacted with during mining, as the nearest known groundwater aquifer is the alluvial aquifer of the Eagle River which is 500-feet below the quarry.

All surface water runoff that encounters the disturbed area will be collected in the quarry floors for infiltration and evaporation during mining operations. The operator is committed to protecting the hydrological balance and water quality at the site.

(d) **ADDENDUM – Rule 6.3.2(d) – Wildlife Information**

The Quarry operator has been in continued conversation with the Colorado Parks and Wildlife (CPW) concerning important wildlife habitats or species that may be impacted by the operation. Measures recommended by the CPW will be implemented at the Quarry to mitigate the impact to wildlife during the operation.

Mapped High Priority Wildlife Habitats that the sight will interact with include the Bighorn Sheep winter range and production area and Peregrine Falcon nesting sites. After a thorough site visit by the CPW that allowed a visual inspection of the habitat and provided an understanding of planned operations, the CPW does not expect that the proposed project will have negative impacts on wildlife. Most wildlife evidence observed onsite was transient in nature, indicating that while wildlife move through this area, they do not occupy it regularly. Moreover, no Peregrine Falcon nests have been observed in the immediate area.

Due to the nature of wildlife occupation in the site, the Brown Quarry commits to following the CPW's site recommendations to ensure the wildlife are minimally impacted, if at all. As described in further detail in Exhibit C, the mine will adhere to operations that support the wildlife in the area, including operating within designated hours, controlling site lighting at night, and establishing trash and dog policies. Furthermore, as explained in Exhibit D, the site will be reclaimed to ensure wildlife can continue to thrive in the area after mining.

6.3.3 EXHIBIT C – Mining Plan

(a) Dates Mining will Commence and End

This is a new application for a limestone mining operation located in Eagle County. The Quarry and associated access roads are proposed to be located northeast of Dotsero, Colorado. T4S, R86W, Section 34, 6th P.M.

Mining operations will commence in the first or second quarter of 2025 subject to permit approval. The mining operation is not intended to be an intermittent operation. Per CPW recommendations, mining will be conducted during daylight hours to minimize disturbance to wildlife that utilize this area to protect nocturnal wildlife behavior. Moreover, lighting on site will be capped from above to help reduce night-sky light pollution and to avoid interference with nocturnal wildlife behavior.

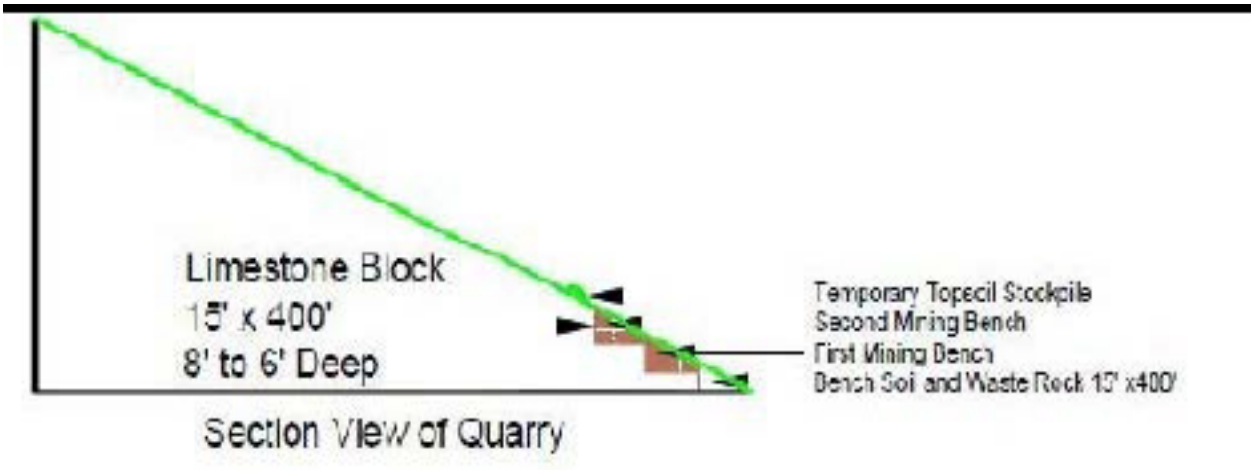
Defiance Stone has a 5-year Contract with the BLM for the Sale of Mineral Material. During the five year permit term the plan is to extract a total of 16,000 bank cubic yards of stone from the Quarry with 90% usable stone. Remaining 10% will be used in reclamation back fill. The mining operation will renew the sales contract for limestone materials with the BLM and Defiance Stone, LLC for up to four - five year terms (twenty additional years).

(b) Topsoil & Subsoil Brown Quarry

Any timber removed for operations will be cut into lumber and firewood.

Based on averaged physical measurements, approximately 6 inches in depth of topsoil and 0 inches will be salvaged for use in the reclamation process.

As shown in the below image, available topsoil will be salvaged and stockpiled at the Quarry. Topsoil stockpiles that are to remain in place for more than ninety days will be seeded as soon as practical. Berms will be constructed around the base of stockpiles where necessary to prevent loss of topsoil material from the stockpiles. Topsoil will be located out of the way of mine traffic and out of stream channels or drainage ways.



(c) Thickness of Overburden

There will not be any waste rock removed to reach the deposit. No overburden stockpiles or waste rock fills will be required.

(d) Thickness of Deposit

The deposit has various layers from 1inch to 5 feet thick.

(e) Major components of the mining operation.

Site Access

Access to the Quarry will be from BLM Road 8460. The BLM- designated administrative access road will lead to the northwest corner of the Quarry. Signage and gating on this access road will keep the public from operations, The road will be 12 feet wide with a design speed limit of 10 miles per hour. The 3,000 feet long access road will have a security gate located where it intersects with BLM Road 8460. BLM Road 8460 will remain open to the public during and after mining.

Fuel

Fuel will be brought in by a local provider as needed. The maintenance truck will have a 100 gallon steel tank for diesel fuel for the excavator. The loader, trucks and generators will be filled at the yard from the delivery truck. Safety measures will be in place.

During the Production Phase - Equipment to be used

- Two excavators
- flatbed truck
- Boom Truck
- Air compressor
- Jumbo drill
- Skid loaders
- Forklift
- Wire saw
- Diamond floor saw
- Jack hammers
- Hydraulic Splitter
- Small RV for office/lunch room.
- rock crusher
- Portable electrical generator
- 2- 250 plastic tanks 1- 2650 plastic tank (wire saw) 1- 750 plastic tank (fire protection)
- 2-500 plastic tanks quarry (fire protection)
- Mobile office/security guard trailer
- Forklift/loader
- Equipment and temporary stone storage area

• Yard will be fenced
• Internet dish
• Electricity
• Diamond wire saw
• Water storage tanks (plastic)
• Hydraulic stone cutters
• Overhead crane
• ATV travel to and from quarry
• compressor

(f) Disturbed Area: Non-Road

See Table C-1 for dimensions of significant disturbances on site.

Table C-1. Disturbed Area Dimensions

Disturbed Area Name	Length (ft)	Width (ft)	Area (acres)
Brown Quarry	440	150	2.78
Yard	150	125	0.43

(g) Roads

The operation will utilize BLM Road 8460 and BLM Road 8466. Defiance Stone will perform routine maintenance on BLM roads. Routine maintenance preserves the existing road, including the physical upkeep or repair of wear or damage whether from natural or other causes, maintaining the shape of the road, grading it, making sure that the shape of the road permits drainage, and keeping drainage features open and operable essentially preserving the status quo. Per CPW recommendations, fresh water will be utilized for dust suppression on all dirt access roads and work surfaces as needed. See Table C-2 below for road dimensions applicable to the site.

Table C-2. Road Dimensions

Roads Name	Length (ft)	Width (ft)	Area (acres)
BLM Road 8460	8,260	24	N/A
BLM Road 8466	1,100	16	N/A
Yard Entrance Roads	0 (Gate)	16	N/A
Brown Quarry Road Upgraded	3,000	12	0.83

Access from BLM Road 8460 starts at the bottom of the hill with access to Interstate I-70. The Quarry will access an upgraded BLM-designated administrative access road that leads to the northwest corner of the Quarry. This road will be 12 feet wide, 3,000 feet long with a design speed limit of 10 miles per hour. There will be rolling dips and pull-outs. The road will be constructed by a combination of dozers or front-end loaders

Access to Yard will be from BLM Road 8466. There will be entrance to the yard on the northeast side of the yard. The existing road intersects the Yard.

For the construction of all of the roads on site, all vegetation material and topsoil will be removed from the design road bed, shoulders, and surfaces where associated structures will be placed. Topsoil will be placed in one of the topsoil stockpiles located on site. No vegetation material or topsoil will be placed beneath or in any haul road embankment. The material for the embankment shall be reasonably free of organic material, coal or coal blossom, frozen materials, wet or peat material, natural soils containing organic matter or any other material considered unsuitable for use in embankment construction.

In the placement of embankment for a road, materials will be spread in layers approximately 12 inches deep, and such lifts made uniformly over long stretches and for the full width of the embankment. Each lift will be moistened or dried to a uniform moisture content suitable for compaction. Hauling equipment will be routed both ways over the fill and routing varied sufficiently to achieve uniform compaction. Compaction will be carried to the edge of the fills so that the final slopes are firm.

Where the embankment is placed against the existing slopes, the slopes will be benched and scarified down to a firm dense base as the new fill is being placed. Material so loosened will be mixed with the new fill and the resultant mix blended firmly into the slope.

When rock or rocky material is used for embankment, placement shall be in layers not exceeding the maximum size of the rock present, and in no case shall lifts exceed 30 inches in depth. Rock layers shall be compacted by routing the spreading equipment and loaded hauling equipment over the entire width of the fill until compaction is obtained.

(h) Water

Water used in the mining operation will be for occasional watering of the roadways, in which case the water will be imported and spread by truck and for coolant on diamond saws. Sawing water will be contained and reused. Water will be purchased from a company or municipality located along the Eagle River. During dry times water consumption could be up to 15,000 gallons per day which equates to utilizing five 3,000 gallon water trucks per day for dust suppression according to needs. The diamond wire saw water will be captured in plastic tanks and allowed to settle out overnight. Clean water float will be pumped to the operating clean water to be reused. Saw settling fines will be put in 1 ton bags. There is a market for the limestone fines. The fines can be used as a cement additive, agricultural additive including neutralizing acidic soils. Moreover, the fines can improve soil structure, promote microbial activity and enhance water retention. They are also used in road bases as they tend not to migrate.

(i) Rule 6.3.3(i) -- Impacts of Mining on Groundwater and/or Surface Water**

Water Quality Protection

The primary concerns surrounding water quality protection at the Brown Quarry site are the potential impacts to the surface and groundwater from sediment, hydraulic fluids, and diesel fuel. Sediment will be controlled through the use of stormwater retention within the disturbance area through the life of the mine. The site will be graded in a manner that maintains all surficial flows within the disturbed area, in turn containing all sediment and unwanted discharges from leaving the site. Hydraulic fluids and diesel fuels will be contained within vehicles or with adequate storage methods that follow best practices of maintenance; these practices include regular inspections of vehicles, hydraulic lines, and any other potential spill sources. Diesel fuel will not be stored onsite. An SPCC plan will be in place to prevent oil discharges and establish a response procedure in the event of spills.

Any surface water discharges from the site will be sampled in accordance with the NPDES discharge permit. Typical surface water discharge sampling analytes are listed in Table C-3. All discharge will be via the approved Outfalls, the proposed locations of which is shown on Map G-1.

Table C-3. Typical Surface Water Discharge Monitoring Requirements in a Construction Materials NPDES Discharge Permit

Parameter	Monitoring Frequency	Sample Type
Flow	Instantaneous, Monthly	In-situ
pH	2x/month	Grab
Total Suspended Solids	2x/month	Grab
Oil and Grease Visual	2x/month	Visual
Oil and Grease	Contingent on visibility of oil and grease	Grab
Total Flow	Instantaneous, Monthly	Calculated
Total Dissolved Solids	Quarterly	Grab

Note: these are the anticipated analytes based on operator experience at similar sites. CDPHE may issue different sampling requirements with the permit.

Surface Water

The mining operation will impact surface water in the area through the stormwater runoff that enters the site. Map G-1 shows the drainage patterns and how they are affected throughout the life of the mine. The maps include information on the drainage basins currently, during mining, and post reclamation as well as the drainage directions throughout these stages.

The primary concern for surface water protection at the site is preventing the discharge of sediment, oil, and/or hydraulic fluids from the operation areas. Oils and hydraulic fluids

are stored off site following the standard best management practices. These practices include the use of secondary containment at fluid storage and transfer points, spill kits, and employee training regarding safe handling practices. Sediment is trapped onsite using controls and best management practices by directing and controlling surface water runoff that enters the disturbed areas. More information on sediment and surface water control is provided below.

Surface Water Handling

Sediment trapping tools and safe fuel management will prevent negative impacts to surface water quality, and passing all runoff through the site will protect surface water quantity. Surface water runoff will be able to drain into the quarry and the yard for the operation.

During all phases of mining, surface water runoff will drain to the active quarry. The Brown Quarry sits in a single drainage basin in the site's existing conditions. Once mining begins, the drainage along the quarry will split this basin into two smaller ones, each routing stormwater to a corner of the quarry for collection and discharge. Benches will be designed to have a slight upward slope towards the center of the pit so water that flows into the pits will be directed either east or west towards the natural drainages instead of flowing over the south hill side. Water collected in these areas will be allowed to evaporate, infiltrate, or discharge through the stormwater control measures. These stormwater control measures are shown on Map G-1. This will help prevent erosion during the operation. Anchored straw bales or other sediment trapping mechanisms will be installed below the two natural drainages so run-off from the quarry is filtered prior to flowing to the ephemeral channel below. Both drainage basins consist almost entirely of highly permeable weathered rock overlaying the mountain bedrock. The mining of the quarry will remove the permeable weathered rock during mining, thus increasing runoff during mining. In the event that infiltration and evaporation has not occurred after 24-hours, either area will be pumped out via the approved CDPHE outfall once sediment has settled out.

Additionally, a rock check dam will be constructed in the ephemeral channel below and down gradient of runoff from the Brown Quarry. The rock check dam will reduce water velocity thus allowing sediment to settle.

The yard for the operation will have a stormwater diversion berm surrounding it made from stripped topsoil. This berm will be at least two-feet tall with 2H:1V sideslopes. It will isolate the yard from area drainage patterns and contain all runoff from the disturbed area of the yard within it to evaporate or infiltrate. In the event that infiltration and evaporation has not occurred after 24-hours, either area will be pumped out via the approved CDPHE outfall once sediment has settled out.

Access Road

The access road connecting the yard to the quarry itself will cross one of the two main ephemeral drainages in the area. Map G-2 shows the culvert drainage basin. A culvert will be installed that can pass the 100-YR event of roughly 36 CFS. Appendix 1 contains the USFS StreamStats calculation of the 100-YR event and the culvert design.

Disturbed Area Runoff

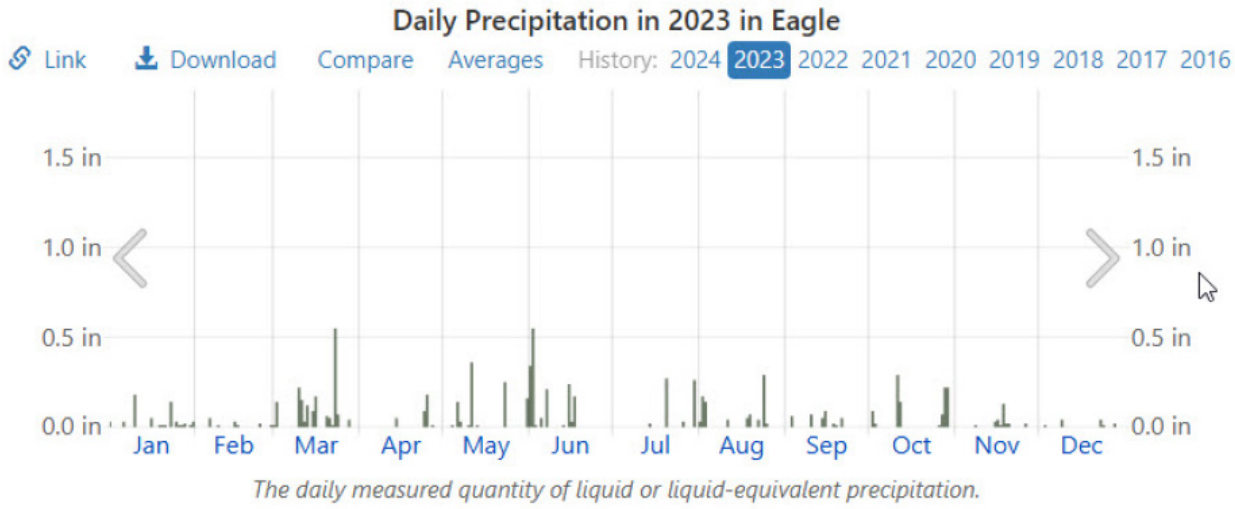
The expected rainfall from the events mentioned in the above section at the site is provided in Table C-4 below.

Table C-4. Area Storm Events (from NOAA)

Event Probability	Event Rainfall (inches)
100-YR 24-HR	2.41
10-YR 24-HR	1.60

Runoff peak flows and volumes for each event were calculated and can be seen on **Map G-1** and in the hydrologic calculations in Appendix 1.

To have a better picture of the precipitation in the surrounding area, a graph displaying the daily precipitation in 2023 in Eagle, CO is shown below.



Groundwater

Groundwater will not be encountered in this operation. No wells are located within 600-ft of the mining area. The nearest wells are over 3500-feet away along the Eagle River to the south. These wells are in the alluvial aquifer of the river. No known bedrock aquifer exists within or near the mining area. Mining is not anticipated to have any impacts on groundwater quality or quantity.

(j) Colorado Water Laws

No water will be impounded in the Quarry. Water used for dust suppression will be purchased from a party that has the right to use the water. The operation will not cause injury to existing water rights.

(k) Refuse or Toxic Producing Materials

If refuse and acid or toxic producing materials are exposed during mining, the material will be left in the pit and covered with available subsoil and topsoil to control unsightliness and protect the drainage system from pollution

(l) **ADDENDUM - Rule 6.3.3(l) -- Measures Taken to Minimize Disturbance of the Hydrologic Balance**

The surface water controls explained in section (i) above will help minimize disturbance to the hydrologic balance and prevent off-site damage. The proposed future land use is recreation and wildlife habitat. Reclaiming the Quarry to approximate original contour will create areas suitable for recreation and wildlife habitat.

During mining, site policies will be implemented to ensure minimal impact to the nearby wildlife. Per CPW recommendation, these policies include that trash and debris be removed daily and that no dogs will be allowed at the Project location.

(m) On Site Processing

The Limestone mined will have limited processing on site, specifically palletizing and sizing.

(n) Commodities to be Mined

The primary commodity mined will be dimensional limestone. The limestone will be used for flooring material, strip-stone, retaining walls, landscaping and other construction uses. No secondary or incidental commodities will be mined/extracted from the quarry.

(o) Use of Incidental Products

Not applicable, no incidental products will be mined/extracted from the quarry.

(p) Explosives

No Explosives will be used.

6.3.4 EXHIBIT D – Reclamation Plan

(1) Describe Reclamation Plan

(a) Replace Overburden

The Quarry has overburden/subsoil depth estimated to be 0" to 6" inches deep. Limestone from the Brown quarry will be mined using a series of cuts measuring approximately 15' feet wide, 435' feet long cuts and 6' to 8' lifts.

The culvert in the channel below the quarry will be removed and the drainage channel will be restored to its predisturbance configuration. The pit access road will be regraded to original adjacent contours.

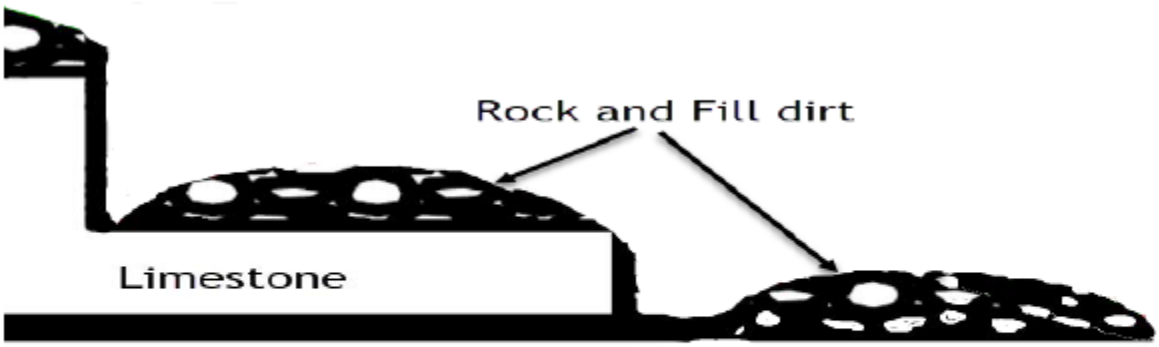
The rock check dam will be graded to create a smooth channel.

The Yard will be graded to approximate original contour. Temporary structures will be removed. Fencing will remain in place until reclamation success is achieved.

(b) **Rule 6.3.4(e) -- Measures Taken to Minimize Disturbance to the Hydrologic Balance Consistent with the Proposed Future Land Use**

The hydrologic balance will be protected in the reclaimed condition by topsoiling and seeding the disturbed areas. The yard will topsoil and seed back to its pre-mine topography and vegetation condition. The quarry will be reclaimed by mounding waste rock and salvaged soil along each mining bench. As shown in the conceptual cross section of Figure D-1, mounds will be made on each bench with waste rock and soil that was salvaged as mining works its way up hill one bench at a time. The rock and soil mounds will be seeded once in place. Reclaiming the benches in this way will allow the benches to trap stormwater and snow melt to encourage revegetation. It will also reduce soil loss due to erosion in reclamation as each bench is very slightly graded into the hill side to control drainage. The soil mounds will run the length of each bench, similar to soil windrows. They will be at least two feet tall with 4H:1V slopes.

Figure D-1. Bench Reclamation Concept



Rock and fill dirt on each lift will act as a buffer slowing down rain water run off to minimize erosion.

Maximum Gradient of Reclaimed Slopes

The maximum gradient of the reclaimed slope at the Quarry is 2H:1V. The natural existing slope of the Quarry is also 2H:1V. The reclaimed slopes at the yard and road will be flatter than 1H:5V.

The post mining land use of the reclaimed quarry, road and yard will be for recreation and wildlife habitat. Most of the area is characterized by steep and extremely rugged cliffs which are not conductive to recreational uses. There is no fishing in the general area.

(c) Site Re-vegetation

(i) Approximately 6 inches of topsoil will be salvaged and stockpiled from the Quarry road and the Yard. The topsoil salvaged should be of adequate quality to be a good plant growth medium. The rock check dam is constructed in a channel that is mostly covered with volcanic cinders so there is no topsoil or vegetation present in this area.

(ii) Site preparation will include regrading to approximate original contour, spreading topsoil to an adequate depth. Re-vegetation will be performed in the fall or early winter. Contemporaneous site preparation and revegetation will be performed in the Quarry if possible. Topsoil depths average six inches. This soil will be stockpiled in a berm above the working benches. When a working bench is ready to be reclaimed it will be shaped to approximate original contour and covered with topsoil.

Backfilled surfaces will be disked or ripped to eliminate compacted conditions. Backfill surfaces will be covered evenly with topsoil. Prior to broadcast seeding, the topsoil will be roughened by a method such as pitting, raking or harrowing to break up any crust that has formed and ensure good seed-to-soil contact. Fertilizer will not be utilized.

To control erosion and enhance vegetative establishment on slopes steeper than 3:1, seedbed preparation may include pocking or pitting the soil material to form microbasins scaled to the site and materials. These microbasins will be constructed in irregularly

spaced and irregularly aligned rows with an orientation perpendicular to the natural flow of runoff down a slope.

(iii) BLM Seed Mix

Per CPW recommendations, the following seed mix has been verified by the Colorado Seed Mix tool to ensure wildlife compatibility.

Seed Mix for Defiance Quarry Reclamation			
Common Name	**Scientific Names**	**Variety**	**PLS lbs/acre***
Plant the Following Three Grasses (19% of Mix each, 58% Total)			
Indian Ricegrass	Achnatherum hymenoides	White River, or Paloma, Rimrock	2.5
Blue Grama	Bouteloua gracilisa	Hachita, or Bad River	3.0
Bluebunch Wheatgrass	Pseudoroegneria spicata	Colorado/Utah source, or Anatone, Goldar	2.5
And the Following Two (11% of Mix Each, 22% Total)			
Needle-and-Thread	Hesperostipa comate	Colorado/Utah source preferred	1.9
Prairie junegrass	Koeleria macrantha	(SI)	0.09
And One of the Following Shrubs (9% of Mix)			
Wyoming Big Sagebrush	Artemisia tridentata ssp. wyomingensis	Colorado/Utah source preferred	0.07
Four-wing Saltbush	Atriplex canescens	Colorado/Utah source preferred	3.3
Winterfat	Krascheninnikovia lanata	Colorado/Utah source preferred	1.4
And Two of the Following Forbs (5% of Mix Each, 10% Total)			
Fringed Sage	Artemisia frigida	(SI)	0.02
Arrowleaf Balsamroot	Balsamorhiza sagittata	(SI)	1.6
Blanket-flower	Gaillardia aristata	Meriwether	0.7
Utah Sweetvetch	Hedysarum boreale	Timp	1.9
Lewis Blue Flax	Linum lewisii	Maple Grove	0.5
Total PLS lbs/acre			**~42**

* PLS lbs/acre: Pounds of pure live seed per acre

(iv) The seed mix is to be broadcast at twice the above rate. If the seedbed has not been adequately roughened prior to seeding, the seed shall be raked or harrowed after broadcast application.

(v) Mulch will be applied within 24 hours following completion of seeding. Where areas have been broadcast-seeded and raked, certified weed-free straw or certified weed-free native grass hay mulch will be crimped into the soil. The application rate will be 1,000 pounds per acre.

(vi) One shrub, Wyoming Big Sagebrush or Four-wing Saltbush or Winterfat will be planted with the seed mix. Shrub density of the reclaimed area will equal or exceed 100 live shrubs per acre.

Weed Management

Measures will be employed for the control of any noxious weed species. The objective of this weed management plan is to control undesirable plants on the site so that plants necessary to wildlife habitats successfully grow in the area during reclamation. Plants identified through the Colorado Noxious Weed Act (C.R.S. 35-5.5) and the Eagle County Noxious Weed List as undesirable and designated for management within the county will be removed. These plants identified as noxious weeds will be managed by control measures. A Weed Control Plan will be utilized as follows:

1) Each April, a weed survey will be taken of the permit area.

2) If any patches or plants have been identified, they will be sprayed by backpack sprayer or 4-wheeler using chemicals approved for use by the weed control staff of Eagle County.

3) After reclamation, weed surveys and spraying will continue until the perennial cover and production of the site have met DRMS requirements and bond release has been obtained.

During all phases and areas of the mining operation the permit area will be monitored closely every year, through which the operator may determine if any additional weeds have grown. If any new species of weeds are found, Eagle County and the CDRMS will be consulted in order to formulate the best plan for the new infestation.

(d) Remaining After Reclamation

No ponds or buildings will remain after reclamation.

The sediment control features at the Quarry include anchored straw bales at the outlet of the quarry. After reclamation the berms and straw bales will remain until vegetation is established at which time the sediment control features will be removed. The rock check dam will be regraded to approximate original contours.

The sediment control features at the Yard include anchored straw bales or other sediment tapping devises at the northeast corner of the yard. After reclamation sediment trapping devices will remain until vegetation is established at which time the sediment control features will be removed.

---

(2) Reclamation Estimate

Reclamation will include replacing subsoil, replacing topsoil, and planting seeds. A task breakdown and a total cost summary are shown in the tables below.

Brown Quarry, Road & Yard Reclamation Estimate

Replace Subsoil						
	Length	Width	Depth	Cubic Yards	Cost/CY	Total Cost
Road	3000	12	2	2,667	0.5	$ 1,333.33
Yard	150	125	2	1,389	0.5	$ 694.44
Quarry	440	150	0	0	0.5	$ -
Rock Check Dam	50	30	3	167	0.5	$ 83.33
Subsoil total cost						$ 2,027.78

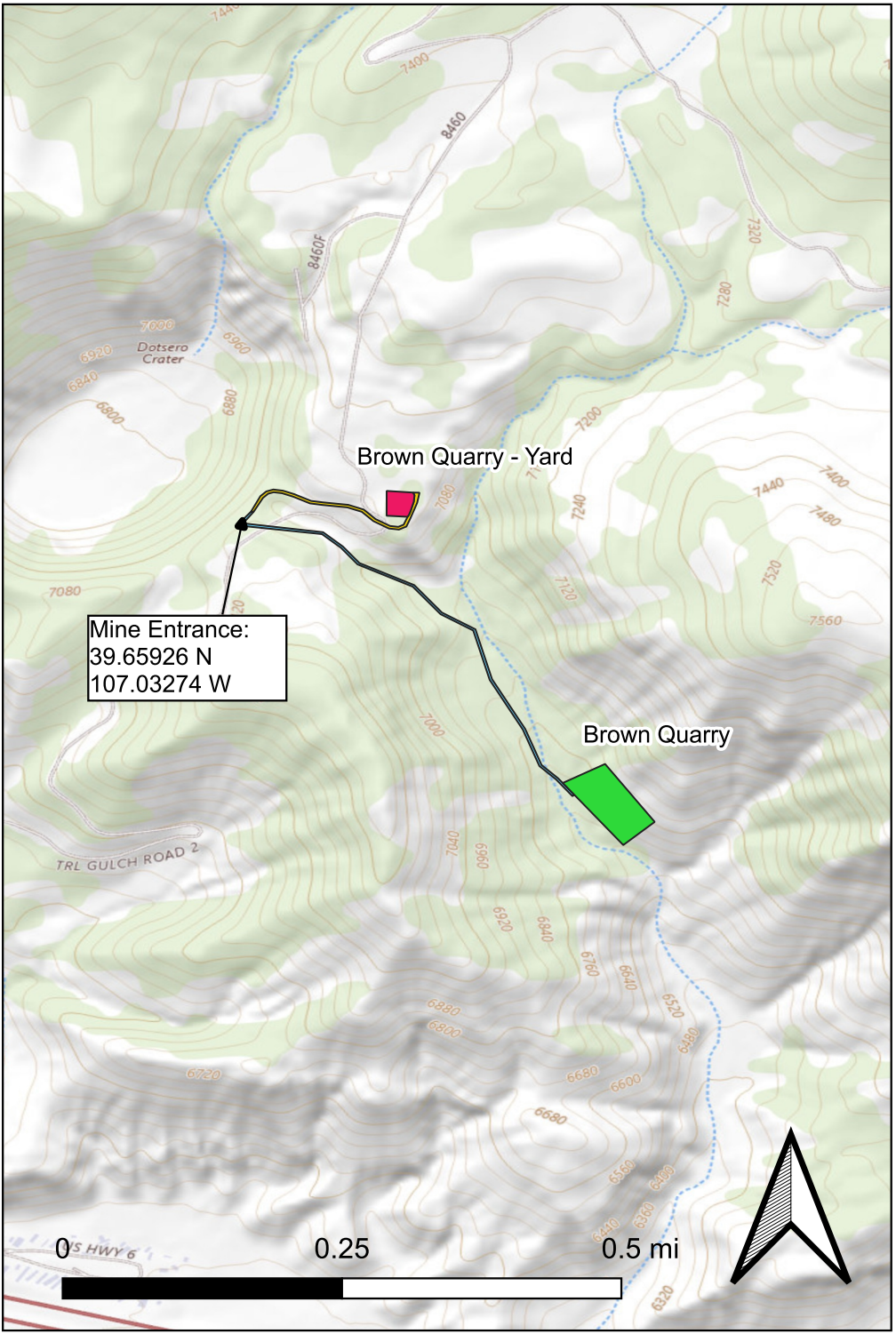
Topsoil						
	Length	Width	Depth	Cubic Yards	Cost/CY	Total Cost
Road	3000	12	0.5	667	0.5	$ 333.33
Yard	150	125	0.5	347	0.5	$ 173.61
Quarry	440	150	0.5	1,222	0.5	$ 611.11
Topsoil total cost						$ 1,118.06

Seed			
	Acres	Unit Cost	Total Cost
Disk	2.8	102	$ 285.60
Weed Control	2.8	200	$ 560.00
Seed Cost	2.8	180	$ 504.00
Broadcast Seed	2.8	230	$ 644.00
Straw	2.8	590	$ 1,652.00
Crimp	2.8	70	$ 196.00
Seed total cost			$ 3,841.60

Cost Summary	
Subsoil	$ 2,027.78
Topsoil	$ 1,118.06
Seed	$ 3,841.60
Subtotal	$ 6,987.43
DRMS Cost (18.5%)	$ 1,292.67
Total Reclamation Cost	**$8,280.10**

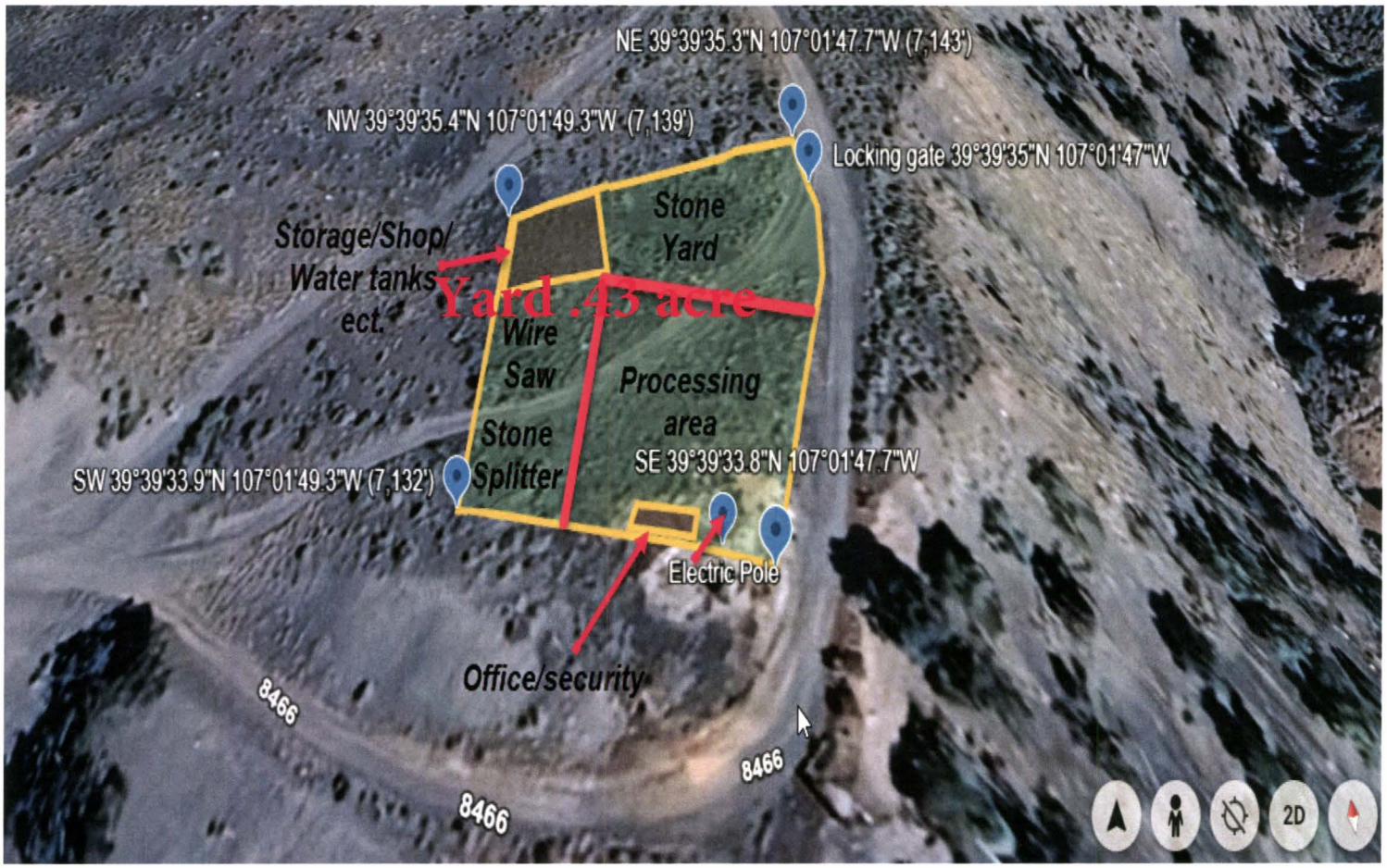
6.3.5 EXHIBIT E – Maps

General Location
Quarry and Yard
Quarry Access road
The Yard Exhibit
Rock Check Dam


Brown Quarry - Yard
Mine Entrance:
39.65926 N
107.03274 W
Brown Quarry
Dotsero Crater
TRL GULCH ROAD 2
US HWY 6
0
0.25
0.5 mi

Limestone Quarry

Yard and Office



Upper access road to Quarry

Lower access road to Quarry

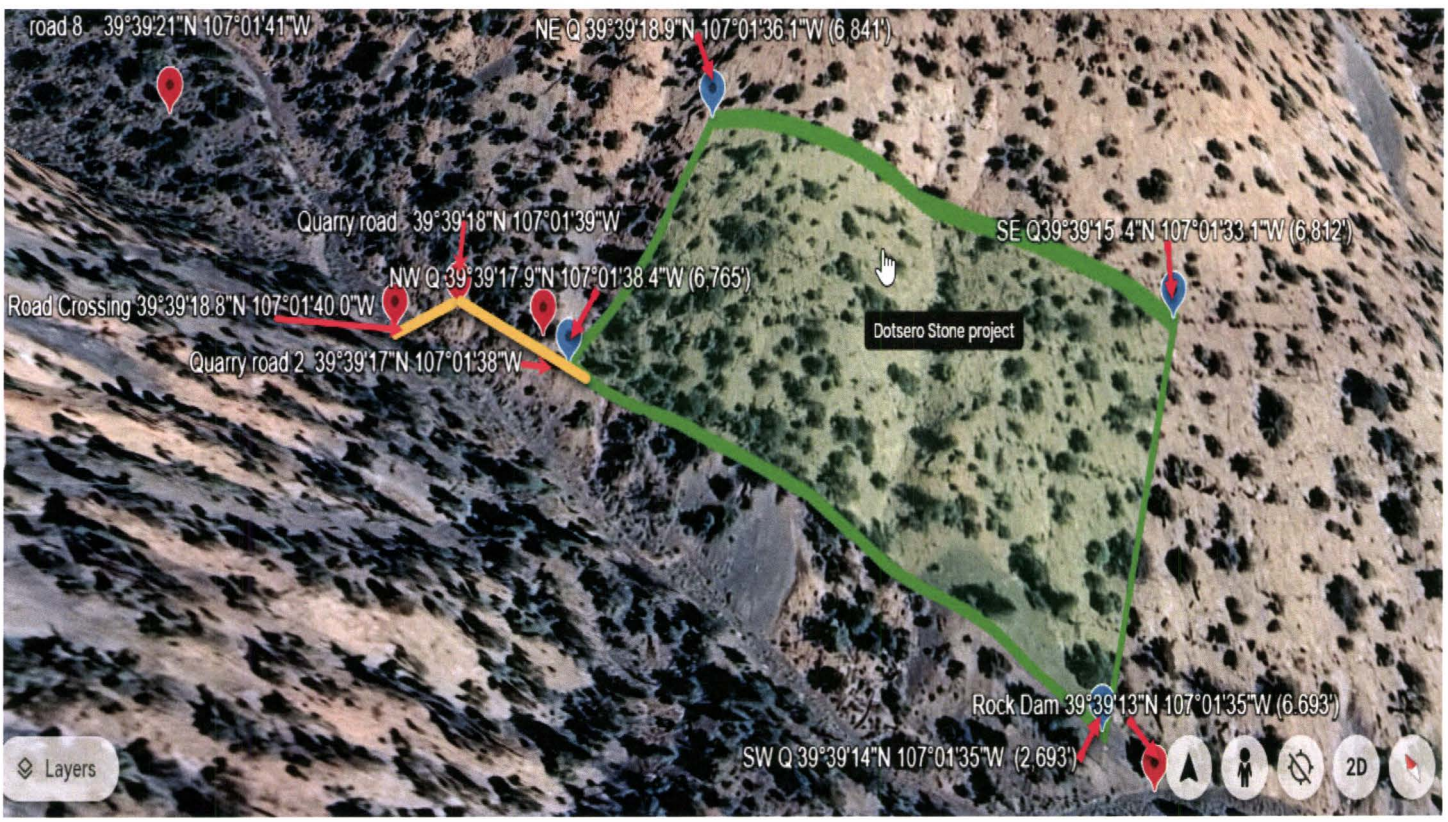


Exhibit D-3

Elevations from the Limestone Quarry to the Eagle River

With the lower drainage section flatting out most of the water will be absorbed into the ground. Drainage from the affected areas will rarely reach the Eagle River.

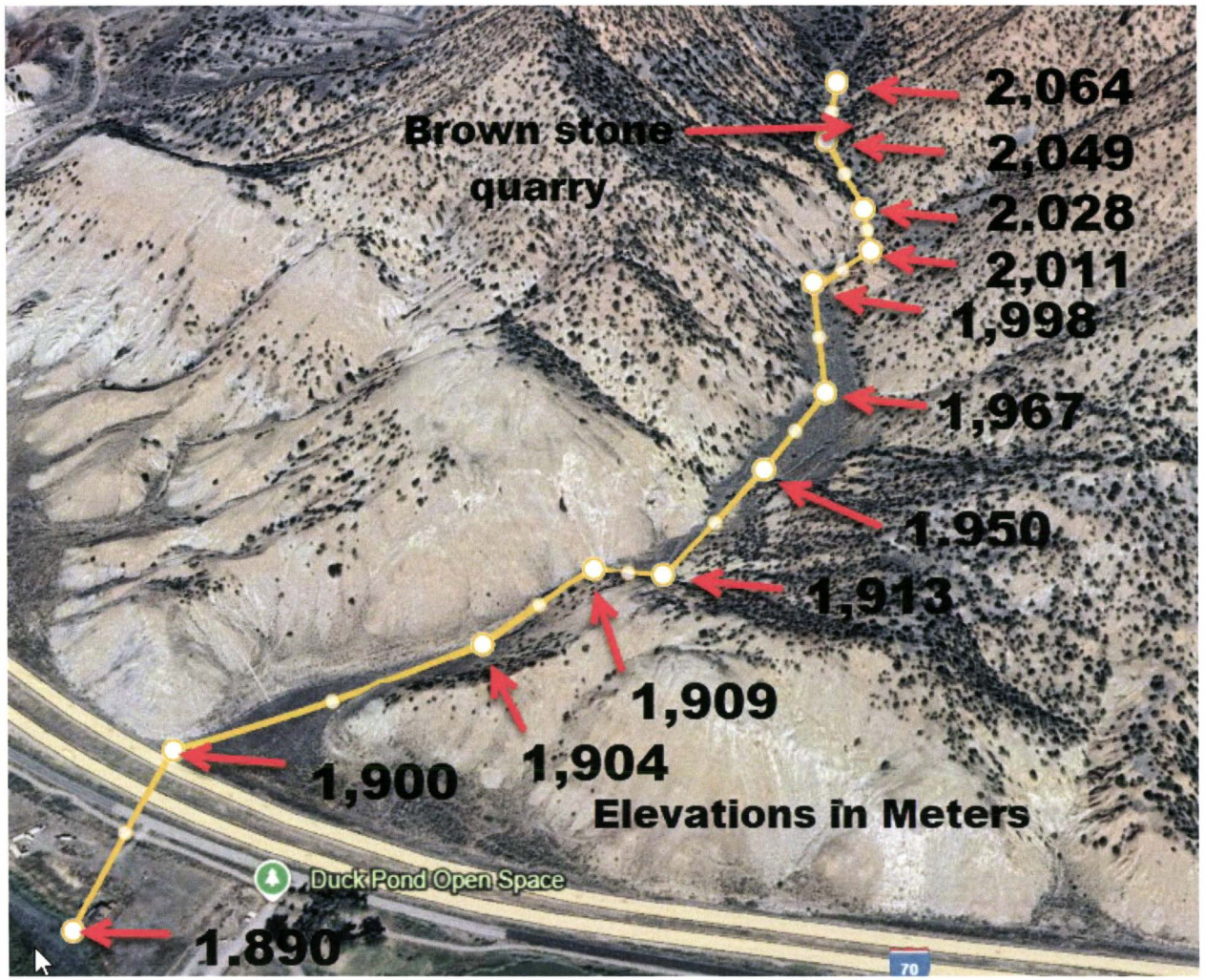
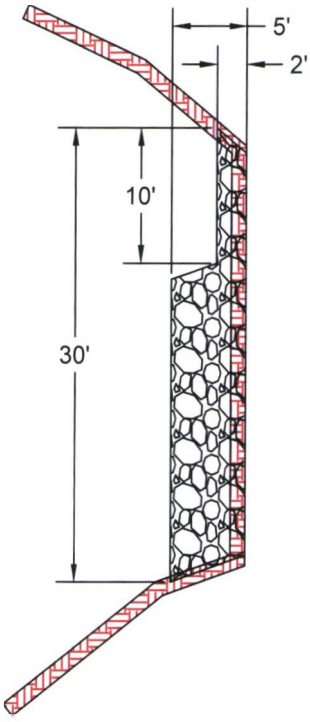
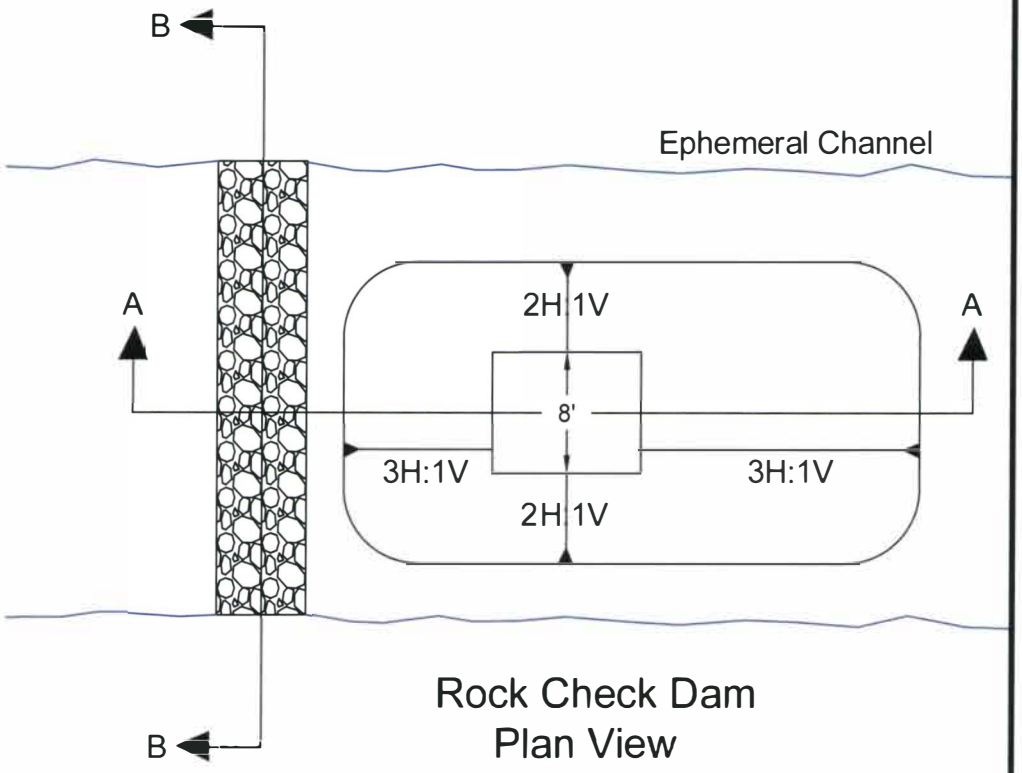


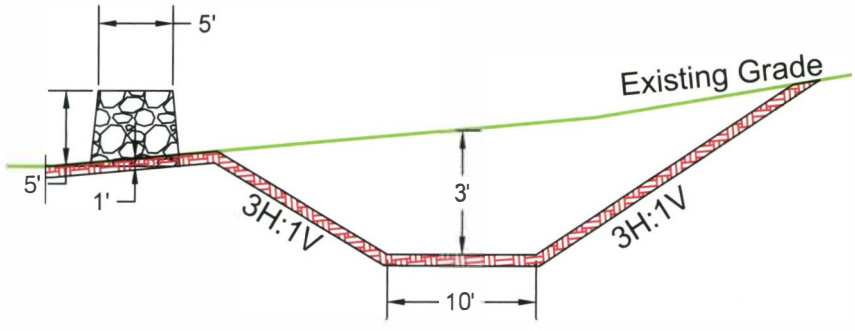
EXHIBIT - C-2



Section B-B



Rock Check Dam
Plan View



Section A-A

Location of Rock Dam

39° 39' 13N 107° 01' 35W

Notes:

- Rock check dam to be located below and down gradient of run-off from the Brown Quarry.
- Rock check dam will slow water and allow sediment to settle.
- Rock check dam has 10' wide low section (emergency spillway) to allow high flows to pass without cascading over the 4' high dam.
- Under high flow the 4' high dam section will still slow flow and cause sediment deposition.
- Sediment to be cleaned out after each precipitation event.
- Key rip rap into channel and side slopes at least 1'.

Drawn by: Jim Stover	Rock Check Dam Plan and Profile
10/3/19	
Scale None	Defiance Stone Company — Exhibit C-2

6.3.6 EXHIBIT F – List of Other Permits and Licenses Required

Eagle County Special Use Permit
Planning
P.O. Box 179
500 Broadway
Eagle, CO 81631

ADDENDUM: CDPHE NPDES Discharge Permit (for surface water discharge)

6.3.7 EXHIBIT G – Source of Legal Right to Enter

BLM Categorical Exclusion DOI-BLM-CO-N040-2019-0050-CX
Serial Number COC-078776

6.3.8 EXHIBIT H – Municipalities Within a Two-Mile Radius

Dotsero is located 1.5 miles northeast of the site. Dotsero is an unincorporated community within Eagle County. The community consists mostly of a cluster of houses, mobile home trailers and industrial business on the northside of the Eagle River. There is no town hall in Dotsero, so concerns may be addressed to the Eagle County Government Offices.

Eagle County Government Offices Information:

500 Broadway St.

Eagle, CO 81631

(970) 328-8600

6.3.9 EXHIBIT I – Proof of Filing with County Clerk

February 9, 2024

Eagle County Clerk and Recorder
500 Broadway St #3
Eagle, CO 81631

Brown Quarry
110 Reclamation Permit Application, County Copy

To Whom It May Concern

A 110 application for the operation known as Brown Quarry to the Colorado Division of Reclamation, Mining, and Safety has been supplied to your office for public viewing. The applicant is Defiance Stone Company. The Colorado Division of Reclamation, Mining, and Safety requires evidence that the application has been filed with your office. Therefore, please sign and date the box below and return this document either by scan and email (tess@lewicki.biz) or by fax (303 346-6934). Thank you.

If you have any further questions or concerns please call (720) 903-0033.

The application was received on the following date: **5/3/2024**

By: [Signature]

6.3.10 EXHIBIT J – Proof of Mailing of Notices to Board of County Commissioners and Soil Conservation District

Stephen Jaouen
Soil Conservation District
Glenwood Springs Field Office
2758 Center Drive
Glenwood Springs, Colorado 81601-2539
Ph: 970-945-5494 x 3443

Eagle County Commissioners
P.O. Box 850
Eagle, Colorado 81631-0850

6.3.11 EXHIBIT K – Terms of Governmental Contract

Not applicable.

6.3.12 EXHIBIT L – Permanent Man-Made Structures

There is a powerline owned by Holy Cross Energy within hundred (200) feet of the affected land. Electricity will be supplied by Holy Cross to the Yard site. None of Holy Cross's equipment will be on the Yard footprint except basic hook up to a distribution panel.

Holy Cross Energy
3799 Highway 82
P.O. Box 2150
Glenwood Spring, CO 81602
970-945-5491

6.3.12 EXHIBIT L - Permanent Man-Made Structures

There is a powerline owned by Holy Cross Energy within hundred (200) feet of the affected land.

Electricity will be supplied by Holy Cross to the Yard site. None of Holy Cross's equipment will be on the Yard footprint except basic hook up to a distribution panel.

Holy Cross Energy
3799 Highway 82
P.O. Box 2150
Glenwood Spring, CO 81602
970-945-5491

Exhibit 6.6

3799 HIGHWAY 82 · P.O. BOX 2150
GLENWOOD SPRINGS, COLORADO 81602
(970) 945-5491 · FAX (970) 945-4081

12/7/2023

Defiance Stone, LLC

RE: Dotsero Trail Gulch

Dear Robert

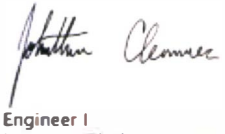
The above mentioned development is within the certified service area of Holy Cross Energy.

Holy Cross Energy has adequate power supply to provide electric power to the development, subject to tariffs, rules and regulations on file. Any power line enlargements, relocations, and new extensions necessary to deliver adequate power to and within the development will be undertaken by Holy Cross Energy upon completion of appropriate contractual agreements and subject to necessary governmental approvals.

Additionally, due to current economic conditions, Holy Cross Energy is not stocking the quantity of construction materials as in past years. If your project is slated for construction this year, please advise us as soon as possible. You will need to enter into agreements with Holy Cross Energy, and pay for the project, sufficiently in advance of construction to avoid possible delays while materials are procured. The currently estimated lead time for procurement of materials is around 12 weeks.

Please advise when you wish to proceed with the development of the electric system for this project.

Sincerely,
HOLY CROSS ENERGY
Johnathan Clemmer



Engineer I
jclemmer@holycross.com
(970) 393-5241

6.5 Geotechnical Stability Exhibit

RULE 6.5: GEOTECHNICAL STABILITY EXHIBIT

There are no known geologic hazards on the proposed site. There are no structures near the Brown Quarry site and slope stability analysis shows that there will be no offsite slope failures. Exhibit E maps show the mining and reclamation slopes of the mine. A standard slope was analyzed for stability as it is a good example of the nearest structure, the slurry wall.

The material properties are derived from Table 2.5 in the SME Mining Reference Handbook[1], as there is no site-specific strength data of the material available. Therefore, all materials are matched to a classification from this table that best matches the materials in terms of description. The weathered rock making up the top five feet of the ground in this area is best classified as weathered limestone. The target bedrock is a hard intact limestone. A summary of the material properties can be seen in Table 6.5-1.

Table 6.5-1 Material Properties

Material	Unit Weight (lbs/ft^3)	Cohesion (lbs/ft^2)	Friction Angle
Weathered limestone bedrock	163.8	0	35
Intact limestone bedrock	163.8	200,000	35

The final reclamation slope condition was analyzed. Mining of the limestone will leave behind intact limestone benches that waste rock and topsoil will be placed upon. The reclamation plan calls for the construction of mounds of this material along the bench as water traps to encourage vegetation growth. Such a backfill scenario does not lend itself to slope stability analysis. Therefore, the reclaimed slope is analyzed assuming each bench is backfilled fully to re-establish the overall slope angle of roughly 2H:1V.

1. Slope Analysis

Factor of Safety is expressed in terms of strength divided by stress as a ratio. It is arrived at by an iterative computer process where a slope failure is assumed, the strength and stress of that slope failure are calculated, and those values are compared to determine a lowest factor of safety. In the case of the Brown Quarry slope stability analysis, the Bishop's Method of Slices was the iterative calculation used, and the software GALENA was used to model slopes and calculate the factor of safety.

The Bishop's Method of Slices is a fundamental geotechnical engineering approach for analyzing slope stability by dividing a potential sliding mass into vertical slices and calculating

[1] Original source: Hoek and Bray 1977

the factor of safety against failure. The method identifies a circular failure surface intersecting the slope, then considers the weight of soil, pore water pressures, and forces acting on each slice while making the simplifying assumption that horizontal forces between slices cancel each other out. This iterative method calculates a factor of safety by comparing driving forces that promote failure to resisting forces that maintain stability.

The slope outlined on the reclamation map in Exhibit E was used as the basis for the GALENA model. Table GS-1 lists the analysis conducted and their respective factors of safety. The overall slope stability result is represented in Figure GS-1. The resulting FoS in each iteration is greater than 100, as the limestone benches prevent large scale slope failure. However, once the failure circle tested is smaller than a bench in size, the FoS drops to unity. This analysis (Reclaimed Analysis 3 in the data outputs and figures in Appendix GS-1) is then evaluated to identify the geometric extent of a failure circle with a FoS > 1.5, to see if this failure circle extends out far enough to risk offsite damage. Figure GS-2 shows the extent of the FoS > 1.5 failure circle (FoS = 1.6). As the figure shows, this failure circle is entirely contained with its bench.

GALENA data tables and analysis result figures are attached as Appendix GS-1.

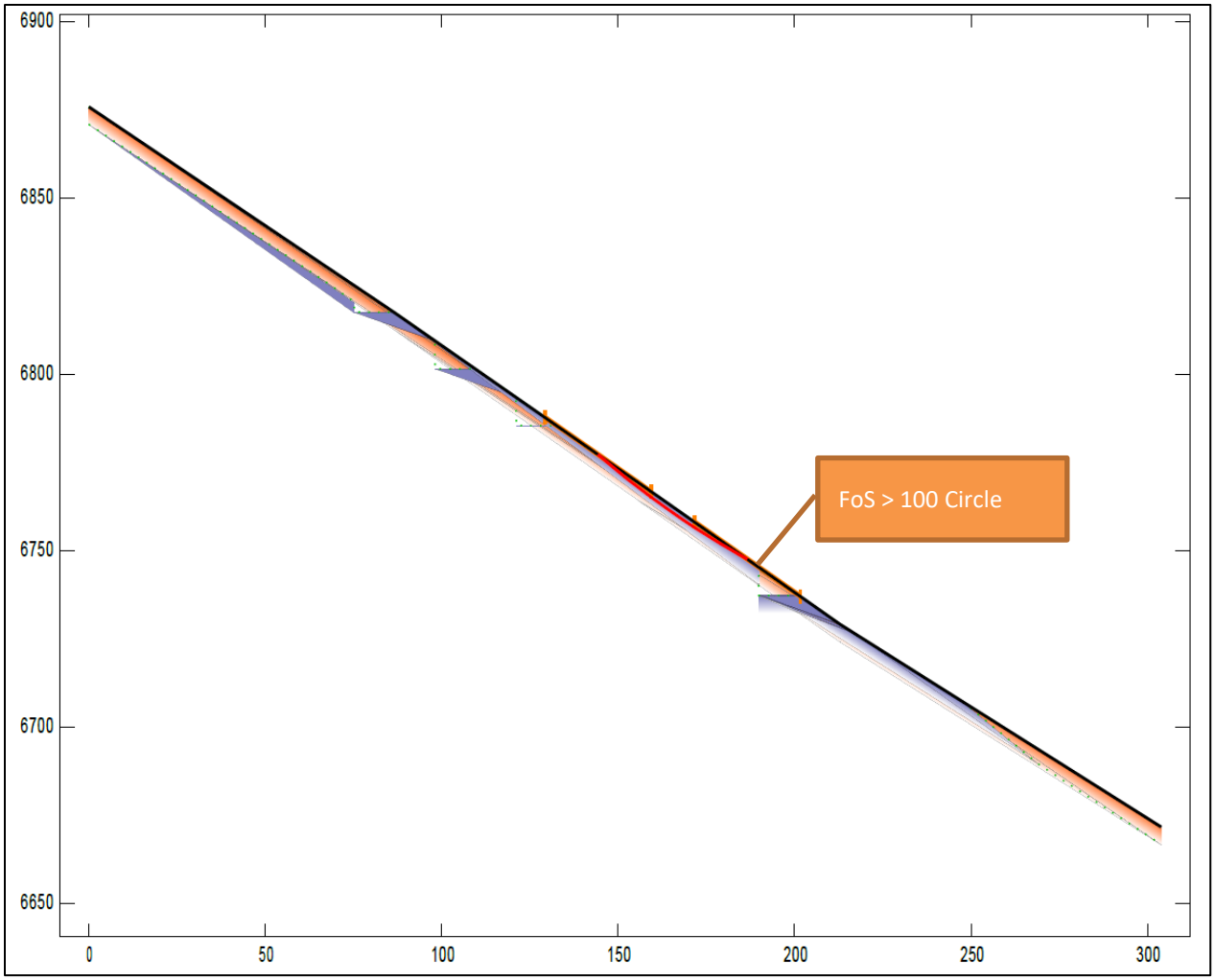


Figure GS-1. GALENA Cross Sections (Overall Reclamation)

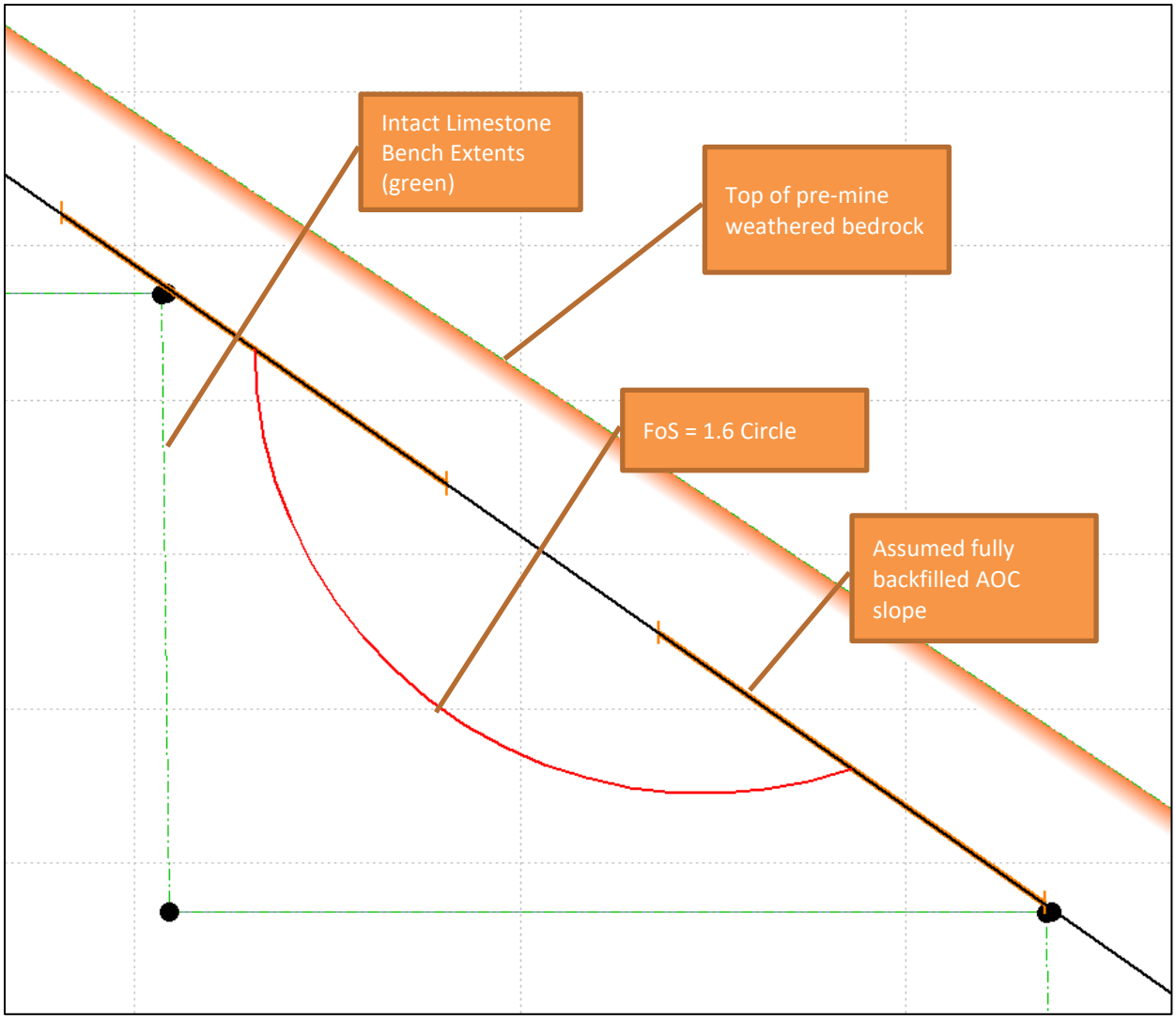


Figure GS-2. GALENA Cross Section (Single Bench Reclamation)

Table GS-1. Factors of Safety for Slope Stability

Slope Condition	Lowest Factor of Safety (static)	Nearest Structure
Large scale slope failure	>100	None
Local bench failure FoS > 1.5	1.6	None

2. Conclusion

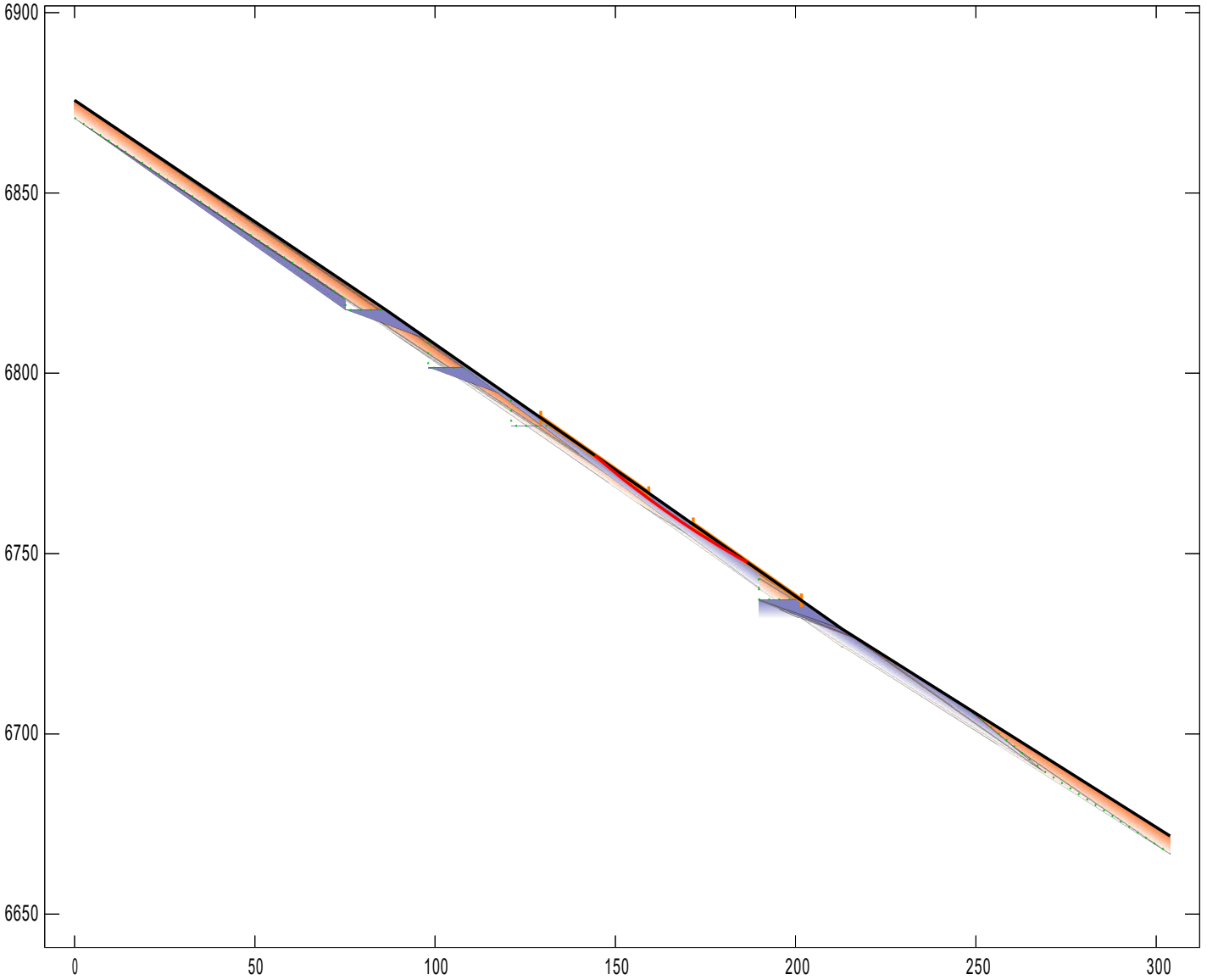
The analysis shows that the Brown Quarry reclaimed slopes, even if fully backfilled to approximate original contour, do not risk offsite damage from slope failure. The overall slope factor of safety is greater than 100, which is greater than the DRMS minimum of 1.5 for this scenario. Reducing the failure circle down to a size that would induce a failure shows a failure within individual bench only, with the FoS > 1.5 failure circle occurring entirely within a bench. Based on this analysis, there is no risk of offsite damage due to slope failure.

The slope stability analysis in this permit has been prepared according to appropriate engineering standards and practices.

Ben Langenfeld, P.E.

P.E.# 0047151

APPENDIX GS-1 GALENA INFORMATION



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Weathered Bedrock

2: Limestone bedrock

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: Undetermined

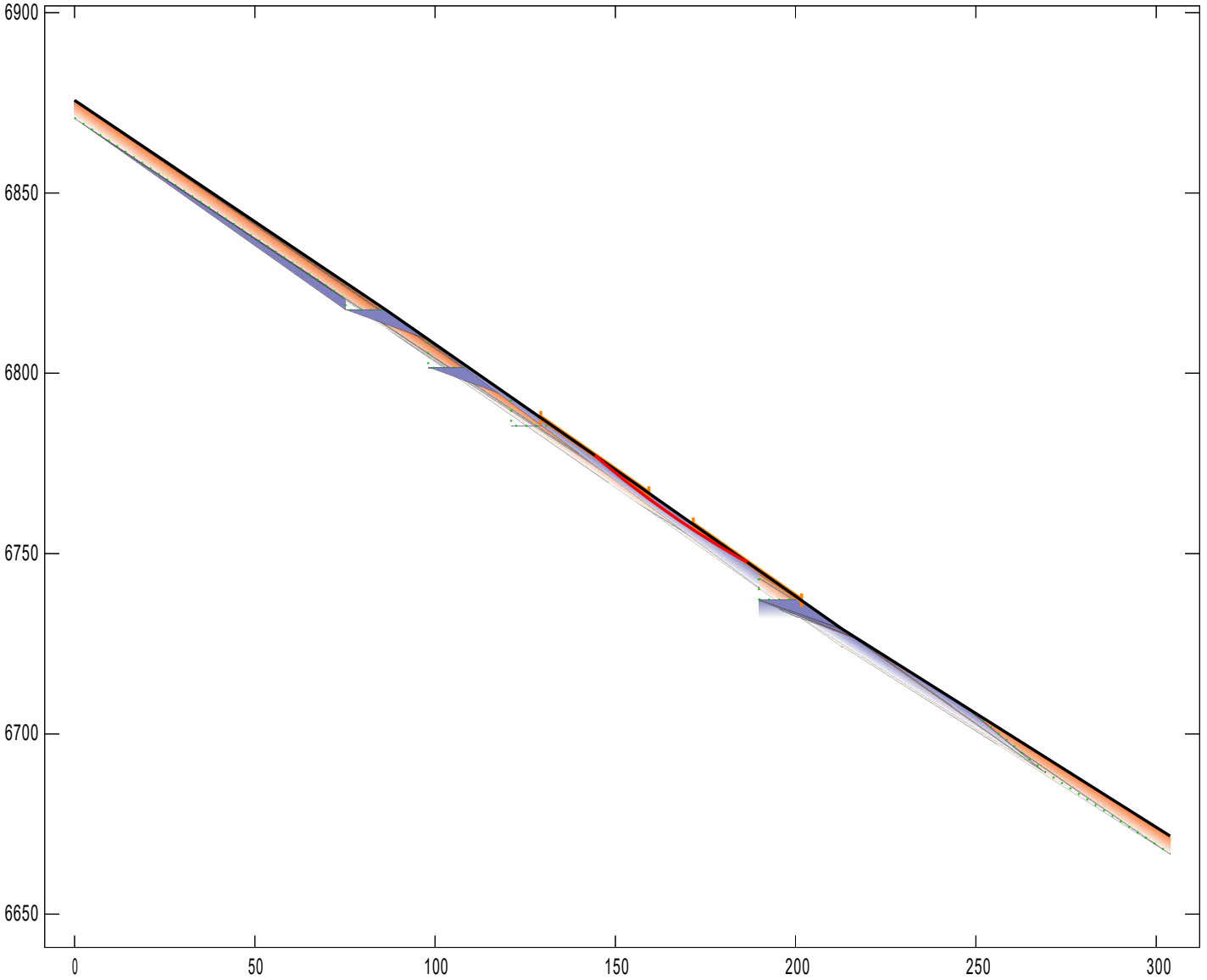
Edited: 11 Mar 2025

Processed: 11 Mar 2025

Project Brown Quarry
Reclaimed Condition

File: E:\Work\GLA Dropbox\Ben Langenfeld\Defiance Stone\Brown Quarry\Slope Stability\Brown Quarry.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Weathered Bedrock

2: Limestone bedrock

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: Undetermined

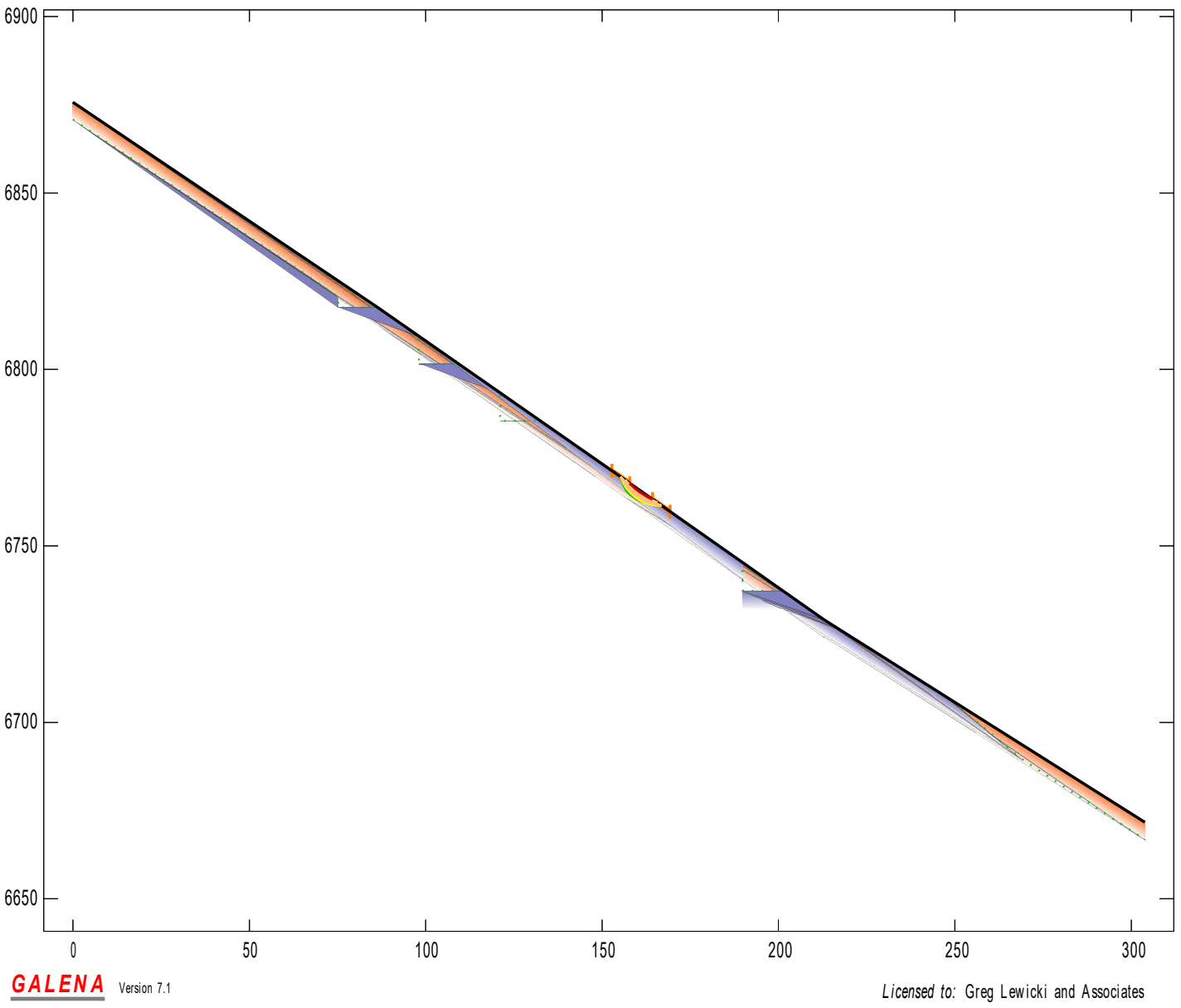
Edited: 11 Mar 2025

Processed: 11 Mar 2025

Project Brown Quarry
Reclaimed Condition

File: E:\Work\GLA Dropbox\Ben Langenfeld\Defiance Stone\Brown Quarry\Slope Stability\Brown Quarry.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Weathered Bedrock

2: Limestone bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.02

Edited: 11 Mar 2025

Processed: 11 Mar 2025

Project Brown Quarry
Reclaimed Condition

File: E:\Work\GLA Dropbox\Ben Langenfeld\Defiance Stone\Brown Quarry\Slope Stability\Brown Quarry.gmf

Lewicki & Associates

GALENA 7.1 Analysis Results Version: 7.10.1.04 Licensee: Greg Lewicki and Associates

Project: Brown Quarry
File: E:\Work\GLA Dropbox\Ben Langenfeld\Defiance Stone\Brown Quarry\Slope Stability\Brown Quarry.gmf
Processed: 11 Mar 2025 11:10:30

DATA: Analysis 1 - Reclaimed Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Weathered Bedrock
Cohesion Phi UnitWeight Ru
0.00 35.0 163.80 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Limestone bedrock
Cohesion Phi UnitWeight Ru
200000.00 35.0 163.80 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 0.000

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Weathered Bedrock
0.00 6875.83 303.82 6671.78
Profile: 2 (41 points) Material beneath: 2 - Limestone bedrock
0.00 6870.83 66.42 6826.66 75.13 6820.57 75.13 6817.57 86.56 6817.57
86.50 6817.54 86.60 6809.54 98.03 6809.54 98.07 6801.51 109.51 6801.51
109.45 6801.48 109.55 6793.48 120.98 6793.48 121.02 6793.45 121.12 6785.45
132.46 6785.45 132.60 6785.42 132.50 6777.42 143.93 6777.42 143.87 6777.39
143.97 6769.39 155.41 6769.39 155.35 6769.37 155.45 6761.37 166.88 6761.37
166.82 6761.34 166.92 6753.34 178.36 6753.34 178.30 6753.31 178.40 6745.31
189.83 6745.31 189.77 6745.28 189.87 6737.28 201.30 6737.28 201.45 6737.25
201.35 6729.25 212.78 6729.25 216.35 6726.75 247.42 6707.42 269.41 6689.29
303.82 6666.78

Slope Surface (5 points)

0.00 6875.73 86.50 6817.50 155.50 6769.40 212.90 6729.10 303.82 6671.68

Phreatic Surface (2 points)

0.00 5500.00 350.00 5500.00

Failure Surface

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

Intersects: XL: 144.30 YL: 6777.21 XR: 186.60 YR: 6747.56
Centre: XC: 308.15 YC: 6966.02 Radius: R: 250.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 30.00 30.00 5.00
Trial positions within range: 5 5 10

- -

RESULTS: Analysis 1 - Reclaimed Condition

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 298.667

There were: 251 successful analyses from a total of 251 trial surfaces

Invalid Result - Factor of Safety >= 100

Negative normal stresses exist on the base of one or more slices; examine slice data and consult the GALENA Help utility

Results Summary - Lowest 1 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	144.30	6777.21	186.60	6747.56	308.15	6966.02	250.00	******	<-- Critical Surface

Critical Failure Surface (circle 1)

Intersects: XL: 144.30 YL: 6777.21 XR: 186.60 YR: 6747.56
Centre: XC: 308.15 YC: 6966.02 Radius: R: 250.00
Generated failure surface: (20 points)

144.30	6777.21	146.37	6775.43	148.45	6773.68	150.56	6771.95	152.68	6770.25
154.82	6768.57	156.98	6766.91	159.16	6765.27	161.36	6763.66	163.57	6762.08
165.80	6760.51	168.05	6758.97	170.31	6757.46	172.59	6755.97	174.89	6754.51
177.20	6753.07	179.53	6751.65	181.87	6750.27	184.23	6748.90	186.60	6747.56

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	144.30	0.09	40.6	1.03	1.36	1	0.00	35.0	14.05	0.00	13.57	1.32
2	145.33	0.26	40.6	1.03	1.36	1	0.00	35.0	42.32	0.00	40.87	1.32
3	146.37	0.42	40.0	1.04	1.36	1	0.00	35.0	69.56	0.00	66.57	1.30
4	147.41	0.58	40.0	1.04	1.36	1	0.00	35.0	95.00	0.00	90.92	1.30
5	148.45	0.73	39.4	1.05	1.36	1	0.00	35.0	119.86	0.00	113.67	1.29
6	149.50	0.87	39.4	1.05	1.36	1	0.00	35.0	142.33	0.00	134.99	1.29
7	150.56	1.01	38.8	1.06	1.36	1	0.00	35.0	164.73	0.00	154.87	1.28
8	151.62	1.13	38.8	1.06	1.36	1	0.00	35.0	184.35	0.00	173.31	1.28

9	152.68	1.27	38.1	1.09	1.39	1	0.00	35.0	208.68	0.00	190.40	1.27
10	153.77	1.32	38.1	1.05	1.33	2	200000.00	35.0	216.08	0.00	-318.97	1.27
11	154.82	0.70	37.5	0.53	0.66	2	200000.00	35.0	114.35	0.00	-296.61	1.26
12	155.35	1.12	37.5	0.82	1.03	1	0.00	35.0	183.14	0.00	223.94	1.26
13	156.17	1.16	37.5	0.82	1.03	1	0.00	35.0	190.32	0.00	232.72	1.26
14	156.98	1.61	36.9	1.09	1.36	1	0.00	35.0	263.40	0.00	241.44	1.25
15	158.07	1.67	36.9	1.09	1.36	1	0.00	35.0	272.89	0.00	250.14	1.25
16	159.16	1.73	36.3	1.10	1.36	1	0.00	35.0	283.01	0.00	257.33	1.24
17	160.26	1.77	36.3	1.10	1.36	1	0.00	35.0	289.16	0.00	262.92	1.24
18	161.36	1.81	35.6	1.11	1.36	1	0.00	35.0	296.21	0.00	267.25	1.23
19	162.46	1.83	35.7	1.11	1.36	1	0.00	35.0	299.22	0.00	269.96	1.23
20	163.57	1.67	35.0	1.01	1.23	1	0.00	35.0	273.36	0.00	271.17	1.22
21	164.58	2.03	35.0	1.22	1.49	2	200000.00	35.0	332.13	0.00	-197.43	1.22
22	165.80	1.68	34.4	1.02	1.24	2	200000.00	35.0	275.21	0.00	-188.58	1.21
23	166.82	2.00	34.4	1.23	1.49	1	0.00	35.0	327.08	0.00	266.15	1.21
24	168.05	1.81	33.8	1.13	1.36	1	0.00	35.0	296.22	0.00	261.29	1.20
25	169.18	1.77	33.8	1.13	1.36	1	0.00	35.0	289.34	0.00	255.22	1.20
26	170.31	1.73	33.2	1.14	1.36	1	0.00	35.0	282.57	0.00	247.48	1.19
27	171.45	1.66	33.2	1.14	1.36	1	0.00	35.0	272.27	0.00	238.46	1.19
28	172.59	1.60	32.5	1.15	1.36	1	0.00	35.0	261.99	0.00	227.84	1.18
29	173.74	1.51	32.5	1.15	1.36	1	0.00	35.0	248.03	0.00	215.70	1.18
30	174.89	1.17	31.9	0.94	1.10	1	0.00	35.0	191.06	0.00	203.57	1.18
31	175.82	1.10	31.9	0.94	1.10	1	0.00	35.0	179.59	0.00	191.35	1.18
32	176.76	0.49	31.9	0.44	0.52	2	200000.00	35.0	79.97	0.00	-233.74	1.18
33	177.20	1.15	31.3	1.10	1.29	2	200000.00	35.0	188.57	0.00	-235.03	1.17
34	178.30	1.15	31.3	1.23	1.44	1	0.00	35.0	188.01	0.00	153.02	1.17
35	179.53	0.95	30.7	1.17	1.36	1	0.00	35.0	156.09	0.00	133.06	1.16
36	180.70	0.80	30.6	1.17	1.36	1	0.00	35.0	131.45	0.00	112.06	1.16
37	181.87	0.65	30.0	1.18	1.36	1	0.00	35.0	105.79	0.00	89.62	1.15
38	183.05	0.47	30.0	1.18	1.36	1	0.00	35.0	77.51	0.00	65.65	1.15
39	184.23	0.29	29.4	1.19	1.36	1	0.00	35.0	47.91	0.00	40.34	1.15
40	185.41	0.10	29.4	1.19	1.36	1	0.00	35.0	15.94	0.00	13.42	1.15

X-S Area: 46.82 Path Length: 51.74 X-S Weight: 7668.75

DATA: Analysis 2 - Reclaimed Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Weathered Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	35.0	163.80	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Limestone bedrock

Cohesion	Phi	UnitWeight	Ru
200000.00	35.0	163.80	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 0.000

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Weathered Bedrock
0.00 6875.83 303.82 6671.78
Profile: 2 (41 points) Material beneath: 2 - Limestone bedrock
0.00 6870.83 66.42 6826.66 75.13 6820.57 75.13 6817.57 86.56 6817.57
86.50 6817.54 86.60 6809.54 98.03 6809.54 98.07 6801.51 109.51 6801.51
109.45 6801.48 109.55 6793.48 120.98 6793.48 121.02 6793.45 121.12 6785.45
132.46 6785.45 132.60 6785.42 132.50 6777.42 143.93 6777.42 143.87 6777.39
143.97 6769.39 155.41 6769.39 155.35 6769.37 155.45 6761.37 166.88 6761.37
166.82 6761.34 166.92 6753.34 178.36 6753.34 178.30 6753.31 178.40 6745.31
189.83 6745.31 189.77 6745.28 189.87 6737.28 201.30 6737.28 201.45 6737.25
201.35 6729.25 212.78 6729.25 216.35 6726.75 247.42 6707.42 269.41 6689.29
303.82 6666.78

Slope Surface (5 points)

0.00 6875.73 86.50 6817.50 155.50 6769.40 212.90 6729.10 303.82 6671.68

Phreatic Surface (2 points)

0.00 5500.00 350.00 5500.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 144.30 YL: 6777.21 XR: 186.60 YR: 6747.56
Centre: XC: 308.15 YC: 6966.02 Radius: R: 250.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 30.00 30.00 5.00
Trial positions within range: 5 5 10

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RESULTS: Analysis 2 - Reclaimed Condition

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 298.667

There were: 251 successful analyses from a total of 251 trial surfaces

Invalid Result - Factor of Safety >= 100

Negative normal stresses exist on the base of one or more slices; examine slice data and consult the GALENA Help utility

Results Summary - Lowest 1 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	144.30	6777.21	186.60	6747.56	308.15	6966.02	250.00	******	<-- Critical Surface

Critical Failure Surface (circle 1)

Intersects: XL: 144.30 YL: 6777.21 XR: 186.60 YR: 6747.56
Centre: XC: 308.15 YC: 6966.02 Radius: R: 250.00
Generated failure surface: (20 points)

144.30	6777.21	146.37	6775.43	148.45	6773.68	150.56	6771.95	152.68	6770.25
154.82	6768.57	156.98	6766.91	159.16	6765.27	161.36	6763.66	163.57	6762.08
165.80	6760.51	168.05	6758.97	170.31	6757.46	172.59	6755.97	174.89	6754.51
177.20	6753.07	179.53	6751.65	181.87	6750.27	184.23	6748.90	186.60	6747.56

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S		Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	144.30	0.09	40.6	1.03	1.36	1	0.00	35.0	14.05	0.00	13.57	1.32
2	145.33	0.26	40.6	1.03	1.36	1	0.00	35.0	42.32	0.00	40.87	1.32
3	146.37	0.42	40.0	1.04	1.36	1	0.00	35.0	69.56	0.00	66.57	1.30
4	147.41	0.58	40.0	1.04	1.36	1	0.00	35.0	95.00	0.00	90.92	1.30
5	148.45	0.73	39.4	1.05	1.36	1	0.00	35.0	119.86	0.00	113.67	1.29
6	149.50	0.87	39.4	1.05	1.36	1	0.00	35.0	142.33	0.00	134.99	1.29
7	150.56	1.01	38.8	1.06	1.36	1	0.00	35.0	164.73	0.00	154.87	1.28
8	151.62	1.13	38.8	1.06	1.36	1	0.00	35.0	184.35	0.00	173.31	1.28
9	152.68	1.27	38.1	1.09	1.39	1	0.00	35.0	208.68	0.00	190.40	1.27
10	153.77	1.32	38.1	1.05	1.33	2	200000.00	35.0	216.08	0.00	-318.97	1.27
11	154.82	0.70	37.5	0.53	0.66	2	200000.00	35.0	114.35	0.00	-296.61	1.26
12	155.35	1.12	37.5	0.82	1.03	1	0.00	35.0	183.14	0.00	223.94	1.26
13	156.17	1.16	37.5	0.82	1.03	1	0.00	35.0	190.32	0.00	232.72	1.26
14	156.98	1.61	36.9	1.09	1.36	1	0.00	35.0	263.40	0.00	241.44	1.25
15	158.07	1.67	36.9	1.09	1.36	1	0.00	35.0	272.89	0.00	250.14	1.25
16	159.16	1.73	36.3	1.10	1.36	1	0.00	35.0	283.01	0.00	257.33	1.24
17	160.26	1.77	36.3	1.10	1.36	1	0.00	35.0	289.16	0.00	262.92	1.24
18	161.36	1.81	35.6	1.11	1.36	1	0.00	35.0	296.21	0.00	267.25	1.23
19	162.46	1.83	35.7	1.11	1.36	1	0.00	35.0	299.22	0.00	269.96	1.23
20	163.57	1.67	35.0	1.01	1.23	1	0.00	35.0	273.36	0.00	271.17	1.22
21	164.58	2.03	35.0	1.22	1.49	2	200000.00	35.0	332.13	0.00	-197.43	1.22
22	165.80	1.68	34.4	1.02	1.24	2	200000.00	35.0	275.21	0.00	-188.58	1.21
23	166.82	2.00	34.4	1.23	1.49	1	0.00	35.0	327.08	0.00	266.15	1.21
24	168.05	1.81	33.8	1.13	1.36	1	0.00	35.0	296.22	0.00	261.29	1.20
25	169.18	1.77	33.8	1.13	1.36	1	0.00	35.0	289.34	0.00	255.22	1.20
26	170.31	1.73	33.2	1.14	1.36	1	0.00	35.0	282.57	0.00	247.48	1.19
27	171.45	1.66	33.2	1.14	1.36	1	0.00	35.0	272.27	0.00	238.46	1.19
28	172.59	1.60	32.5	1.15	1.36	1	0.00	35.0	261.99	0.00	227.84	1.18
29	173.74	1.51	32.5	1.15	1.36	1	0.00	35.0	248.03	0.00	215.70	1.18
30	174.89	1.17	31.9	0.94	1.10	1	0.00	35.0	191.06	0.00	203.57	1.18
31	175.82	1.10	31.9	0.94	1.10	1	0.00	35.0	179.59	0.00	191.35	1.18
32	176.76	0.49	31.9	0.44	0.52	2	200000.00	35.0	79.97	0.00	-233.74	1.18
33	177.20	1.15	31.3	1.10	1.29	2	200000.00	35.0	188.57	0.00	-235.03	1.17
34	178.30	1.15	31.3	1.23	1.44	1	0.00	35.0	188.01	0.00	153.02	1.17

35	179.53	0.95	30.7	1.17	1.36	1	0.00	35.0	156.09	0.00	133.06	1.16
36	180.70	0.80	30.6	1.17	1.36	1	0.00	35.0	131.45	0.00	112.06	1.16
37	181.87	0.65	30.0	1.18	1.36	1	0.00	35.0	105.79	0.00	89.62	1.15
38	183.05	0.47	30.0	1.18	1.36	1	0.00	35.0	77.51	0.00	65.65	1.15
39	184.23	0.29	29.4	1.19	1.36	1	0.00	35.0	47.91	0.00	40.34	1.15
40	185.41	0.10	29.4	1.19	1.36	1	0.00	35.0	15.94	0.00	13.42	1.15

X-S Area: 46.82 Path Length: 51.74 X-S Weight: 7668.75

DATA: Analysis 3 - Reclaimed Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Weathered Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	35.0	163.80	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Limestone bedrock

Cohesion	Phi	UnitWeight	Ru
200000.00	35.0	163.80	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 0.000

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Weathered Bedrock

0.00 6875.83 303.82 6671.78

Profile: 2 (41 points) Material beneath: 2 - Limestone bedrock

0.00	6870.83	66.42	6826.66	75.13	6820.57	75.13	6817.57
86.56	6817.57	86.50	6817.54	86.60	6809.54	98.03	6809.54
98.07	6801.51	109.51	6801.51	109.45	6801.48	109.55	6793.48
120.98	6793.48	121.02	6793.45	121.12	6785.45	132.46	6785.45
132.60	6785.42	132.50	6777.42	143.93	6777.42	143.87	6777.39
143.97	6769.39	155.41	6769.39	155.35	6769.37	155.45	6761.37
166.88	6761.37	166.82	6761.34	166.92	6753.34	178.36	6753.34
178.30	6753.31	178.40	6745.31	189.83	6745.31	189.77	6745.28
189.87	6737.28	201.30	6737.28	201.45	6737.25	201.35	6729.25
212.78	6729.25	216.35	6726.75	247.42	6707.42	269.41	6689.29
303.82	6666.78						

Slope Surface (5 points)

0.00 6875.73 86.50 6817.50 155.50 6769.40 212.90 6729.10 303.82 6671.68

Phreatic Surface (2 points)

0.00 5500.00 350.00 5500.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 155.30 YL: 6769.54 XR: 166.80 YR: 6761.47
Centre: XC: 165.14 YC: 6771.33 Radius: R: 10.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 5.00 5.00 25.00
Trial positions within range: 5 5 10

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RESULTS: Analysis 3 - Reclaimed Condition

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 167.184

There were: 154 successful analyses from a total of 251 trial surfaces
97 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.02

Results Summary - Lowest 56 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	157.80	6767.79	164.30	6763.22	173.78	6783.63	22.50	1.016	<-- Critical Surface
2	157.80	6767.79	164.30	6763.22	172.15	6781.31	19.72	1.021	
3	156.55	6768.66	164.30	6763.22	173.06	6783.94	22.50	1.024	
4	157.80	6767.79	165.55	6762.34	174.31	6783.07	22.50	1.024	
5	157.80	6767.79	164.30	6763.22	170.52	6778.99	16.94	1.030	
6	156.55	6768.66	164.30	6763.22	171.43	6781.61	19.72	1.032	
7	157.80	6767.79	165.55	6762.34	172.68	6780.73	19.72	1.032	
8	157.80	6767.79	166.80	6761.47	174.84	6782.48	22.50	1.033	
9	155.30	6769.54	164.30	6763.22	172.34	6784.24	22.50	1.033	
10	156.55	6768.66	165.55	6762.34	173.59	6783.36	22.50	1.033	
11	155.30	6769.54	165.55	6762.34	172.84	6783.63	22.50	1.045	
12	156.55	6768.66	166.80	6761.47	174.09	6782.75	22.50	1.045	
13	155.30	6769.54	164.30	6763.22	170.68	6781.88	19.72	1.045	
14	157.80	6767.79	166.80	6761.47	173.18	6780.13	19.72	1.045	
15	156.55	6768.66	165.55	6762.34	171.93	6781.00	19.72	1.045	
16	157.80	6767.79	165.55	6762.34	171.02	6778.38	16.94	1.045	
17	156.55	6768.66	164.30	6763.22	169.77	6779.26	16.94	1.045	
18	157.80	6767.79	164.30	6763.22	168.86	6776.63	14.17	1.046	
19	155.30	6769.54	166.80	6761.47	173.33	6783.00	22.50	1.058	
20	156.55	6768.66	166.80	6761.47	172.42	6780.37	19.72	1.060	
21	155.30	6769.54	165.55	6762.34	171.17	6781.25	19.72	1.060	
22	157.80	6767.79	166.80	6761.47	171.51	6777.74	16.94	1.063	
23	155.30	6769.54	164.30	6763.22	169.01	6779.50	16.94	1.063	
24	156.55	6768.66	165.55	6762.34	170.26	6778.62	16.94	1.063	

25	156.55	6768.66	164.30	6763.22	168.10	6776.87	14.17	1.067
26	157.80	6767.79	165.55	6762.34	169.35	6775.99	14.17	1.067
27	157.80	6767.79	164.30	6763.22	167.18	6774.24	11.39	1.074
28	155.30	6769.54	166.80	6761.47	171.64	6780.59	19.72	1.077
29	156.55	6768.66	166.80	6761.47	170.72	6777.95	16.94	1.084
30	155.30	6769.54	165.55	6762.34	169.47	6778.83	16.94	1.084
31	156.55	6768.66	165.55	6762.34	168.55	6776.19	14.17	1.094
32	155.30	6769.54	164.30	6763.22	167.30	6777.07	14.17	1.094
33	157.80	6767.79	166.80	6761.47	169.80	6775.31	14.17	1.094
34	155.30	6769.54	166.80	6761.47	169.91	6778.12	16.94	1.109
35	156.55	6768.66	164.30	6763.22	166.38	6774.42	11.39	1.109
36	157.80	6767.79	165.55	6762.34	167.63	6773.54	11.39	1.109
37	156.55	6768.66	166.80	6761.47	168.98	6775.46	14.17	1.125
38	155.30	6769.54	165.55	6762.34	167.73	6776.34	14.17	1.125
39	157.80	6767.79	164.30	6763.22	165.44	6771.76	8.61	1.139
40	157.80	6767.79	166.80	6761.47	168.03	6772.79	11.39	1.154
41	156.55	6768.66	165.55	6762.34	166.78	6773.67	11.39	1.154
42	155.30	6769.54	164.30	6763.22	165.53	6774.54	11.39	1.154
43	155.30	6769.54	166.80	6761.47	168.12	6775.57	14.17	1.164
44	156.55	6768.66	164.30	6763.22	164.56	6771.83	8.61	1.210
45	157.80	6767.79	165.55	6762.34	165.81	6770.95	8.61	1.210
46	155.30	6769.54	165.55	6762.34	165.89	6773.73	11.39	1.210
47	156.55	6768.66	166.80	6761.47	167.14	6772.85	11.39	1.210
48	155.30	6769.54	166.80	6761.47	166.20	6772.84	11.39	1.279
49	157.80	6767.79	166.80	6761.47	166.11	6770.05	8.61	1.305
50	156.55	6768.66	165.55	6762.34	164.86	6770.93	8.61	1.305
51	155.30	6769.54	164.30	6763.22	163.61	6771.80	8.61	1.305
52	157.80	6767.79	164.30	6763.22	163.51	6769.00	5.83	1.362
53	155.30	6769.54	165.55	6762.34	163.82	6770.78	8.61	1.436
54	156.55	6768.66	164.30	6763.22	162.38	6768.73	5.83	1.615
55	157.80	6767.79	165.55	6762.34	163.63	6767.85	5.83	1.615
56	155.30	6769.54	166.80	6761.47	165.14	6771.33	10.00	******

Critical Failure Surface (circle 1)

Intersects: XL: 157.80 YL: 6767.79 XR: 164.30 YR: 6763.22

Centre: XC: 173.78 YC: 6783.63 Radius: R: 22.50

Generated failure surface: (20 points)

157.80	6767.79	158.10	6767.49	158.40	6767.20	158.71	6766.92	159.03	6766.64
159.35	6766.36	159.67	6766.10	160.00	6765.84	160.34	6765.58	160.68	6765.34
161.02	6765.09	161.37	6764.86	161.72	6764.63	162.08	6764.41	162.44	6764.19
162.80	6763.99	163.17	6763.78	163.54	6763.59	163.92	6763.40	164.30	6763.22

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	157.80	0.00	44.7	0.15	0.21	1	0.00	35.0	0.53	0.00	2.09	0.84
2	157.95	0.01	44.7	0.15	0.21	1	0.00	35.0	1.58	0.00	6.27	0.84
3	158.10	0.02	43.6	0.15	0.21	1	0.00	35.0	2.61	0.00	10.37	0.83
4	158.25	0.02	43.5	0.15	0.21	1	0.00	35.0	3.58	0.00	14.21	0.83
5	158.40	0.03	42.6	0.15	0.21	1	0.00	35.0	4.54	0.00	17.97	0.83
6	158.56	0.03	42.6	0.15	0.21	1	0.00	35.0	5.38	0.00	21.31	0.83

7	158.71	0.04	41.5	0.16	0.21	1	0.00	35.0	6.28	0.00	24.79	0.83
8	158.87	0.04	41.6	0.16	0.21	1	0.00	35.0	7.02	0.00	27.69	0.83
9	159.03	0.05	40.4	0.16	0.21	1	0.00	35.0	7.84	0.00	30.89	0.83
10	159.19	0.05	40.4	0.16	0.21	1	0.00	35.0	8.46	0.00	33.31	0.83
11	159.35	0.06	39.3	0.16	0.21	1	0.00	35.0	9.16	0.00	36.06	0.83
12	159.51	0.06	39.4	0.16	0.21	1	0.00	35.0	9.67	0.00	38.01	0.83
13	159.67	0.06	38.3	0.16	0.21	1	0.00	35.0	10.26	0.00	40.27	0.83
14	159.84	0.07	38.2	0.16	0.21	1	0.00	35.0	10.66	0.00	41.88	0.82
15	160.00	0.07	37.2	0.17	0.21	1	0.00	35.0	11.13	0.00	43.69	0.82
16	160.17	0.07	37.3	0.17	0.21	1	0.00	35.0	11.40	0.00	44.68	0.82
17	160.34	0.07	36.2	0.17	0.21	1	0.00	35.0	11.77	0.00	46.11	0.82
18	160.51	0.07	36.1	0.17	0.21	1	0.00	35.0	11.89	0.00	46.65	0.82
19	160.68	0.07	35.2	0.17	0.21	1	0.00	35.0	12.13	0.00	47.49	0.82
20	160.85	0.07	35.0	0.17	0.21	1	0.00	35.0	12.12	0.00	47.50	0.82
21	161.02	0.07	34.0	0.17	0.21	1	0.00	35.0	12.20	0.00	47.80	0.82
22	161.19	0.07	33.9	0.17	0.21	1	0.00	35.0	12.08	0.00	47.37	0.82
23	161.37	0.07	32.9	0.18	0.21	1	0.00	35.0	12.02	0.00	47.10	0.82
24	161.54	0.07	32.9	0.18	0.21	1	0.00	35.0	11.73	0.00	46.00	0.82
25	161.72	0.07	31.8	0.18	0.21	1	0.00	35.0	11.52	0.00	45.19	0.82
26	161.90	0.07	31.8	0.18	0.21	1	0.00	35.0	11.12	0.00	43.62	0.82
27	162.08	0.07	30.8	0.18	0.21	1	0.00	35.0	10.74	0.00	42.19	0.83
28	162.26	0.06	30.9	0.18	0.21	1	0.00	35.0	10.18	0.00	39.93	0.83
29	162.44	0.06	29.7	0.18	0.21	1	0.00	35.0	9.65	0.00	37.95	0.83
30	162.62	0.05	29.7	0.18	0.21	1	0.00	35.0	8.92	0.00	35.08	0.83
31	162.80	0.05	28.7	0.18	0.21	1	0.00	35.0	8.21	0.00	32.33	0.83
32	162.99	0.04	28.6	0.18	0.21	1	0.00	35.0	7.36	0.00	29.00	0.83
33	163.17	0.04	27.7	0.19	0.21	1	0.00	35.0	6.49	0.00	25.61	0.83
34	163.36	0.03	27.6	0.19	0.21	1	0.00	35.0	5.47	0.00	21.59	0.83
35	163.54	0.03	26.5	0.19	0.21	1	0.00	35.0	4.42	0.00	17.50	0.83
36	163.73	0.02	26.5	0.19	0.21	1	0.00	35.0	3.25	0.00	12.86	0.83
37	163.92	0.01	25.3	0.19	0.21	1	0.00	35.0	2.00	0.00	7.96	0.83
38	164.11	0.00	25.5	0.19	0.21	1	0.00	35.0	0.67	0.00	2.65	0.83

--- --- ---

X-S Area: 1.87 Path Length: 7.98 X-S Weight: 306.02

Appendix 1

Appendix 1 Hydrology

Drainage basin numbers on the following analyses correspond to basins outlined on Map G-1.

Basin	Description
Baseline – Basin 1	Pre-mine west drainage basin passing through quarry area.
Baseline – Basin 2	Pre-mine east drainage basin passing through quarry area.
Mining – Basin 1	West drainage basin passing through quarry area during mining.
Mining – Basin 2	East drainage basin passing through quarry area during mining.
Reclaimed – Basin 1	West drainage basin passing through quarry area after reclamation.
Reclaimed – Basin 2	East drainage basin passing through quarry area after reclamation.

All stormwater calculations are based on the 10-YR & 100-YR 24-HR storm event for this area of Colorado. Calculations of runoff, both in terms of volume and flow, are according to the Rational Method.

The Rational Method is a widely used technique in hydrology for estimating peak discharge from small drainage basins during storm events. It is based on the premise that peak discharge is proportional to rainfall intensity, catchment area, and a runoff coefficient that accounts for land use and soil type. The method uses the formula Q = CiA, where Q is the peak discharge (cubic feet per second or cubic meters per second), C is the runoff coefficient, i is the rainfall intensity (inches per hour or millimeters per hour), and A is the catchment area (acres or hectares). This method is particularly useful for catchments where the time of concentration is relatively short.

Map G-1 summarizes the drainage basins (A). Runoff coefficients are based on land conditions (C). NOAA data for rainfall intensity (i) is used. Runoff coefficients are typical values from ASCE[3] tables included in the hydrology software. The coefficients are based on either unimproved ground (0.20-0.25) or light industrial ground (0.5-0.6) for disturbed areas of the site.

Assumptions: The following assumptions are made for the surface hydrology model.

1. NOAA rainfall intensities that are publicly available are accurate.
2. The computed maximum rate of runoff to the design point is a function of the average rainfall rate during the time of concentration to that point.
3. The hydrologic losses in the catchment are homogeneous and uniform.
4. The runoff coefficients represent the average soil antecedent moisture condition, imperviousness, and type of soil.
5. The depth of rainfall used is one that occurs from the start of the storm to at least the time of concentration, and the design rainfall depth during that time period is converted to the average rainfall intensity for that period.
6. The maximum runoff rate occurs when the entire area is contributing flow.

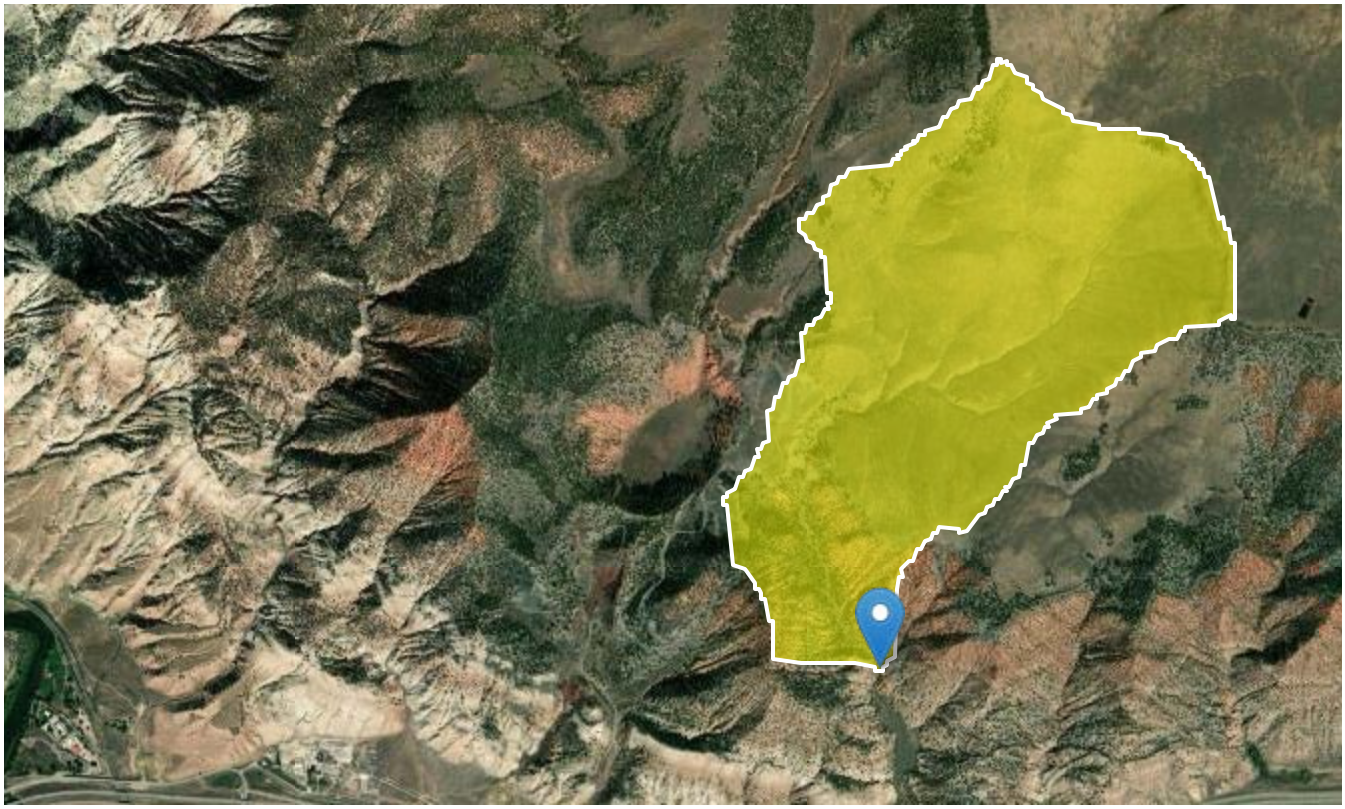
Hydrographs and storm outputs (runoff, runoff peak flow, etc.) are included in the Appendix. USGS StreamStats reports for each neighboring basin are also included.

[3] American Society of Civil Engineers

The access road culvert design is included in the Appendix. The design is based on USGS StreamStats data for its basin.

Brown Quarry West Drainage - Access Road Crossing Culvert

Region ID: CO
Workspace ID: CO20250204203959911000
Clicked Point (Latitude, Longitude): 39.65311, -107.02576
Time: 2025-02-04 13:40:22 -0700



This drainage basin is west of the Brown Quarry mining area. It is crossed by the access road to the Brown Quarry.

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.84	square miles
EL7500	Percent of area above 7500 ft	37	percent
ELEV	Mean Basin Elevation	7437	feet
PRECIP	Mean Annual Precipitation	15.99	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Northwest Region Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	1	5250
EL7500	Percent above 7500 ft	37	percent	0	99
PRECIP	Mean Annual Precipitation	15.99	inches	8	49

Peak-Flow Statistics Disclaimers [Northwest Region Peak Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Northwest Region Peak Flow]

Statistic	Value	Unit
50-percent AEP flood	5.42	ft^3/s
20-percent AEP flood	10.2	ft^3/s
10-percent AEP flood	14.8	ft^3/s
4-percent AEP flood	22.2	ft^3/s
2-percent AEP flood	29.7	ft^3/s
1-percent AEP flood	38.1	ft^3/s
0.5-percent AEP flood	47.9	ft^3/s
0.2-percent AEP flood	65.9	ft^3/s

Peak-Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Low-Flow Statistics

Low-Flow Statistics Parameters [Northwest Region Min Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	5	5250
ELEV	Mean Basin Elevation	7437	feet	6880	10480

Low-Flow Statistics Disclaimers [Northwest Region Min Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Low-Flow Statistics Flow Report [Northwest Region Min Flow]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0222	ft^3/s
7 Day 10 Year Low Flow	0.00759	ft^3/s
7 Day 50 Year Low Flow	0.00515	ft^3/s

Low-Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Annual Flow Statistics

Annual Flow Statistics Parameters [Northwest Region Mean Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	1	5250
PRECIP	Mean Annual Precipitation	15.99	inches	8	49

Annual Flow Statistics Disclaimers [Northwest Region Mean Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Annual Flow Statistics Flow Report [Northwest Region Mean Flow]

Statistic	Value	Unit
Mean Annual Flow	0.0881	ft^3/s

Annual Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Bankfull Statistics

Bankfull Statistics Parameters [Rocky Mountain System D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	0.15444	9730.1061

Bankfull Statistics Parameters [Southern Rocky Mountains P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	1.540539	9729.943938

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.84	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Rocky Mountain System D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	5.71	ft
Bieger_D_channel_depth	0.899	ft
Bieger_D_channel_cross_sectional_area	3.67	ft^2

Bankfull Statistics Disclaimers [Southern Rocky Mountains P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [Southern Rocky Mountains P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	7.91	ft
Bieger_P_channel_depth	0.728	ft
Bieger_P_channel_cross_sectional_area	5.2	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	11.6	ft
Bieger_USA_channel_depth	1.16	ft
Bieger_USA_channel_cross_sectional_area	15.6	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bieger_D_channel_width	5.71	ft
Bieger_D_channel_depth	0.899	ft
Bieger_D_channel_cross_sectional_area	3.67	ft^2
Bieger_P_channel_width	7.91	ft
Bieger_P_channel_depth	0.728	ft
Bieger_P_channel_cross_sectional_area	5.2	ft^2
Bieger_USA_channel_width	11.6	ft
Bieger_USA_channel_depth	1.16	ft

Statistic	Value	Unit
Bieger_USA_channel_cross_sectional_area	15.6	ft^2

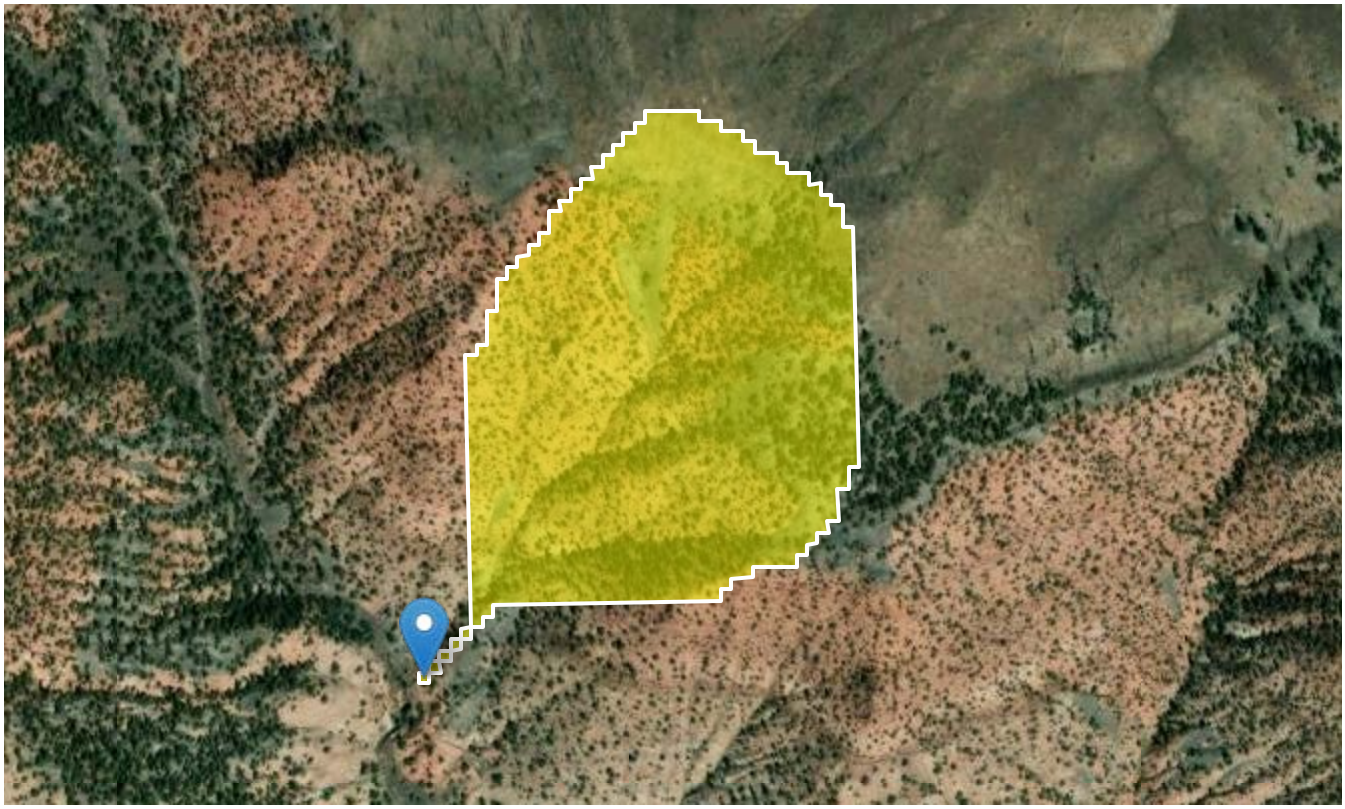
Bankfull Statistics Citations

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_c

Application Version: 4.26.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Brown Quarry East Drainage - Neighbors Quarry to East

Region ID: CO
Workspace ID: CO20250204202955665000
Clicked Point (Latitude, Longitude): 39.65309, -107.02549
Time: 2025-02-04 13:30:21 -0700



The drainage basin lies east of the Brown Quarry mining area.

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0512	square miles
EL7500	Percent of area above 7500 ft	15	percent
ELEV	Mean Basin Elevation	7253	feet
PRECIP	Mean Annual Precipitation	14.84	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Northwest Region Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	1	5250
EL7500	Percent above 7500 ft	15	percent	0	99
PRECIP	Mean Annual Precipitation	14.84	inches	8	49

Peak-Flow Statistics Disclaimers [Northwest Region Peak Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Northwest Region Peak Flow]

Statistic	Value	Unit
50-percent AEP flood	0.807	ft^3/s
20-percent AEP flood	1.67	ft^3/s
10-percent AEP flood	2.72	ft^3/s
4-percent AEP flood	4.44	ft^3/s
2-percent AEP flood	6.4	ft^3/s
1-percent AEP flood	8.56	ft^3/s

Statistic	Value	Unit
0.5-percent AEP flood	11.5	ft^3/s
0.2-percent AEP flood	16.9	ft^3/s

Peak-Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Flood-Volume Statistics

Flood-Volume Statistics Parameters [Northwest Region Max Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	5	5250
EL7500	Percent above 7500 ft	15	percent	0	99
PRECIP	Mean Annual Precipitation	14.84	inches	8	49

Flood-Volume Statistics Disclaimers [Northwest Region Max Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Flood-Volume Statistics Flow Report [Northwest Region Max Flow]

Statistic	Value	Unit
7 Day 2 Year Maximum	0.0016	ft^3/s
7 Day 10 Year Maximum	0.00695	ft^3/s
7 Day 50 Year Maximum	0.0299	ft^3/s

Flood-Volume Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific

Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Low-Flow Statistics

Low-Flow Statistics Parameters [Northwest Region Min Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	5	5250
ELEV	Mean Basin Elevation	7253	feet	6880	10480

Low-Flow Statistics Disclaimers [Northwest Region Min Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Low-Flow Statistics Flow Report [Northwest Region Min Flow]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00176	ft^3/s
7 Day 10 Year Low Flow	0.000484	ft^3/s
7 Day 50 Year Low Flow	0.000298	ft^3/s

Low-Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Annual Flow Statistics

Annual Flow Statistics Parameters [Northwest Region Mean Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	1	5250

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIP	Mean Annual Precipitation	14.84	inches	8	49

Annual Flow Statistics Disclaimers [Northwest Region Mean Flow]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Annual Flow Statistics Flow Report [Northwest Region Mean Flow]

Statistic	Value	Unit
Mean Annual Flow	0.00482	ft^3/s

Annual Flow Statistics Citations

Capesius, J.P., and Stephens, V. C.,2009, Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado: U. S. Geological Survey Scientific Investigations Report 2009-5136, 32 p. (http://pubs.usgs.gov/sir/2009/5136/)

Bankfull Statistics

Bankfull Statistics Parameters [Rocky Mountain System D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	0.15444	9730.1061

Bankfull Statistics Parameters [Southern Rocky Mountains P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	1.540539	9729.943938

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0512	square miles	0.07722	59927.7393

Bankfull Statistics Disclaimers [Rocky Mountain System D Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [Rocky Mountain System D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	1.69	ft
Bieger_D_channel_depth	0.479	ft
Bieger_D_channel_cross_sectional_area	0.536	ft^2

Bankfull Statistics Disclaimers [Southern Rocky Mountains P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [Southern Rocky Mountains P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	3.05	ft
Bieger_P_channel_depth	0.416	ft
Bieger_P_channel_cross_sectional_area	1.18	ft^2

Bankfull Statistics Disclaimers [USA Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	4.35	ft
Bieger_USA_channel_depth	0.64	ft
Bieger_USA_channel_cross_sectional_area	3.43	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bieger_D_channel_width	1.69	ft

Statistic	Value	Unit
Bieger_D_channel_depth	0.479	ft
Bieger_D_channel_cross_sectional_area	0.536	ft^2
Bieger_P_channel_width	3.05	ft
Bieger_P_channel_depth	0.416	ft
Bieger_P_channel_cross_sectional_area	1.18	ft^2
Bieger_USA_channel_width	4.35	ft
Bieger_USA_channel_depth	0.64	ft
Bieger_USA_channel_cross_sectional_area	3.43	ft^2

Bankfull Statistics Citations

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_c

Application Version: 4.26.0

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Hydraflow Table of Contents

Gypsum.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Tuesday, 03 / 11 / 2025

10 - Year

100 - Year

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

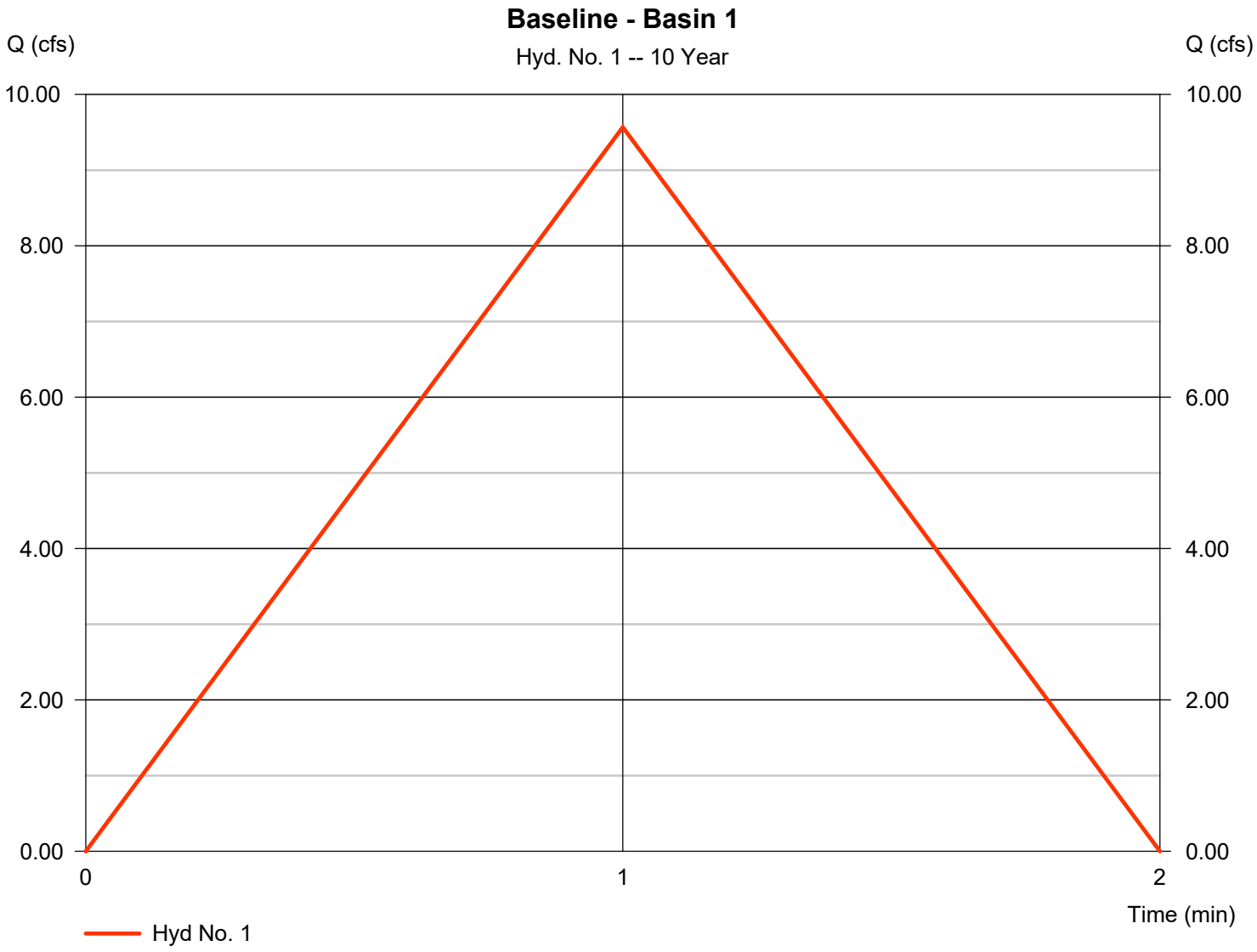
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	Rational	9.567	1	1	0.013	------	------	------	Baseline - Basin 1
2	Rational	12.59	1	3	0.052	------	------	------	Mining - Basin 1
3	Rational	7.232	1	3	0.030	------	------	------	Mining - Basin 2
4	Rational	5.494	1	1	0.008	------	------	------	Baseline - Basin 2
5	Rational	4.821	1	3	0.020	------	------	------	Reclaimed - Basin 2
6	Rational	8.395	1	3	0.035	------	------	------	Reclaimed - Basin 1

Hydrograph Report

Hyd. No. 1

Baseline - Basin 1

Hydrograph type	=	Rational	Peak discharge	=	9.567 cfs
Storm frequency	=	10 yrs	Time to peak	=	1 min
Time interval	=	1 min	Hyd. volume	=	0.013 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.4
Intensity	=	4.803 in/hr	Tc by TR55	=	1.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 1

Baseline - Basin 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 890.00		0.00		0.00		
Watercourse slope (%)	= 63.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=12.81		0.00		0.00		
Travel Time (min)	**= 1.16**	**+**	**0.00**	**+**	**0.00**	**=**	**1.16**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

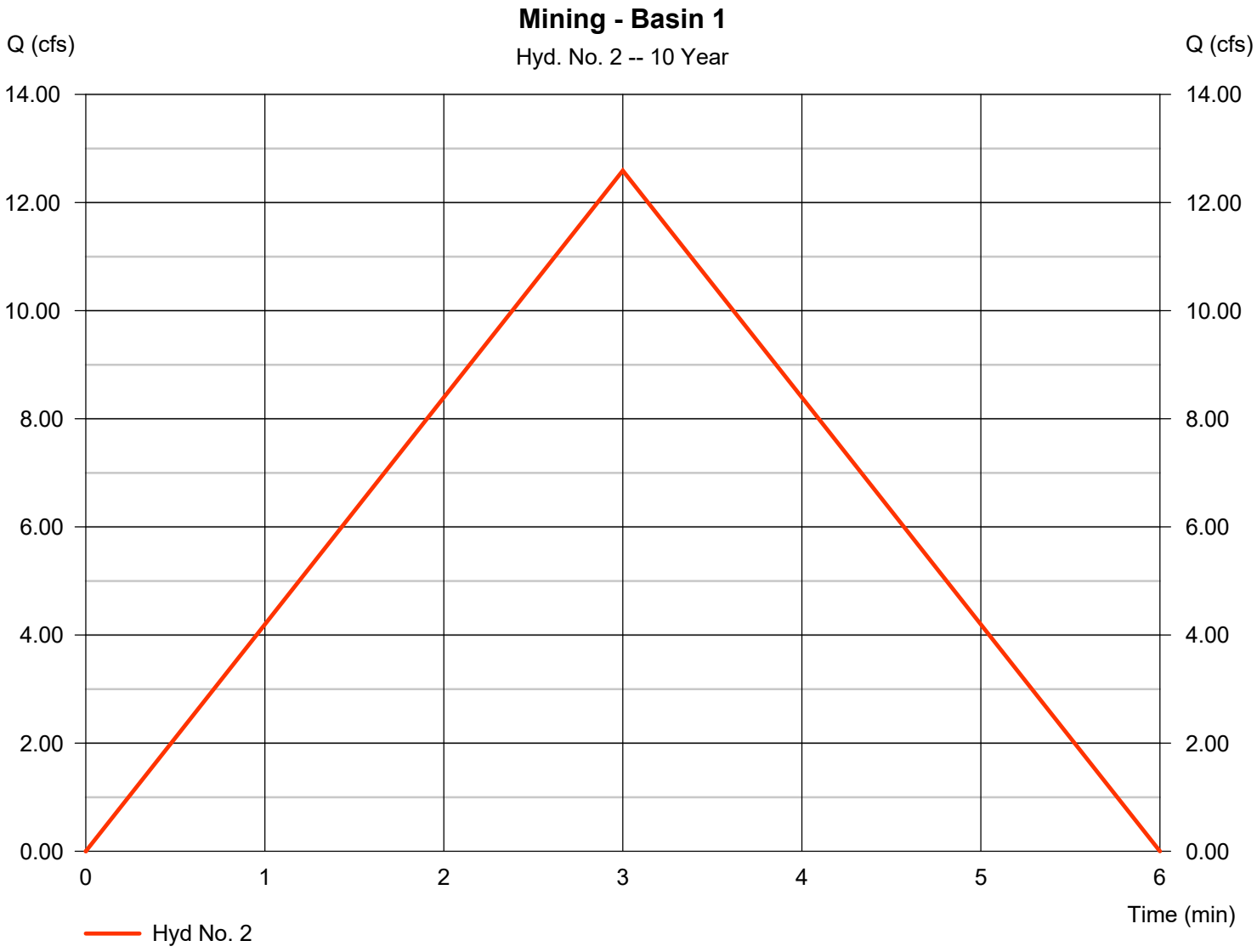
Total Travel Time, Tc ..... 1.00 min

Hydrograph Report

Hyd. No. 2

Mining - Basin 1

Hydrograph type	=	Rational	Peak discharge	=	12.59 cfs
Storm frequency	=	10 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.052 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.6
Intensity	=	4.214 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 2

Mining - Basin 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 150.00		740.00		0.00		
Watercourse slope (%)	= 0.50		53.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=1.14		11.78		0.00		
Travel Time (min)	**= 2.19**	**+**	**1.05**	**+**	**0.00**	**=**	**3.24**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

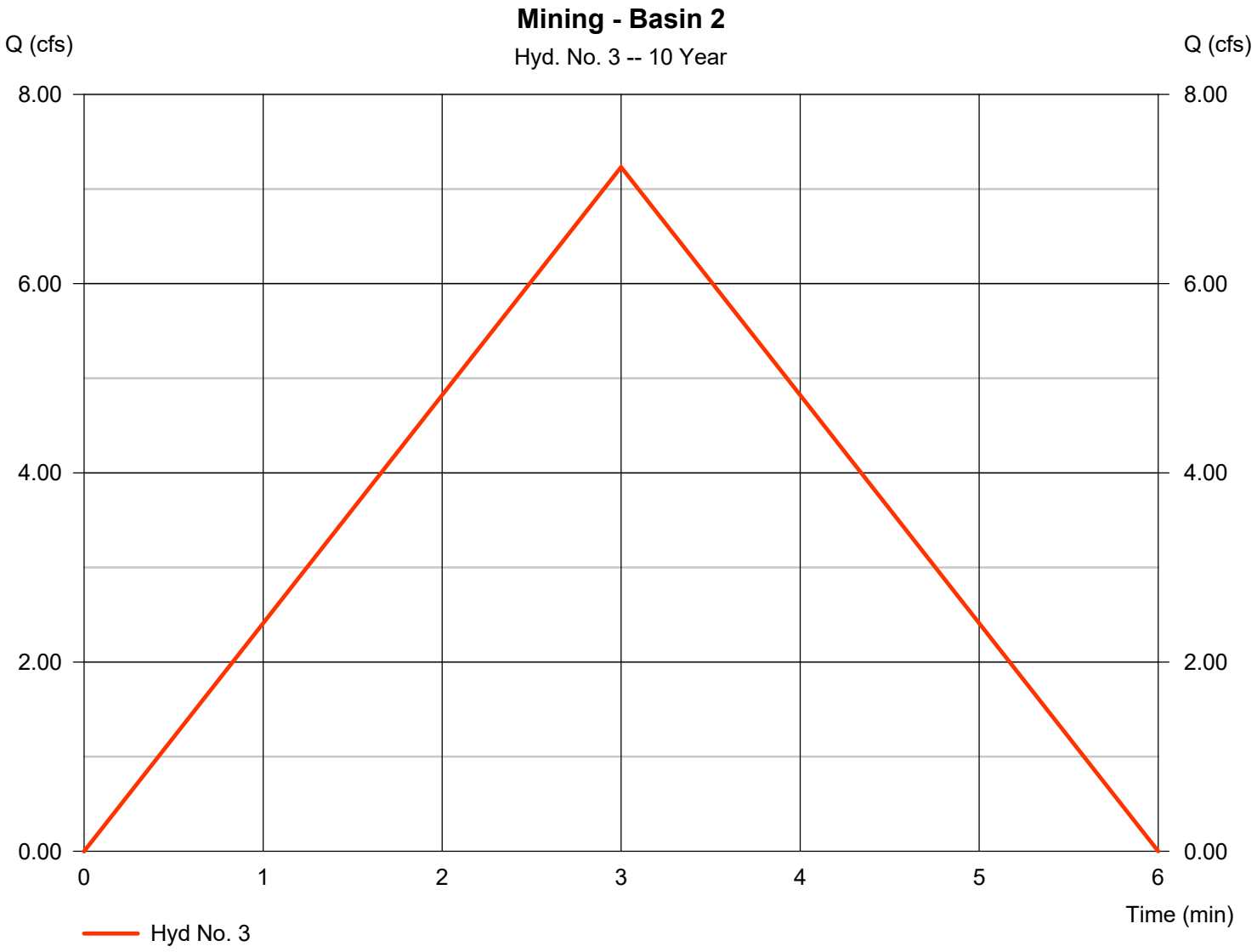
Total Travel Time, Tc ..... 3.00 min

Hydrograph Report

Hyd. No. 3

Mining - Basin 2

Hydrograph type	=	Rational	Peak discharge	=	7.232 cfs
Storm frequency	=	10 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.030 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.6
Intensity	=	4.214 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 3

Mining - Basin 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 700.00		160.00		0.00		
Watercourse slope (%)	= 55.00		1.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=11.97		1.61		0.00		
Travel Time (min)	**= 0.98**	**+**	**1.65**	**+**	**0.00**	**=**	**2.63**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

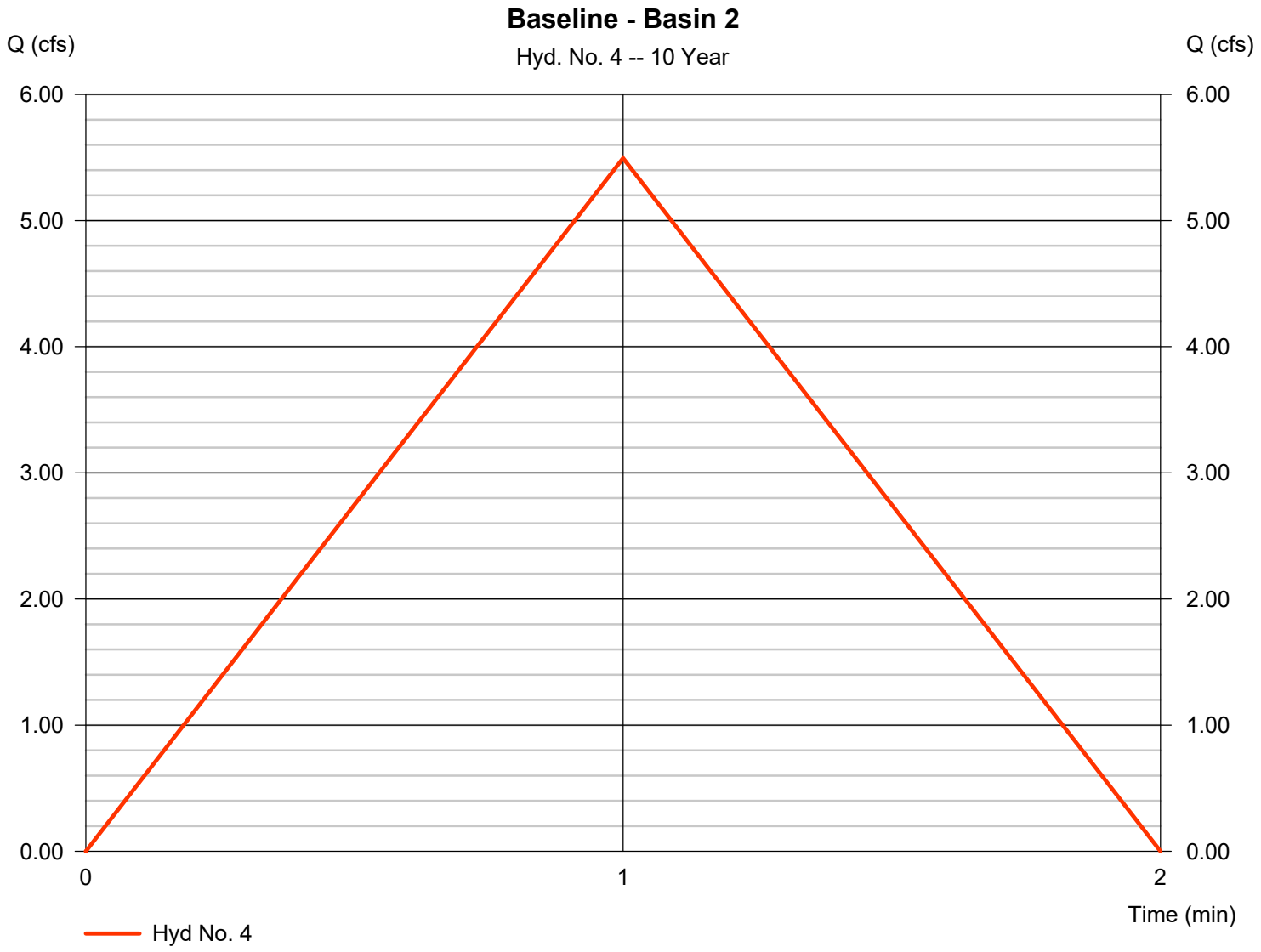
Total Travel Time, Tc ..... 3.00 min

Hydrograph Report

Hyd. No. 4

Baseline - Basin 2

Hydrograph type	=	Rational	Peak discharge	=	5.494 cfs
Storm frequency	=	10 yrs	Time to peak	=	1 min
Time interval	=	1 min	Hyd. volume	=	0.008 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.4
Intensity	=	4.803 in/hr	Tc by TR55	=	1.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 4

Baseline - Basin 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 860.00		0.00		0.00		
Watercourse slope (%)	= 50.00		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=11.41		0.00		0.00		
Travel Time (min)	**= 1.26**	**+**	**0.00**	**+**	**0.00**	**=**	**1.26**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

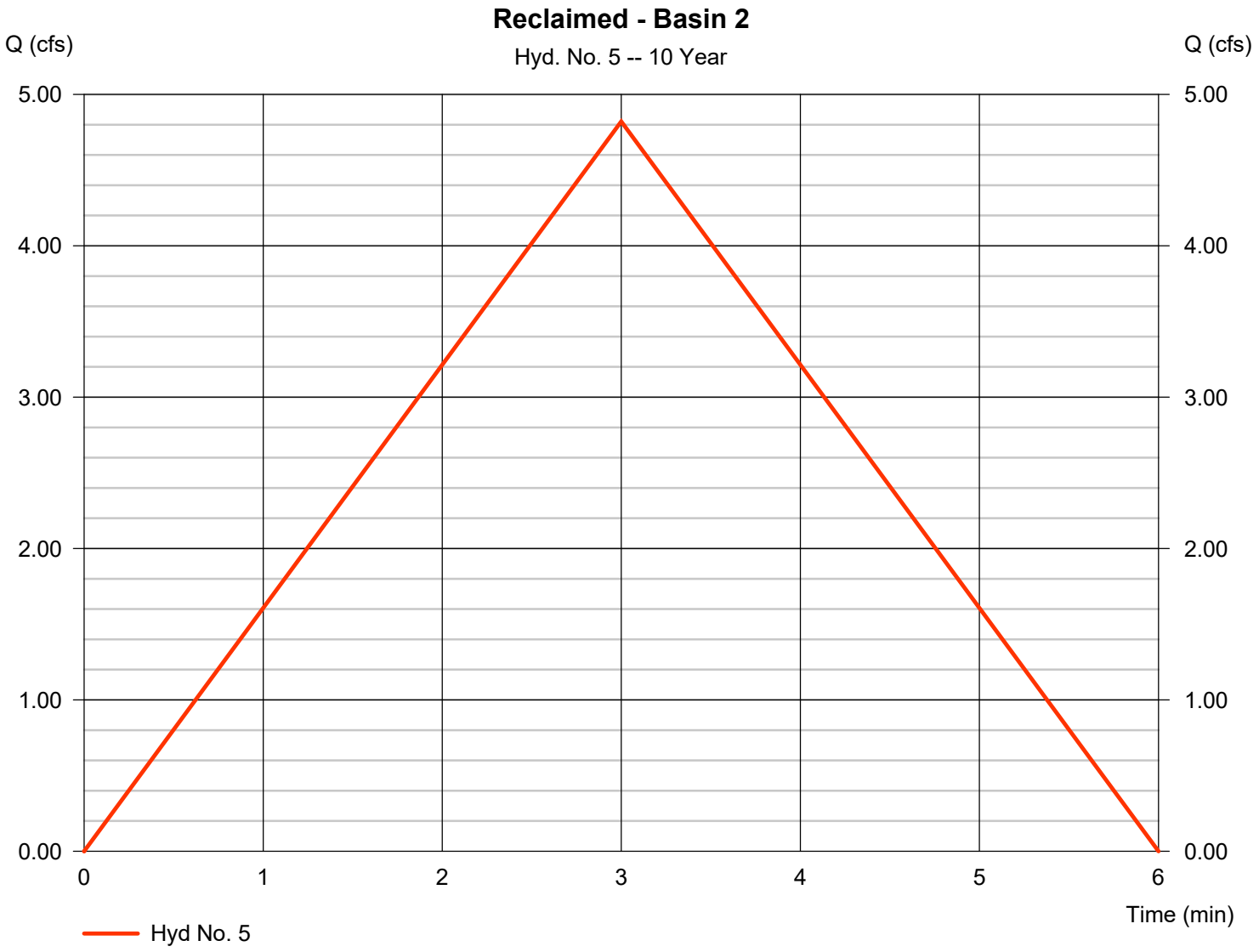
Total Travel Time, Tc ..... 1.00 min

Hydrograph Report

Hyd. No. 5

Reclaimed - Basin 2

Hydrograph type	=	Rational	Peak discharge	=	4.821 cfs
Storm frequency	=	10 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.020 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.4
Intensity	=	4.214 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 5

Reclaimed - Basin 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 700.00		160.00		0.00		
Watercourse slope (%)	= 55.00		1.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=11.97		1.61		0.00		
Travel Time (min)	**= 0.98**	**+**	**1.65**	**+**	**0.00**	**=**	**2.63**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

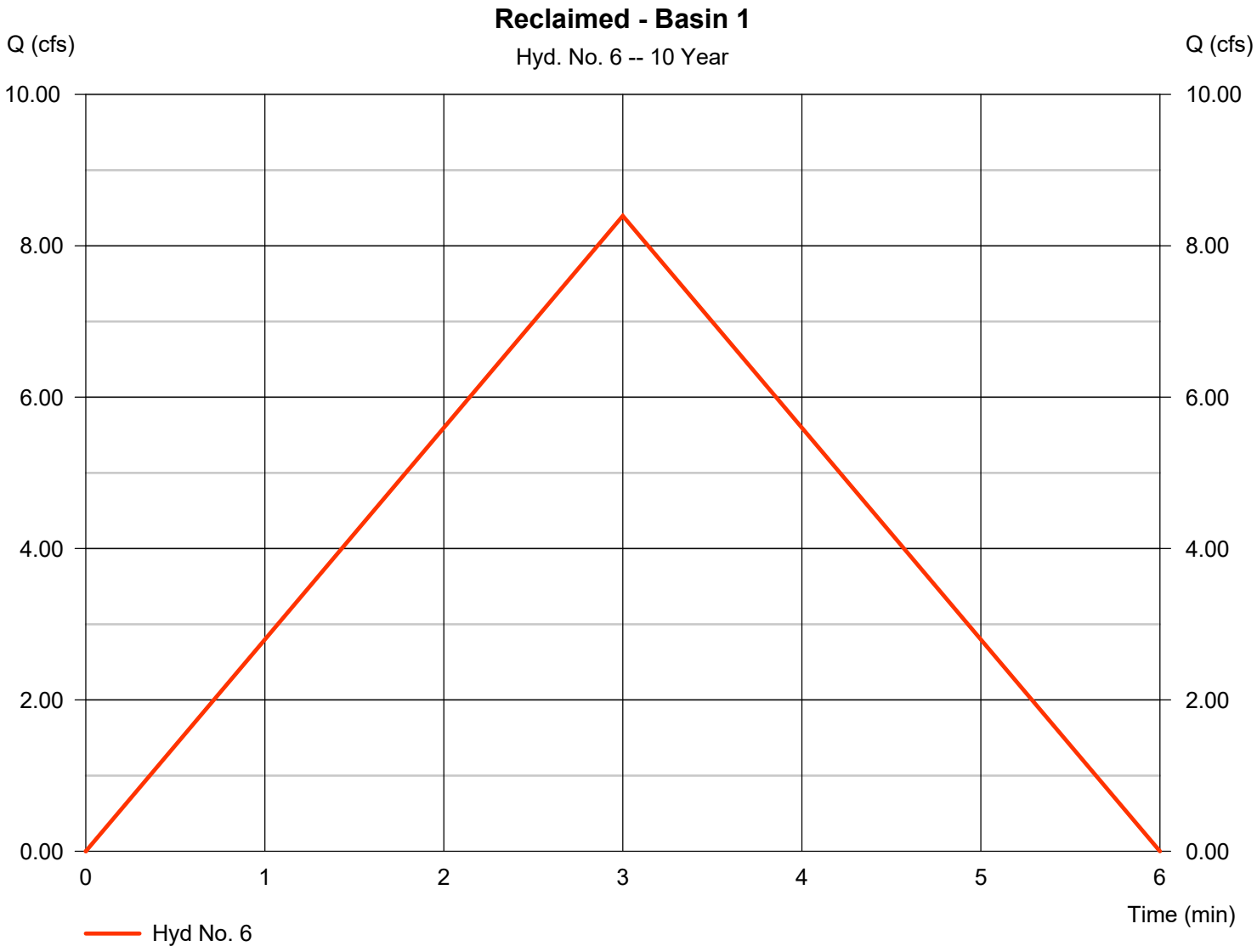
Total Travel Time, Tc ..... 3.00 min

Hydrograph Report

Hyd. No. 6

Reclaimed - Basin 1

Hydrograph type	=	Rational	Peak discharge	=	8.395 cfs
Storm frequency	=	10 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.035 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.4
Intensity	=	4.214 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 6

Reclaimed - Basin 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 150.00		740.00		0.00		
Watercourse slope (%)	= 0.50		53.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=1.14		11.78		0.00		
Travel Time (min)	**= 2.19**	**+**	**1.05**	**+**	**0.00**	**=**	**3.24**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 3.00 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	Rational	15.58	1	1	0.021	------	------	------	Baseline - Basin 1
2	Rational	20.51	1	3	0.085	------	------	------	Mining - Basin 1
3	Rational	11.78	1	3	0.049	------	------	------	Mining - Basin 2
4	Rational	8.949	1	1	0.012	------	------	------	Baseline - Basin 2
5	Rational	7.852	1	3	0.032	------	------	------	Reclaimed - Basin 2
6	Rational	13.67	1	3	0.057	------	------	------	Reclaimed - Basin 1

Hydrograph Report

Hyd. No. 1

Baseline - Basin 1

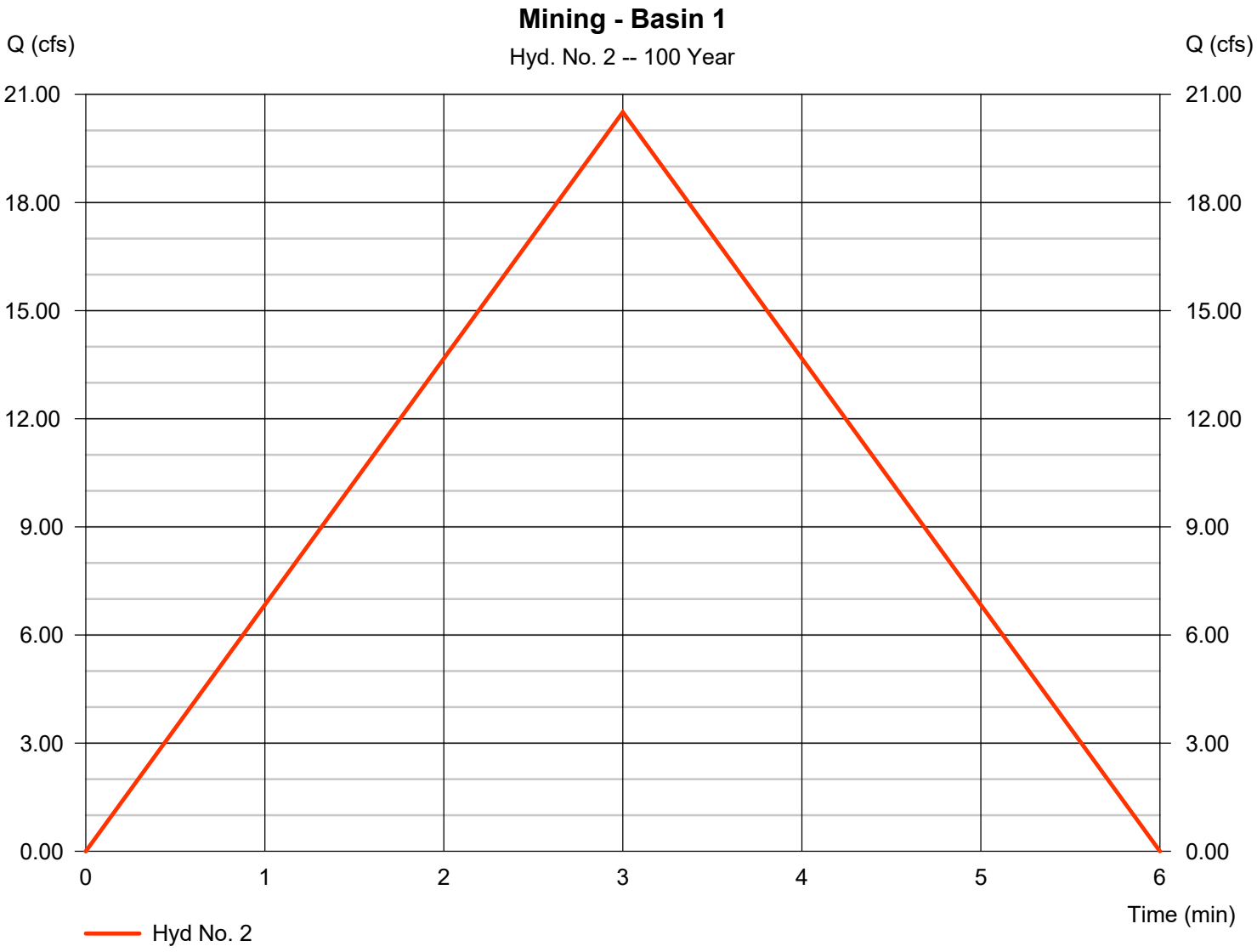
Hydrograph type	=	Rational	Peak discharge	=	15.58 cfs
Storm frequency	=	100 yrs	Time to peak	=	1 min
Time interval	=	1 min	Hyd. volume	=	0.021 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.4
Intensity	=	7.822 in/hr	Tc by TR55	=	1.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Report

Hyd. No. 2

Mining - Basin 1

Hydrograph type	=	Rational	Peak discharge	=	20.51 cfs
Storm frequency	=	100 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.085 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.6
Intensity	=	6.864 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1

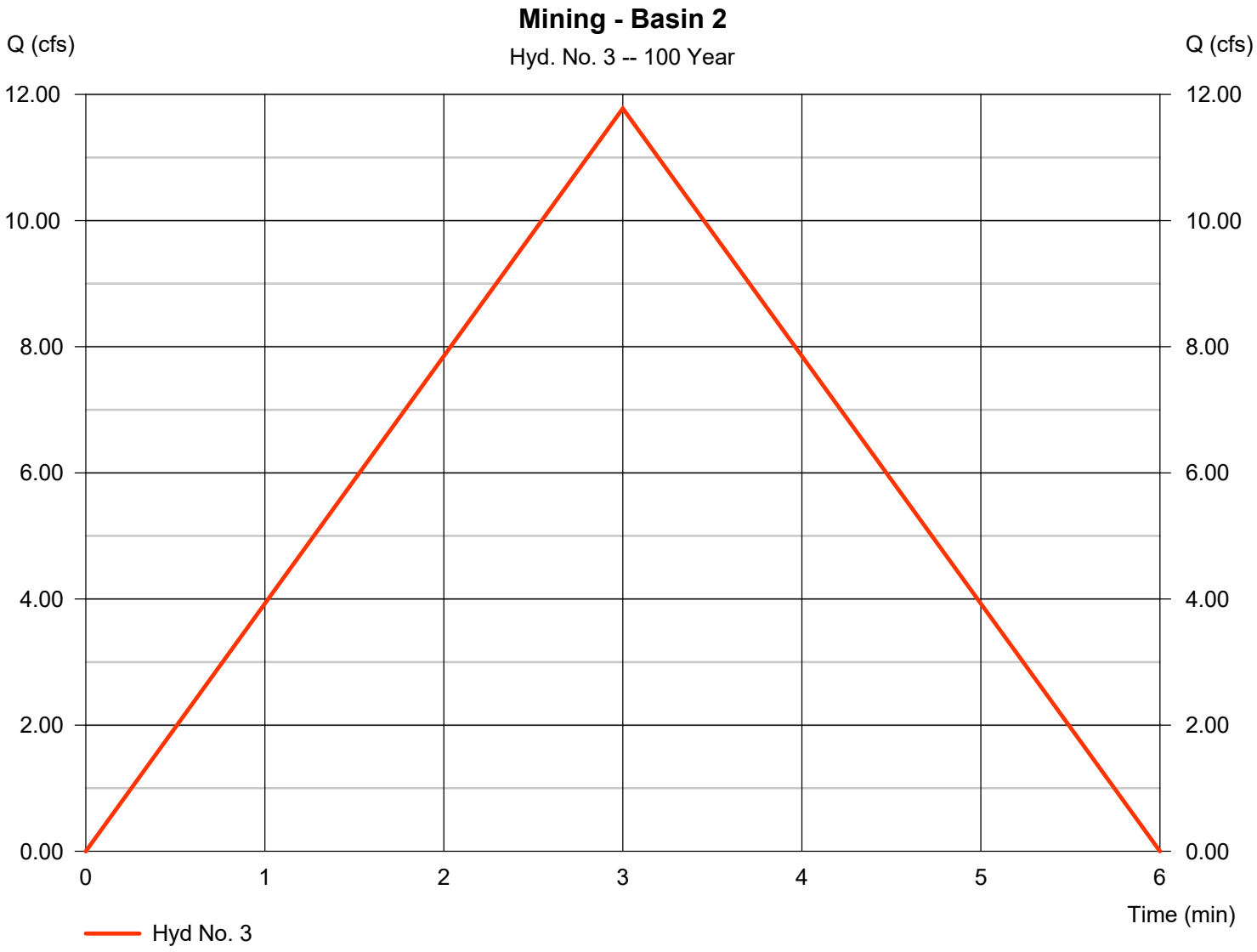


Hydrograph Report

Hyd. No. 3

Mining - Basin 2

Hydrograph type	=	Rational	Peak discharge	=	11.78 cfs
Storm frequency	=	100 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.049 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.6
Intensity	=	6.864 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



Hydrograph Report

Hyd. No. 4

Baseline - Basin 2

Hydrograph type	=	Rational	Peak discharge	=	8.949 cfs
Storm frequency	=	100 yrs	Time to peak	=	1 min
Time interval	=	1 min	Hyd. volume	=	0.012 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.4
Intensity	=	7.822 in/hr	Tc by TR55	=	1.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Report

Hyd. No. 5

Reclaimed - Basin 2

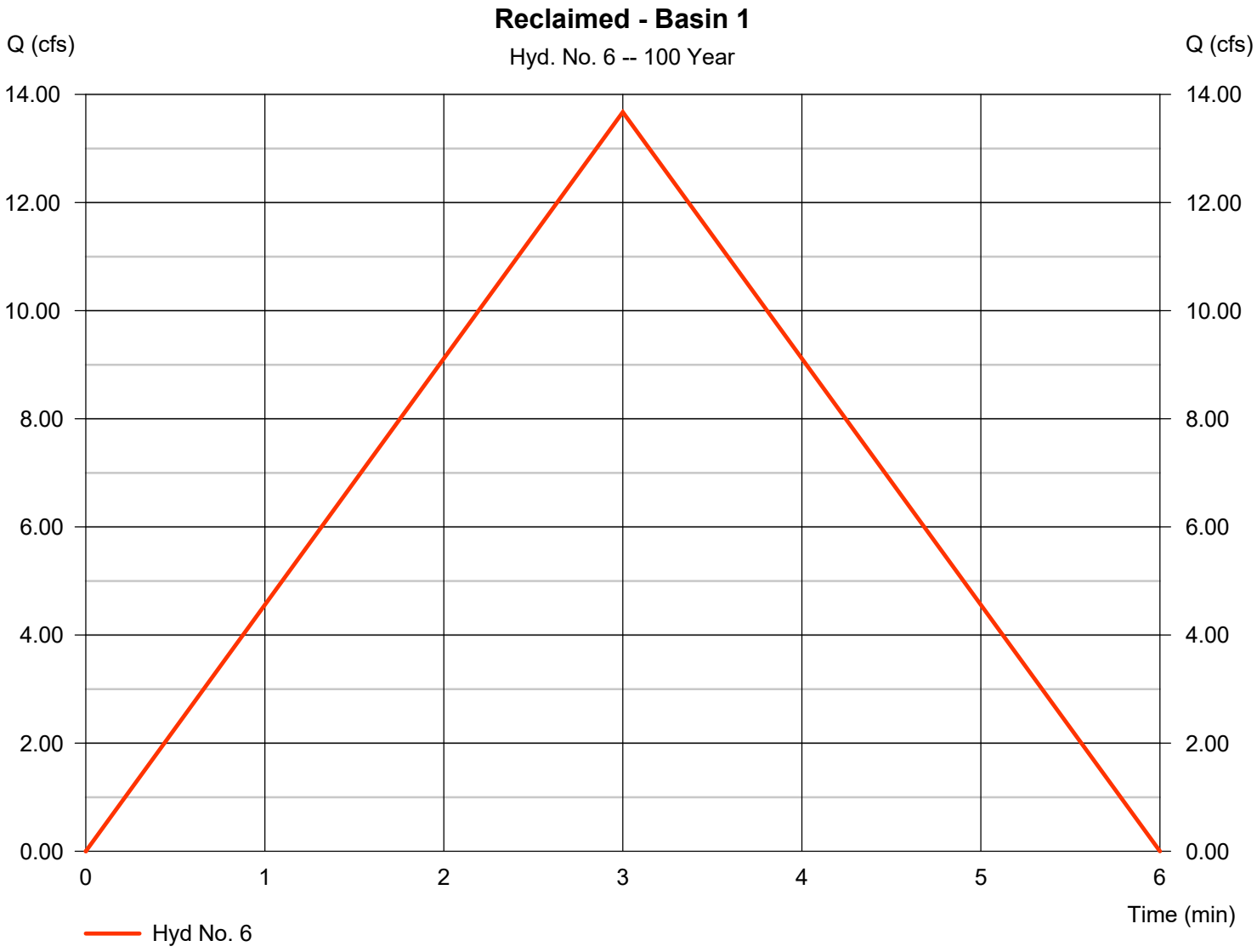
Hydrograph type	=	Rational	Peak discharge	=	7.852 cfs
Storm frequency	=	100 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.032 acft
Drainage area	=	2.860 ac	Runoff coeff.	=	0.4
Intensity	=	6.864 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Report

Hyd. No. 6

Reclaimed - Basin 1

Hydrograph type	=	Rational	Peak discharge	=	13.67 cfs
Storm frequency	=	100 yrs	Time to peak	=	3 min
Time interval	=	1 min	Hyd. volume	=	0.057 acft
Drainage area	=	4.980 ac	Runoff coeff.	=	0.4
Intensity	=	6.864 in/hr	Tc by TR55	=	3.00 min
IDF Curve	=	Gypsum.IDF	Asc/Rec limb fact	=	1/1



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 26 2025

Brown Quarry Access Road Culvert - 18-inch diameter, 3 Barrels

Invert Elev Dn (ft)	=	6720.00
Pipe Length (ft)	=	25.00
Slope (%)	=	15.00
Invert Elev Up (ft)	=	6723.75
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	3
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Headwall
Coeff. K,M,c,Y,k	=	0.0078, 2, 0.0379, 0.69, 0.5

Embankment

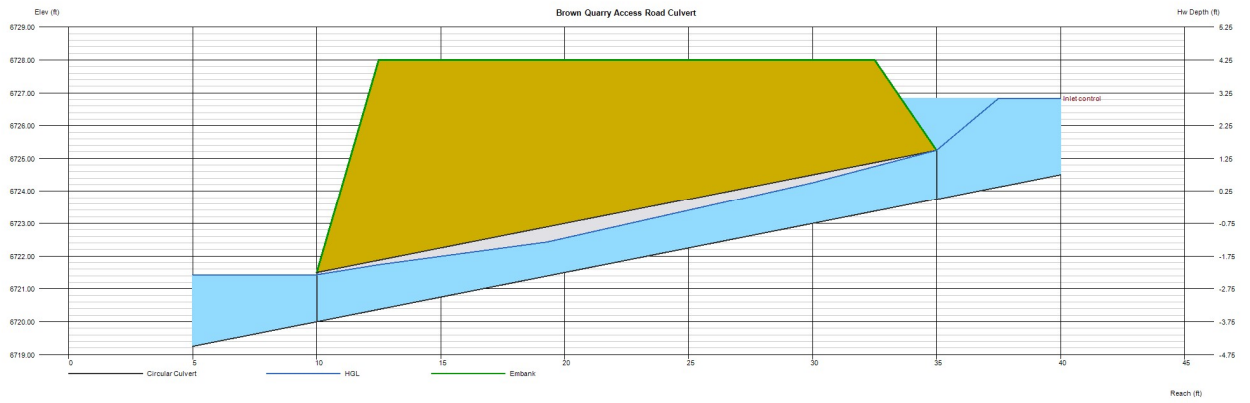
Top Elevation (ft)	=	6728.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	40.00

Calculations

Qmin (cfs)	=	5.00
Qmax (cfs)	=	40.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	40.00
Qpipe (cfs)	=	40.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.67
Veloc Up (ft/s)	=	7.91
HGL Dn (ft)	=	6721.43
HGL Up (ft)	=	6725.11
Hw Elev (ft)	=	6726.83
Hw/D (ft)	=	2.05
Flow Regime	=	Inlet Control



BASELINE CONDITIONS

MINING PLAN

RECLAMATION PLAN

1 | 5.0 | 0.4

1 | 2.9 | 0.4

1 | 5.0 | 0.6

2 | 2.9 | 0.6

1 | 5.0 | 0.4

2 | 2.9 | 0.3

1

2

DRAINAGE

MINE WATER DISCHARGE TO NATURAL DRAINAGE

MINING

DRAINAGE

MINING BENCHES (TYP.)

MINE WATER DISCHARGE TO NATURAL DRAINAGE

ANCHORED STRAW BALES OR SIMILAR SEDIMENT TRAPPING MECHANISMS FOR STORMWATER CONTROL MEASURES

DISCHARGE TO NATURAL DRAINAGE

DRAINAGE

FINAL RECLAIMED SLOPE

DRAINAGE

DISCHARGE TO NATURAL DRAINAGE

7250' 7225' 7200' 7175' 7100' 7075' 7050' 7025' 7000' 6975' 6950' 6925' 6900' 6875' 6850' 6825' 6800' 6775' 6750' 6725' 6700'

G-1 Hydrology Map

DRMS Permit Number: M-2024-023 — **Defiance Stone Company LLC**

Mine Entry Location:	Latitude: 39.65932	Longitude: -107.32890
State: CO	County: Eagle	Nearest Town: Gypsum
Section: 34	Township: 4S	Range: 86W PM: 6th
Major Watershed:	----	

Map Scale: 1": 700

0 700 1400

N

Map Georeferencing Information: **Datum: NAD83** **Projection: CO CENTRAL**

Survey Source: ----
Imagery Source: Bing
Survey Date: ----
Imagery Date: ----

Drawn by: 01/31/25 Date: ----
Checked by: ---- Date: ----
Approved by: ---- Date: ----

File Name: Brown Stone Quarry 250311

3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz

Stormwater Runoff

Condition	Basin	Area (acres)	Event	Peak Runoff (CFS)	Runoff Vol. (acre-ft)
Baseline	1	4.98	100-YR, 24-HR	15.58	0.021
Baseline	2	2.86	100-YR, 24-HR	8.949	0.012
Mining	1	4.98	100-YR, 24-HR	20.51	0.085
Mining	2	2.86	100-YR, 24-HR	11.78	0.049
Reclaimed	1	4.98	100-YR, 24-HR	13.67	0.057
Reclaimed	2	2.86	100-YR, 24-HR	7.85	0.032

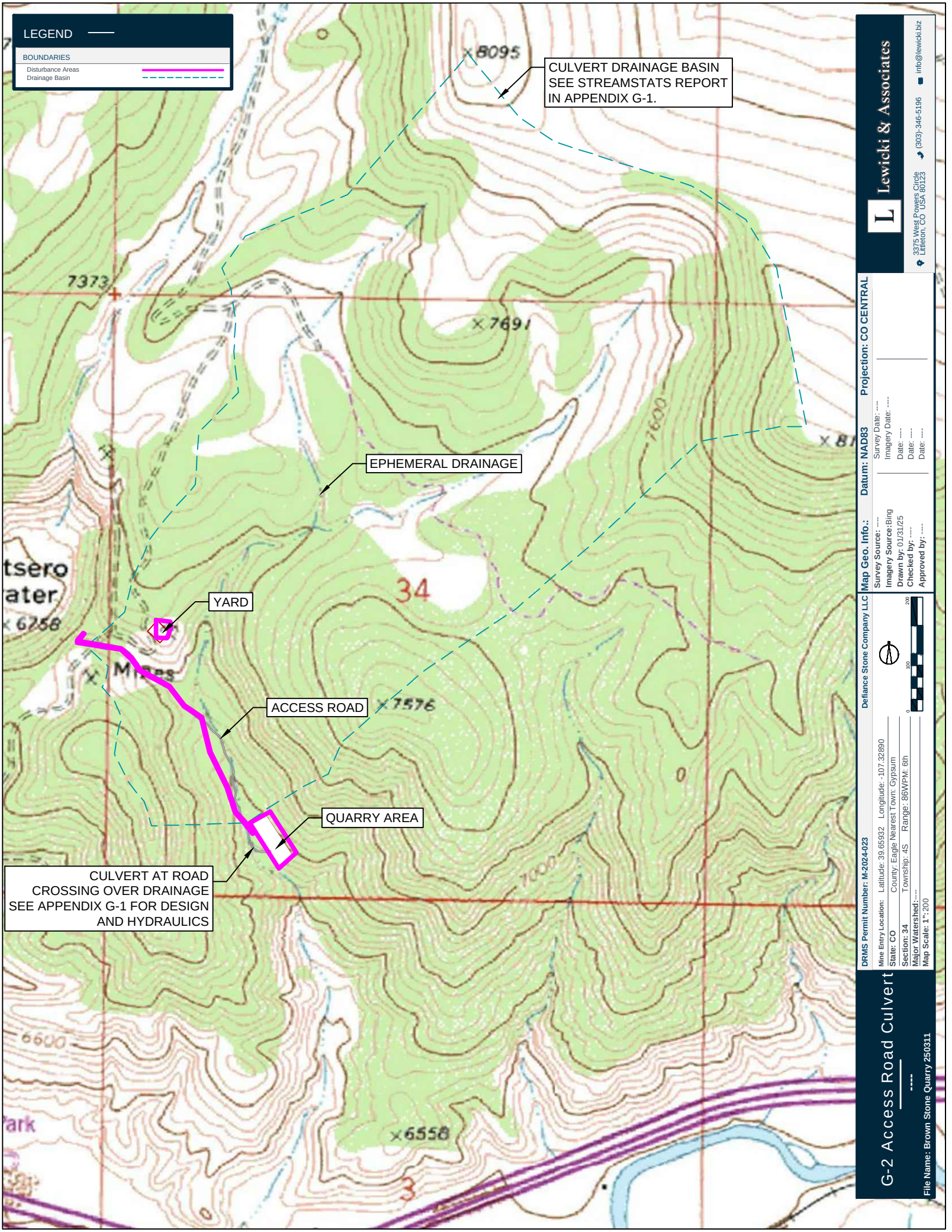
LEGEND

BOUNDARIES
- DRMS Permit Boundary
- Stormwater Control Measure

ROADS AND RELATED FEATURES
- Highway
- Light duty road, paved

DRAINAGE DATA
- Basin
- Basin Destination
- 1 | 62.6 | 0.2
- Area (acres)
- Composite Runoff Coefficient
- Drainage Direction
- Drainage Basin

Contours
- Index
- Intermediate
- 5280


LEGEND
BOUNDARIES
Disturbance Areas
Drainage Basin
CULVERT DRAINAGE BASIN
SEE STREAMSTATS REPORT
IN APPENDIX G-1.
EPHEMERAL DRAINAGE
YARD
ACCESS ROAD
QUARRY AREA
CULVERT AT ROAD
CROSSING OVER DRAINAGE
SEE APPENDIX G-1 FOR DESIGN
AND HYDRAULICS
8095
7373
7691
7576
6558
6258
34
3
Lewicki & Associates
3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz
Map Geo. Info.:
Datum: NAD83
Projection: CO CENTRAL
Survey Source: ---
Survey Date: ---
Imagery Source: Bing
Imagery Date: ---
Drawn by: 01/31/25
Date: ---
Checked by: ---
Date: ---
Approved by: ---
Date: ---
Defiance Stone Company LLC
DRMS Permit Number: M-2024-023
Mine Entry Location: Latitude: 39.65932 Longitude: -107.32890
State: CO County: Eagle Nearest Town: Gypsum
Section: 34 Township: 4S Range: 86W PM: 6th
Major Watershed: ---
Map Scale: 1":200
0
100
200
G-2 Access Road Culvert

File Name: Brown Stone Quarry 250311