Revised Closure Plan
Iron Duke Mine
Sections 3 and 4, T 22S, R 8E
Pemit No. OT006MN

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Revised RECLAMATION PLAN
Iron Duke Mine, Permit No. OT006MN.

Project Description

The Iron Duke Mine is owned by Gulf Coast Mining Group, LLC (Gulf Coast). On January 24, 2012, Gulf Coast was issued Permit No. OT066M for a Minimal Impact New Mining Operation by the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals, and Natural Resources Department. The mine is located in Sections 3 and 4 of T 22S, R 08E in Otero County, New Mexico. Guld Coast owns the Cinco de Mayo, Iron Duke, Virginia, and Barbara patented claims. In addition, Gulf Coast owns the Evergreen #1 through #8 claims.

MMD requested an updated closure plan for the Iron Duke Mine in XX 2025.

The mine is accessed via existing access roads across lands managed by the New Mexico State Land Office (SLO) and the Federal Bureau of Land Management (BLM).

Site Specific Criteria

Setting
Sections 3 and 4 are located within the outcropping bedrock of the Jarilla Mountains that compose the Orogrande Mining District. The Jarilla Mountains are a small, uplifted range in the southeastern quadrant of the Tularosa Basin. The Basin is an enclosed drainage within the Basin and Range physiographic province. The Basin's dimensions are approximately150 miles north to south and up to 50 miles wide. Its southern floor is near flat.

Geology
The Jarilla Mountains have an extent of about 10 miles north to south and are about 6 miles wide. They consist of upper Paleozoic sedimentary beds that have been intruded by a series of Tertiary age igneous rocks. The intrusions uplifted the older sedimentary beds creating a domal feature protruding above the Tularosa Basin floor (Schmidt, 1964).

The contact between the sedimentary beds (primarily limestones) and the igneous rocks is characterized by contact metamorphism and mineralization. Three types of ore have been identified in the Jarilla Mountains: iron deposits, copper/gold/silver/lead lodes, and placer lodes.

Mining Activities
At the Iron Duke Mine, the top of the peak is composed of Paleozoic limestones with the newer intrusives immediately below. The ore that was historically mined about a century ago is the iron bearing rock in this contact zone. The ore was most likely moved down to the foot of peak using a cable rail system; and then to Orogrande by use of the rail line at the foot of the cable rail grade. The subgrade waste rock was dumped down the slopes of the peak both to the north and south sides.

The current mining project at the Iron Duke Mine is removal of the subgrade waste rock from the slope sides. There is no excavation, digging of trenches, or drill holes associated with this activity. Removal of the waste rock exposes the former slope surface and profile.

Groundwater

As stated above, the patented mining claims are located within the outcropping bedrock of the Jarilla Mountains. At the topographic high point of the Iron Duke Mine, the Monzonite Stock (Tm) in Figure 1 (below), is exposed beneath the limestones and on the slopes of the uplift. In our opinion, the Monzonite Stock is not an aquifer and ground water, as defined by New Mexico Regulations, is not present beneath the proposed mining/reclamation project.

A larger scale view of the Jarilla Mountains shows that Quaternary alluvium (Q) has been deposited in the bottoms of the eroded drainages of the Monzonite core that lead to the Tularosa Basin floor (Schmidt, 1964). The depth of the alluvium is not known but likely increases from several feet to possibly several hundred feet down stream. Factors affecting this include the drainage areas and gradients of the various drainages.

The closest water wells to the Iron Duke Mine are in the mapped alluvium of Water Canyon, two drainages and about two miles to the north. Depth to water in the closest well, north of the mine, is 74 feet from the OSE database. There is no data for the well located in the alluvium near the mouth of Water Canyon. At the two wells about 3.5 miles northeast of the mine (and east of Water Canyon), depths to water are 70 feet and 400 feet. We conclude that the "shallow" well is completed within the stream alluvium and fan deposits and that the "deep" well accesses a "regional" aquifer. It is likely to be confined groundwater.

Should there be groundwater within the drainage east of the patented mining claims, we consider it to be most likely found in the blue shape within the mapped alluvium deposited on top of the monzonite stock. By the nature of the activities, there are no dewatering activities associated with the mining/reclamation project.

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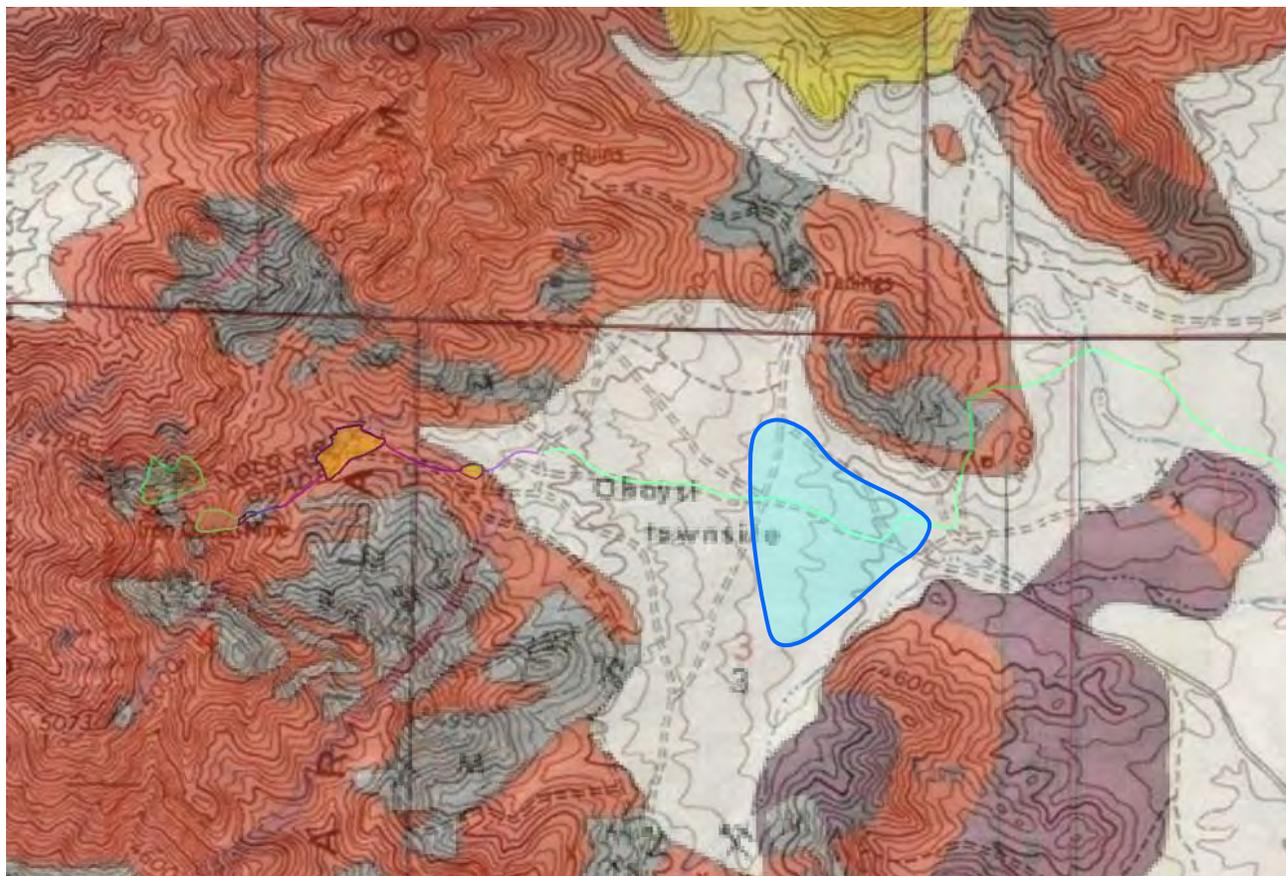Sections 3 and 4, T22S, R 8E

Figure 1: Geologic map of area of the patented mining claims (from Schmitt, 1964 and
http://geoinfo.nmt.edu/publications/openfile/downloads/OFR300-399/351-375/370/ofr_370.pdf)

The source of ground water information is the OSE database, the geologic map (Figure 4) and our site visit.

Description of Iron Duke Mine Plates
For the reader's use we provide a description of the plates to make the inventory of sites at the mine more easily accessible.

- Plate 1 shows the location of the Iron Duke Mine, about 34 miles southeast of Alamogordo and south of Alamogordo and 39 miles east of Las Cruces.
- Plate 2a shows the 1924 survey with an overlay showing the names of the patented claims and the Evergreen Claims. Please note that the overlay of the patented claims and the Evergreen claims is a schematic drawing. Plate 2b shows a topographic map of the Jarilla Mountains overlain on the 1924 survey with the Cinco de Mayo, Iron Duke, Viginia, and Barbara patented mining claims shown (from west to east).
- Plate 3 shows a topographic map of the Jarilla Mountains showing sections, patented mining claims, and closest OSE and USGS water wells

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- Plate 4a shows the waste rock mining areas, pads, possible future pads on an aerial photograph. and roads shown in different colors on an aerial photograph. The features are numbered. Plate 4b provides a key and additional information about each area.
- Plate 5 Shows the active areas of the Iron Duke Mine on an aerial photograph. We have also placed an overlay of the geology (from Figure 1). In addition, the plate has a half-mile radius buffer zone drawn around the project (in light blue). In dark blue is shown the watershed divide. The project is contained on the eastern side of the divide.
- Plate 6a is a 1941 aerial photograph with roads present at that time as dashed red lines. Plate 6b is a 2022 aerial photograph with the 1941 network of roads shown as dashed red lines. Roads that are present currently and were present prior to 1976 are RS 2477 roads.
- Plate 7 shows the vegetation reference area on an aerial photograph along with the patented mining claims with Iron Duke areas outlined in purple.

Berming Plates
- Plate 8a shows berming details for the Iron Duke Waste Rock Area (No. 13). Plate 8b presents a cross section.
- Plate 9a shows berming details for the Lower Iron Duke Pad (No.15) and Road Section No. 16. Plate 9b is a cross section.
- Plate 10a shows berming details for the Processing (No. 3) Pad while Plate 10b is a cross section. Plate 10c shows berming of the additional disturbed area east of the Processing Pad and Plate 10d is a cross section of the same feature.
- Plate 11a shows berming details for the Entrance Pad (No. 4) and Road Sections No.s 10 and 11. Plate 11b is a cross section of Road Section 10.

Mining Areas
There are two areas of historic waste rock. On the southeast side of the ridge line is the Iron Duke Waste Rock Dump. On the north side of the ridge line is the larger North Side Waste Rock Dump occupying part of both the Cinco de Mayo and Iron Duke Claims. These areas are No. 13 and 14 on Plate 4, respectively.

The Iron Duke Waste Rock Pile is the active mining area. It has an area of 0.9 acres. Topographical relief is from about 5010 feet to 4840 feet giving a vertical relief of 170 feet. The length of the slope is 330 feet. The gradient of the slope is about (170 ft/330 ft =) 0.51. This corresponds to a slope angle of about 27 degrees.

The North side Waste rock Pile has an area of 2.42 acres with a relief of from 4920 feet to 4800 feet, 120 vertical feet. As the area has a down-slope length of 260 feet yielding a gradient of (120/260 =) 0.46. This corresponds to a slope angle of about 24 degrees.

Pads and Staging Areas
 There are five pads and staging areas. The feature numbers all refer to Plate 4.
- The easternmost and lowest pad has the entrance gate and a parking area (No. 4). The pad has an area of 0.42 acres with a relief of about 10 feet from the southwest to the northeast.
- About 850 feet northwest of this pad is the Processing Pad (No. 3). It is used for processing, stockpiling, and loading. Its area is 2.65 acres with about 40 feet of relief from the west-southwest to the east-northeast.

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- o About 700 feet southwest of the processing pad is a pad (No. 15 on Plate XX) at the base of the Iron Duke Waste Rock Pile. Its area is 0.16 acres. It connects with the No. 16 road leading to the processing pad.
- o Above the Iron Duke Waste Rock Pile is the Upper Iron Duke Pad (No. 2). It is not used. Its area is 0.20 acres.
- o The Upper Staging Area (No. 1) is also not used. it has an area of 0.26 acres. The pad gives access to the top of both waste rock piles. In the current activities, the Iron Duke Waste Rock is accessed from below. No pads or access roads to the top of the mountain are in use.

Proposed Pad

Should Gulf Coast decide to mine the North Side Waste Rock Area, the North Side Upper Pad (No. 5) will be developed. This would occur after reclamation of the Iron Duke Waste Rock (No. 13), the Lower Iron Duke Pad (No.15), and the Access Road to Lower Iron Duke Waste Rock (No. 16).

Roads and Access, existing

There are seven road segments in existence. Again, the feature numbers all refer to Plate 4a and 4b.

- The Drainage Crossing connects the entrance of the mine with a haul road on the north side of the Drainage (No. 11). Length is about 0.07 miles.
- The segment connecting the Entrance Pad with the Processing Pad (No. 10) has a length of about 0.12 miles.
- The former rail grade accessing the top of the ridgeline from the Processing Pad (No. 6) has a length of 0.12 miles.
- The access road from the Processing Pad (No. 4) to the Lower Iron Duke Pad (No. 15) has a length of 0.12 miles. The Lower Iron Duke Pad functionally acts as a road to the Iron Duke Waste Rock. The pad's length is 0.03 miles.

The following areas are not in use.

- Road segment No. 7 accesses the uppermost areas of the mine. The road leaves the Processing Pad (No. 3) and gains the ridgeline to the north. It then follows the ridgeline to the southwest. It has a length of 0.43 miles
- From the upper end of the mine access road (No. 7), there are two segments. One leads to the pad accessing the upper end of the Iron Duke Waste Rock (No. 8) with a length of 0.04 miles.
- A final road segment (No. 9) connects to the upper end of the North Side rock Pile (No. 14) and to the Upper Iron Duke Pad (No.2) from the Upper staging Area (No. 1). Its length is 0.09 miles.

RS 2477 Roads

A number of these roads were present in aerial photographs taken in 1941 and 1946. The 1941 aerial photograph is presented in Plate 6 as details were easier to identify in the 1941 image. The 1946 image is included in Appendix Miscellaneous for comparison purposes.

- The access road to the upper areas of the mine (No. 7) existed prior to 1941. Its length is about 0.43 miles with an elevation gain of about 160 feet.

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- The road (No. 10) connecting the entrance pad to the processing pad uses about 0.04 miles of the former rail grade connecting the Iron Duke Mine to Orogrande. The rails were most likely removed before 1941. The former rail grade is present as a road in all aerial photographs since 1941
- A segment of road trending northwestwards from the rail grade to the processing pad is also present in 1941. This is the portion of road segment No. 10 that is northwest of the 0.04 mi. length of the former rail grade
- The inclined former rail grade now connects the eastern end of the processing pad with the upper mountain. Its length is about 0.16 miles with an elevation gain of about 210 feet. The gradient is (210/843 =) 0.25. Necessarily the railline was a cable rail grade. The road segment is not used, nor is it usable by common vehicles.
- Road section No. 11 goes eastwards from the mine entrance. It then crosses to the north side of the primary arroyo and continues eastward on the north side of the drainage. This crossing and the haul road on the north side of the drainage both existed in 1941.

Post-Closure Use

Objective

The intent of this reclamation is to re-establish the pre-mining drainage patterns and vegetation that existed prior to the introduction of the waste rock from the historic mining activities. The larger area is currently grazed by wildlife. After mining/reclamation is complete, the reclaimed areas will also be available to wildlife.

At this time, the company is not aware of any cultural resources in the area of the proposed action.

Topsoil

The historic mining activities did not salvage topsoil. Based upon the obvious area of rock removal, the historic mining activity near the top of the peak laterally followed the contact between the sedimentary beds (primarily limestones) and the igneous rocks. Most likely, whatever topsoil was covering the contact in the active mining area was dumped over the slope sides along with the waste rock.

The removal of the waste rock from the slope sides at the Iron Duke Mine exposes the land surface that was present about a century ago, albeit with some additional topsoil. In many areas of the Jarilla Mountains, including the Iron Duke Mine, topsoil is either thin or not present.

Description of Closeout Activities

Pads and roads on the patented mining claims will be re-seeded during the reclamation process to minimize erosion and sediment loading to arroyos.

Excavation and Backfilling

No backfilling is proposed and is not necessary as no excavation occurs during the waste rock removal.

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Waste Rock Area Stabilization
This project involves removing the waste rock dumps and does not use blasting, excavation or any in-place ore disturbance. To preserve topsoil on the now exposed surface after removal of the waste rock, slope stabilization will occur as areas of waste rock have been cleared and are no longer needed for vehicle movement. All other reclamation will occur within 1 year of completion of activities on the patented mining claims. Reclamation and re-seeding of roads and pads not located on the patented mining claims that are no longer used will occur in the latter half of summer to take advantage of the late summer moisture pattern.

As the waste rock is removed:
- A perimeter berm is maintained on the downside slopes of the waste rock areas to prevent runoff and control fine material movement.
- As useful, perimeter berms are maintained on the upside slopes of the waste rock area to prevent run on.
- When areas have been cleared of waste rock and are no longer needed to allow vehicle movement, berms will be constructed across the former waste rock area at vertical intervals of about 40 feet. The berms are oriented diagonally across the area to reduce the gradient that surface water will flow to be shallower than 3:1. See Plates 8a.
- To construct the berms, shallow trenches are graded across the hill side. Cobbles of country rock will be placed in the trenches to slow and direct stormwater runoff. See Figure 2.
- On the uphill side of these berms, waddles will be staked across the footing of the berm to control movement of fine- grained materials and provide additional stability to the berms
- Country rock aggregate will be left to armor the slopes between the berms as available.

The waddles staked across the slopes (see above) will catch fine-grained material moving down the slopes. Examination of adjacent slopes demonstrates that top-soil thickness is marginal in areas of steeper gradient and areas of outcrop.

Figure 2: *Schematic of berm construction within Waste Rock Area.*
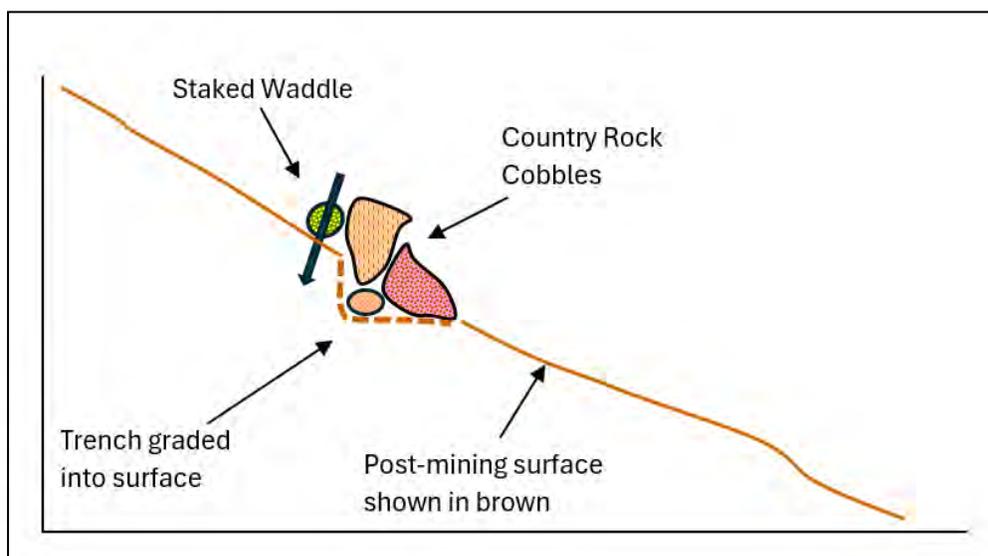
Contour Location of the Waste Rock Area
Removal of the Waste Rock will expose the pre-mining surface of about 1900. Hence the post-mining surface will very closely approximate the pre-mining surface. The thickness of the waste rock materials varies from near zero to possibly 8 feet. Figure 3, below, demonstrates that the landscape form will vary with the thickness of the waste rock. Existing USGS topographic maps were drawn on top of the waste rock material. The post mining surface contours will move to the west from about 2 feet to perhaps 15 feet.

Figure 3: *Location of post-mining contours relative to their current location.*

Adjacent Side = Distance between current location of a contour on the Waste Rock surface and the location of that same contour on the pre-mining ground surface.

Opposite Side = Thickness of Waste Rock

Pre-mining surface shown in brown

θ = Slope angle calculated from USGS Topo.
= 27⁰

We note that the Tan θ = (Length of Opposite Side)/(Length of Adjacent Side)
The length of the adjacent side is the desired quantity.
By algebra:
Length of Adjacent Side = (Length of Opposite Side) / Tan θ

The Waste Rock thickness roughly varies between 2' and 8'. For this case, we take the thickness as 6'
As θ = 27⁰ , Tan 27⁰ = 0.5095

Then:
Length of Adjacent Side = 6'/ 0.5095
= 11.78'

Pad Reclamation

Berms will be placed along the perimeters of pads and roads as shown in Plates XX. Interior berms crossing the pads to manage stormwater will be graded as shown. Berm construction on the pads will differ from the waste rock area in that rock will not be as plentiful (Figures 2 and 4). The waddles staked along the berms will catch fine-grained material moving down the slopes. Examination of adjacent slopes demonstrates that topsoil thickness is marginal in areas of steeper gradient and areas of outcrop.
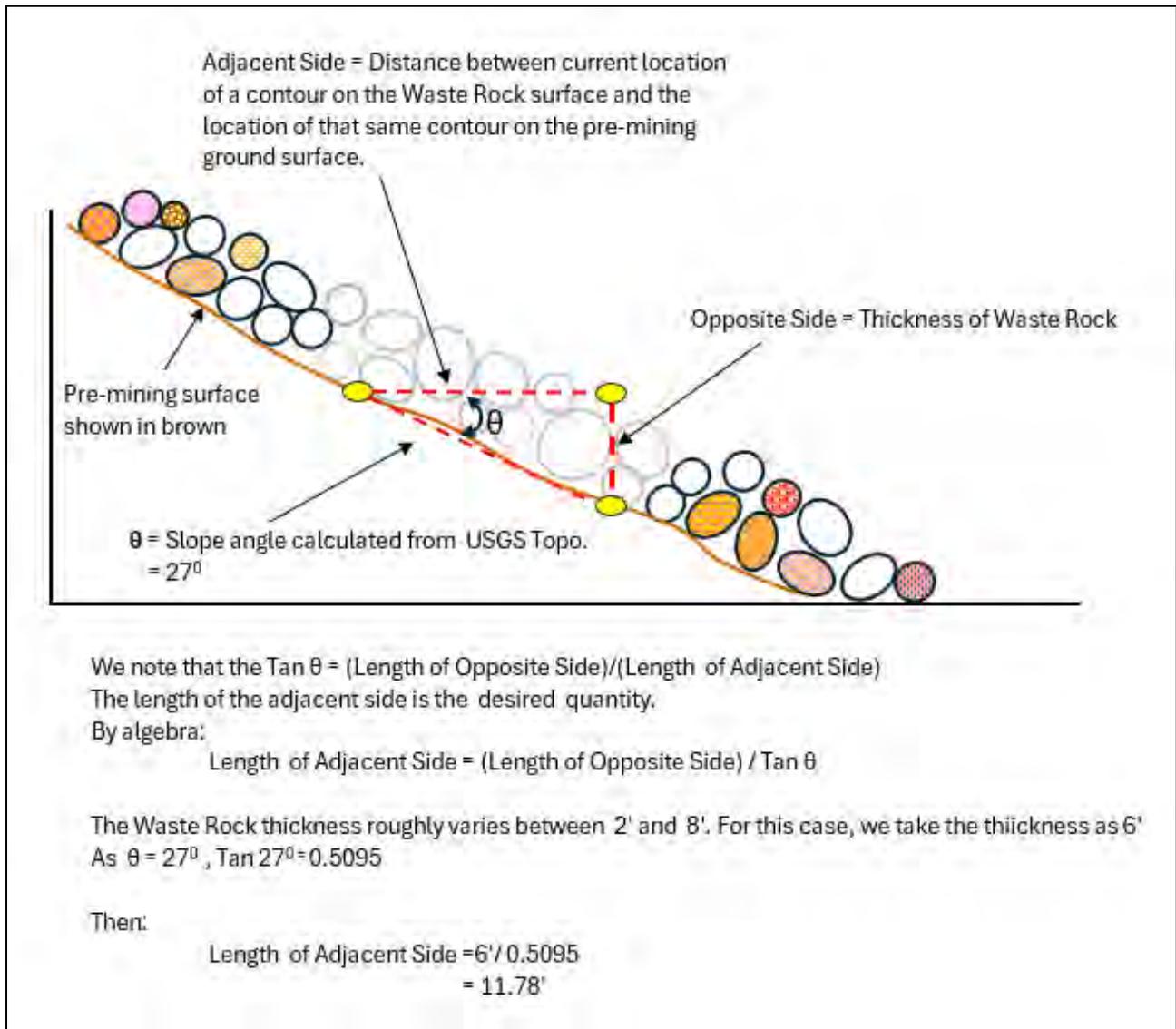
Figure 4: *Berm construction on pads*
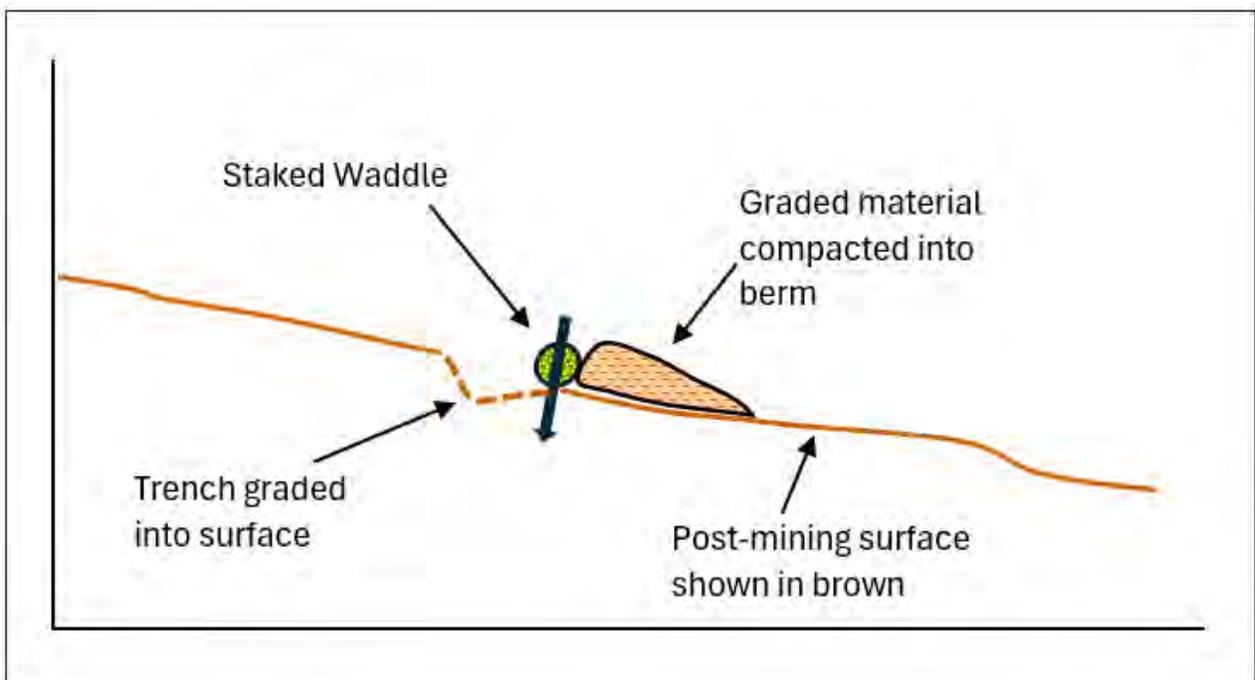
Scarification

Following the grading, contouring and berming described above, the company will carefully examine the nature of residual soil. In those areas with very thin topsoil, we do not anticipate that seed bed preparation (e.g. scarification) will provide any benefit.

Reseeding

Plant species used for reseeding are those recommended by the Bureau of Land Management for the Orogrande area (Jarilla Mountains). The application rate is that suggested for broadcast seeding and is presented in Appendix A. On the steepest slopes of the site, given the wind conditions, mulch will probably provide no benefit.

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Equipment Removal
Currently, six shipping containers, used for inventory storage, and three portable buildings are present on the Processing Pad (No. 4). When mining is completed, all of the operating equipment, containers, and portable buildings will be removed.

Access Roads
New roads at the site include the access road (No. 16) to the lower Iron Duke Pad (No. 15) from the Processing Pad (No. 3). Existing roads at the site have been graded to make them usable to equipment. Roads are graded and bermed appropriately to control runoff events. Road areas are provided in Plate 4b.

After completion of activities on the Iron Duke Waste Rock Area, the access road (No. 16) to the lower Iron Duke Pad (No. 15) and the pad, which are not located on the patented claims, will be regraded to original contour and re-seeded.

Vegetation Reference Area
Plate 9 shows the proposed vegetative reference area. As can be seen it is east of the mining areas and is entirely contained within the patented Virginia and Barbara claims. The area is a slope with gradients representative to those in the mining areas. As there is a small drainage through this area, the slopes locally face from southwest to east-southeast, similar to the mining area. Because of the historic mining activities, there are a number of small, historic, exploratory excavations nearby. Due to their age and size, they have localized effects. There are no modern disturbances above this proposed reference area.

Schedule of Closeout Activities

It is anticipated that the removal of the waste rock at the Iron Duke Waste Rock Area will take two years. During the removal process, the waste rock area is stabilized as areas have been cleared and are no longer needed for vehicle movement.

Upon this completion:
- The reclamation of Areas No. 15 and 16 can proceed. This is expected to take 3 months
- With the upper mountain reclamation complete, equipment from the lower pads can be removed and the pads can be reclaimed.
- The RS 2477 roads will receive maintenance.

These latter two activities are scheduled to take four months.

References

Schmidt, P.G., Craddock, C. (1964). The Geology of the Jarilla Mountains, Otero County, New Mexico. State Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, New Mexico. Bulletin 82, pp. 38, 43

Storm Water Calculations

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Calculated Estimate of Runoff at the Site

Additional Runoff Created by the Mining Activities
Areas used in the mining activities contribute additional runoff to the watershed as compared to the pre-mining landscape. This pre-mining landscape is the standard to which runoff control is compared. The additional runoff from the activities can be calculated by subtracting the pre-mining runoff from the runoff from the affected landscape to determine the additional runoff volume.

To calculate runoff for such an event, we employed the Rational Method in which:
$$Q = I * C * A$$

with :   Q = discharge in cubic feet per second [cfs]
   I = rainfall intensity [in/hr]
   C = composite runoff coefficient. It is the proportion of water that runs off the site
       out of the total precipitation event. The number is between 0 and 1 [unitless]
   A = watershed area in acres [ac]. It is measured in the horizontal plane.

As a side note, an examination of the units in the equation shows an inaccuracy. For an equation to be true, the units on both sides of an equation must be the same. Consider the right-hand side (RHS) of the Rational Method equation. The units are: in/hr * [vol of water/vol of water] * acres. Initially, this does not appear to be ft^3/sec.

Multiplying the RHS by the following factors gives:
   RHS   = I (in/hour) * 1/12 (foot/in) * 1/3600 (hour/sec) * A (ac) * 43560 (ft^2/ac)
       = I * 1/(12 *3600) (foot/sec) * A *43560 (ft^2)
       = I *A * (43560/43200) (ft^3/sec)
       = I * A * 1.0083 (ft^3/sec)

The small factor of 1.0083 is commonly ignored.

Weather Data for the Site
We obtained weather data from NOAA for Alamogordo, NM, about 31 miles north of the site. It is the closest location to the Iron Duke Project for which this data exists. Average rainfall for Alamogordo is about 9 inches. The weather data is in Appendix Miscellaneous.

The 24-hour duration rainfall event with a recurrence time of 100-years is 3.65 inches (90% confidence interval). The inches/hour rate is given by:
   I = 3.65 inches/24 hours
       = 0.152 inches/hour

Runoff Coefficients
The runoff coefficient, C, is the sum of four terms: Cs, Ci, Cv, and Cs: i.e.
$$C = Cs + Ci + Cv + Cr$$
(See Thomasson, 2019)

A larger C value is a measure of more water running off a landscape. For rural watersheds they are considered to have these properties:
> Cs – surface storage is a measure of depressions holding water on the surface.
> > This coefficient is small in floodplains (0.04 – 0.06) and large (0.10-0.12) in
> > areas with negligible surface depressions, shallow drainages, and no marshes.
> Ci - soil infiltration corresponds to the soils ability to accept infiltration.
> > This coefficient is small (0.04 - 0.06) in soils such as deep sands or other soils that
> > accept water readily with a high porosity and large (0.10-0.12) in
> > areas of either no soil cover or minimal soil cover.
> Cv – varies with vegetal cover of the watershed.
> > It is small (0.04-0.06) in areas with 90% grass cover or an equivalent woodland
> > and is large (0.12 – 0.16) in areas with no effective plant cover or bare to very
> > sparse cover.
> Cr – accounts for the relief of the area. It is small (0.08 – 0.14) for relatively flat land
> > with slopes of 0 - 5% and is large (0.28 – 0.35) for rugged terrain with slopes
> > greater than 30%.

Note that C, the sum of the four runoff coefficients for rural watersheds, ranges from a minimum of 0.20 to 0.79. To provide an additional scale, a C = 0.0 would correspond to a rain event over the ocean while a C = 1.0 corresponds to a rain event upon a completely impervious surface (with no pores of any size or bonding of water molecules). A complete description of the coefficients is available in the reference.

To simulate the terrain prior to the mining activities, we have set the runoff coefficients as:
> Cs – we used a low value for surface storage, 0.09, corresponding
> > to a well-defined system of small drainages with no ponds or marshes.
> Ci – the soil infiltration coefficient is taken as 0.12, a large value due to the thinness of the
> > soil on the steeper slopes. For the shallower slopes with a much greater depth of
> > sandy alluvium, we assigned 0.08.
> Cv – due to the sparse vegetal cover, we assigned a large value to Cv of 0.12 as less than
> > 20% of the area has good cover.
> Cr – This was taken as 0.35 for the steepest areas (> 30% slope) and as 0.25 for the
> > Intermediate slopes (10%-30%). Cr = 0.16 was used for the remaining areas
> > (slopes between 5-10%).

To simulate the terrain during the current mining activities, we have altered the runoff coefficients as described below
> Cs – surface storage is left at 0.09 as the activities are not creating depressions.
> Ci – the soil infiltration coefficients have been left as explained for pre-mining time.
> Cv – we increased the coefficient to 0.16 corresponding to no vegetal cover.
> Cr – These values were not altered as the activities at the site are not changing the
> > slope angle in any large way.

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The calculation of the runoff coefficients are shown in Table 1, below.

Slopes of Mining Areas

For removal of the waste rock from the Iron Duke Waste Rock Area, the following areas are active: (They are shown on Plate 4)

- o The easternmost and lowest pad has the entrance gate and a parking area (No. 4). The pad has an area of 0.42 acres with a relief of about 10 feet from the southwest to the northeast, a 5.2% slope.
- o About 850 feet northwest of this pad is the Processing Pad (No. 3). It is used for processing, stockpiling, and loading. Its area is 2.65 acres with about 40 feet of relief from the west-southwest to the east-northeast. The slope averages about 7.75%.
- o About 700 feet southwest of the Processing Pad is the No. 15 Pad at the base of the Iron Duke Waste Rock Pile. Its area is 0.16 acres. It connects with the No. 16 Road leading to the Processing Pad. Relief is about 158 feet over a length of 344 feet giving a slope of 46%.
- o The No. 16 Road connects the No. 15 Pad with the Processing Pad (No. 3). It has an area of 0.38 acres. The vertical relief of 96 feet over its 633-foot length results in an average slope of 15%.
- o Connecting the Processing Pad to the Entrance Pad is Road Section No.10 with an area of 0.16 acres. It has an intermediate highpoint and slopes of 2.7% to the east and 9.2% to the east
- o Connecting the Entrance Pad to the Haul Road outside of the mine area is Road Section No.11 with an area of 0.40 acres. Total relief is about 15 feet over 850 feet as it crosses the arroyo. Average slope is about 3.5% although locally higher for short lengths.

These last two road sections (No.s 10 and 11) are RS 2477 roads. As such, they will be left in place at the completion of the project.

Table 1: *Calculation of Runoff Coefficients Components*

Runoff Coefficients	Pre-Mining Coefficient Values			Current Values		
	Slope %			Slope %		
	>30%	30% - 10%	10% - 5%	>30%	30% - 10%	10% - 5%
Cs	0.09	0.09	0.09	0.09	0.09	0.09
Ci	0.12	0.12	0.08	0.12	0.12	0.08
Cv	0.12	0.12	0.12	0.16	0.16	0.16
Cr	0.35	0.25	0.15	0.35	0.25	0.15
C= Cs+Ci+Cv+Cr	0.68	0.58	0.44	0.72	0.62	0.48
Areas 13, 15, 16	0.68			0.72		
Area 3		0.58			0.62	
Areas 4, 10, 11			0.44			0.48

Calculated Runoff and Additional Runoff Created by the Mining Activities

To calculate runoff from the areas prior to mining activities, the appropriate runoff coefficients were used along with the areas and the rainfall event to calculate each area's runoff. We also

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include the result as feet^3/hour. The same calculation was made using the coefficients relevant to the current situation at the site.

Table 2: *Calculation of runoff prior to mining and at the current time*.

Pre Mining	C	A	I	Runoff	
	[-]	[acres]	[in/hour]	[ft^3/sec]	ft^3/hour
Area 3	0.58	2.65		0.234	841.0
Area 4	0.44	0.42		0.028	101.1
Area 10	0.44	0.16		0.011	38.5
Area 11	0.44	0.4	0.152	0.027	96.3
Area 13	0.68	0.9		0.093	334.9
Area 15	0.68	0.28		0.029	104.2
Area 16	0.68	0.38		0.039	141.4

Current	C	A	I	Runoff	
	[-]	[acres]	[in/hour]	[ft^3/sec]	ft^3/hour
Area 3	0.62	2.65		0.250	899.0
Area 4	0.48	0.42		0.031	110.3
Area 10	0.48	0.16		0.012	42.0
Area 11	0.48	0.4	0.152	0.029	105.1
Area 13	0.72	0.9		0.098	354.6
Area 15	0.72	0.28		0.031	110.3
Area 16	0.72	0.38		0.042	149.7

As can be seen, the largest runoffs are from the largest areas. To identify the difference between the pre-mining runoff quantities and now, we subtract the former from the latter.

Table 3: *Additional runoff due to mining activities*

Runoff Difference due to Mining Activities	Current Runoff	Pre-Mining Runoff	Change due to Activities
	ft^3/hour		
Area 3	899.0	841.0	58.0
Area 4	110.3	101.1	9.2
Area 10	42.0	38.5	3.5
Area 11	105.1	96.3	8.8
Area 13	354.6	334.9	19.7
Area 15	110.3	104.2	6.1
Area 16	149.7	141.4	8.3

Iron Duke Mine, Permit No. OT006MN
Sections 3 and 4, T22S, R 8E

The largest source of additional runoff compared to runoff from the pre-mining surface is the Processing Pad. The runoff calculation predicts an additional 58 ft^3/hour or (58.3 ft^3/hour *24 hours =) 1399.2 ft^3/24-hour event. This volume accounts for more than half of the additional runoff as the sum of additional runoff from all of the areas is about 113 ft^3/hour.

Catchment Depressions to Control Runoff

Processing Pad (Area No. 3)
To control runoff on the Processing Pad, we propose increasing the catchment on the eastern side of the Processing Pad to a volume of (899 Ft^3 * 24 hours* 0.15 =) 3,236 ft^3. This will intercept 15% of the runoff from a 24-hour precipitation event with a recurrence interval of 100 years. This volume is several times the additional runoff from the Processing Pad because of activities at the site (58 ft^3/hour *24 hours = 1392 ft^3).

The catchment will be constructed with the following properties.
  i)   The sides and bottom will have a slope of 3:1 and will be covered with riprap (A basin 105 feet long by 30 feet wide with a depth of 1.5 feet at the upper end and 3.5 feet at the lower end has a capacity of 3328 ft^3).
  ii)   The outlet to the arroyo (over riprap) is set so that it is one-foot lower than the catchment rim. In this way an amount of water greater than the additional runoff from the mining activities is kept in the catchment during the rainfall event. Because of this, the outflow to the arroyo during the precipitation event is not greater than that discharged to the arroyo prior to the mining development.

Iron Duke Waste Rock Area and Lower Iron Duke Pad Areas (No.13 and 15)
To control runoff from the Waste Rock Area, we propose placing a catchment on the Lower Iron Duke Pad (Area No. 15) at the east end of the Waste Rock Area. It will be sized to intercept 15% of the runoff volumes of both the Waste Rock Area (354 ft^3 * 24 hours* 0.15 =) 1,274 ft^3 and the Lower Iron Duke Pad (110 ft^3 * 24 hours* 0.15 =) 397 ft^3. The combined volume is 1,671 ft^3. As before, the catchment intercepts several times the additional runoff from both areas due to the mining activities.

In a similar way, the catchment will be constructed with the following properties.
  i)   The sides and bottom will have a slope of 3:1 and will be covered with riprap (A basin 65 feet long by 26 feet wide with a depth of 1.5 feet at the upper end and 3.5 feet at the lower end has a capacity of 1709 ft^3).
  ii)   The outlet to the arroyo (over riprap) is set so that it is one-foot lower than the catchment rim. In this way an amount of water greater than the additional runoff from the mining activities is kept in the catchment during the rainfall event. Because of this, the outflow to the arroyo during the precipitation event is not greater than that discharged to the arroyo prior to mining development.
The catchment contains several times more than the additional runoff (19.7 ft^3/hour * 24 hours + 6.1 ft^3 * 24 hours=) 619.9 ft^3) generated by the changes in runoff characteristics from the mining activities.

Entrance Pad (Area No. 4)

Runoff from the precipitation event on the Entrance Pad is 110 ft^3/hour, about two ft^3/min. To control this, we propose berming to move the water to a section of riprap leading into the arroyo. The additional runoff due to the site activities is 9.2 ft^3/hour, about a gallon/minute.

Road Segments (Area No.s 10, 11, 15)

Runoffs from the road segments are all less than that from the entrance pad. Berms will be placed to control the runoff with riprap placed where the runoff can be directed into the natural drainage channels.

Disturbed Area East of Processing Pad

Runoff on the disturbed area east of the Processing Pad will be controlled with berms laterally crossing the feature.

Reference

Thomasson, C. P.E., (Revised September 2019), Hydraulic Design Manual, Chapter 4: Hydrology, Section 12, Rational Method, Runoff Coefficients, 4-54. Texas Department of Transportation Manual System

Plates

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

WHITE SANDS MISSILE RANGE

Alamogordo

WHITE SANDS NATIONAL MONUMENT

WHITE SANDS MISSILE RANGE

FORT BLISS ANTIAIRCRAFT RANGE

Las Cruces

FORT BLISS

ANTIAIRCRAFT

USGS
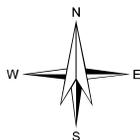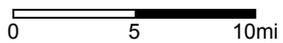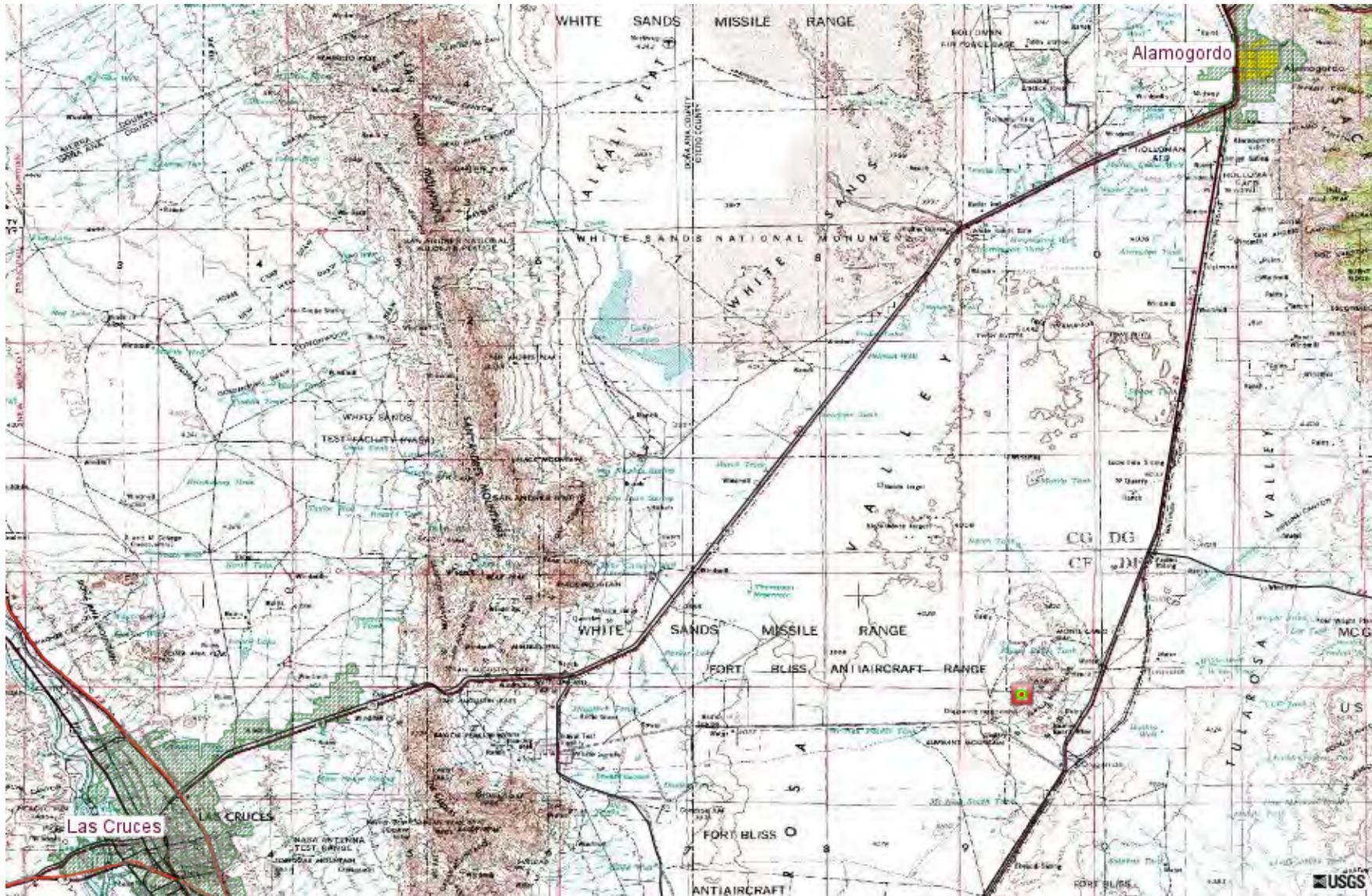
R.T. Hicks Consultants, Ltd	Location Map	Plate 1
	Gulf Coast Mining Group LLC	Aug. 2025

0   5   10mi

N
W   E
S

P:\OrograndeThree\OrograndeThree.aprx

Cinco de Mayo (Patented)

M.S. 1247

M.S. 1915

M.S. 1915

M.S. 1248

M.S. 1720

M.S. 246

Map Center: 106°7'6"W 32°25'22"N

N
W · E
S

| 0 | 485 | 970 |
Feet

Scale: 1:8,000

R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Topo Map with 1924 Survey, Waste Rock Piles Shown in Green

Iron Duke Mine

Plate 2a

August 2025

33 34

Evergreen #10

M.S. 1247

Evergreen #7

Cinco de Mayo (patented)

Iron Duke (patented)

Virginia (patented)

Barbara (patented)

4 3

M.S. 1248

Evergreen #1

Evergreen #4

Evergreen #5

Evergreen #2

Evergreen #3

1720

M.S. 1721

Sec.

M.S. 1246

N
W — E
S

0   485   970 Feet

Scale: 1:8,000

R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

1924 Survey with Claims , Waste Rock Piles Shown in Green

Iron Duke Mine

Plate 2b

August 2025

Path: S:\Projects\gulfCoast\oroGrande\Plates\plate1.mxd

29; T21S.R08E
28; T21S.R08E
27; T21S.R08E
26; T21S.R08E
25; T21S.R08E

DTW = Not Recorded
DTW = 74 ft bgs
DTW = 320 ft bgs
DTW = 400 ft bgs

32; T21S.R08E
33; T21S.R08E
34; T21S.R08E
35; T21S.R08E
36; T21S.R08E

06; T22S.R08E
05; T22S.R08E
04; T22S.R08E
03; T22S.R08E
02; T22S.R08E
01; T22S.R08E

07; T22S.R08E
08; T22S.R08E
09; T22S.R08E
10; T22S.R08E
11; T22S.R08E
12; T22S.R08E

US 54

13; T22S.R08E
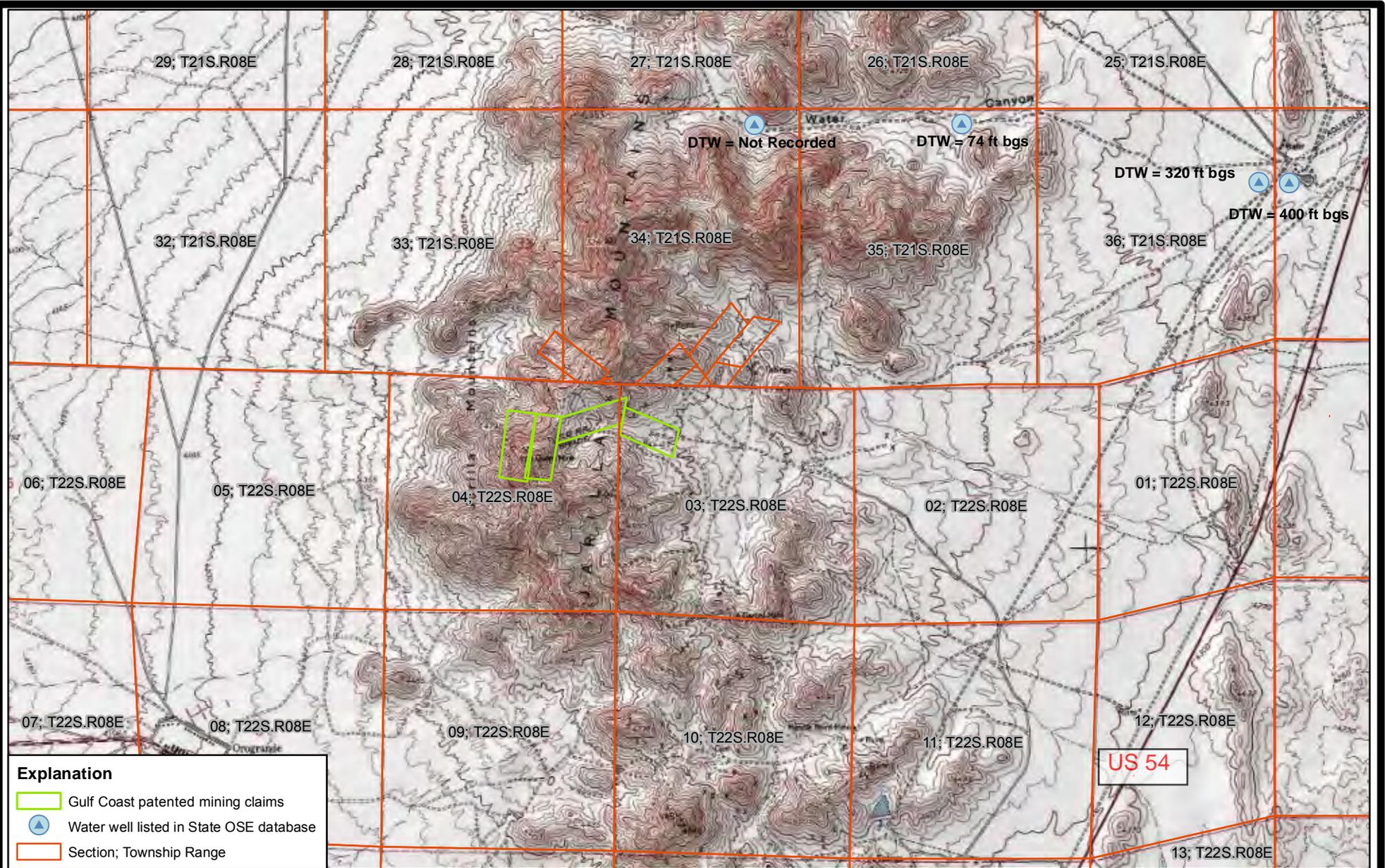
Explanation

Gulf Coast patented mining claims

Water well listed in State OSE database

Section; Township Range

Base Map: esri.com

N
W   E
S

0   1,500   3,000
Feet

R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

Topo Map With MS Claim Overlay and OSE Wells

Plate 3

Gulf Coast Mining Group, LLC
Barbara, Cinco de Mayo, Iron Duke, & Virginia MS Claims

June 29, 2011

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Schematic Plan of Berms, Roads, and Pads by the Active Mining/Reclamation Area. Iron Duke Project	Plate 4a
	Gulf Coast Mining Claims, LLC	August, 2011

Area Number	Area Name	Description	Area [Acres]	Used in Mining of Iron Duke Waste Rock — Areas in Use	Used in Mining of Iron Duke Waste Rock — RS 2477 Roads	Not in Use	Area Number
1	Upper Staging Area	Pads and staging areas	0.26			0.26	1
2	Upper Iron Duke Access and Pad	Pads and staging areas	0.20			0.20	2
3	Processing Pad (Foot of rail Grade)	Pads and staging areas	2.65	2.65			3
4	Lowermost Pad (on Barbara Patented Claim)	Pads and staging areas	0.42	0.42			4
5	Cinco de Mayo Access and Upper Pad	Pads and staging areas	0.30			0.30	5
6	Cat Path (rail grade)	Roads and access	0.41			0.41	6
7	Access Road to Iron Duke and Cinco de Mayo	Roads and access	1.11			1.11	7
8	Upper Junction Pad	Roads and access	0.09			0.09	8
9	Upper access Road (from Junction Pad to North Side waste Rock	Roads and access	0.08			0.08	9
10	Pad Connecting Road	Roads and access	0.16		0.16		10
11	Widened Drainage Crossing	Roads and access	0.40		0.40		11
12	Iron Duke access Road (to Upper Pad from North)	Roads and access	0.20			0.20	12
13	Iron Duke Waste Rock	Mining/Reclamation areas	0.90	0.90			13
14	North Side Waste Rock	Mining/Reclamation areas	2.27			2.27	14
15	Lower Iron Duke Pad	Pads and staging areas	0.28	0.28			15
16	Access Road to Lower Iron Duke Waste Rock	Roads and access	0.38	0.38			16
17	Access to Noth Side Waste Rock	30 X 300 foot area on the eastern edge of North Side Waste Rock	0.21			0.21	17
18	Access to Iron Duke Waste Rock	30 X200 foot area on the northern edge of Iron Duke Waste Rock	0.14	0.14			18
				4.77	0.56	5.13	
				5.33			
		Totals	10.46	10.46			

RT Hicks Consultants
901 Rio Grande Blvd. Suite F-142
Albuquerque, NM
505 266 5004

Identifiers, Areas, and Catergorization of Areas for the Iron Duke Preoject

Plate 4b

Guld Coast Mining Group, LLC
Cinco de Mayo, Iron Duke, Virginia, and Barbara Patented Claims

December 2025

Iron Duke Mine

Map Center: 106°7'2"W 32°25'26"N

Vantor

Half mi. Buffer of the Iron Duke Mine. Drainage Div. in Dark Blue

Plate 5

Gulf Coast Investments LLC

Dec. 2025

P:\OrograndeThree\OrograndeThree.aprx
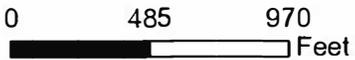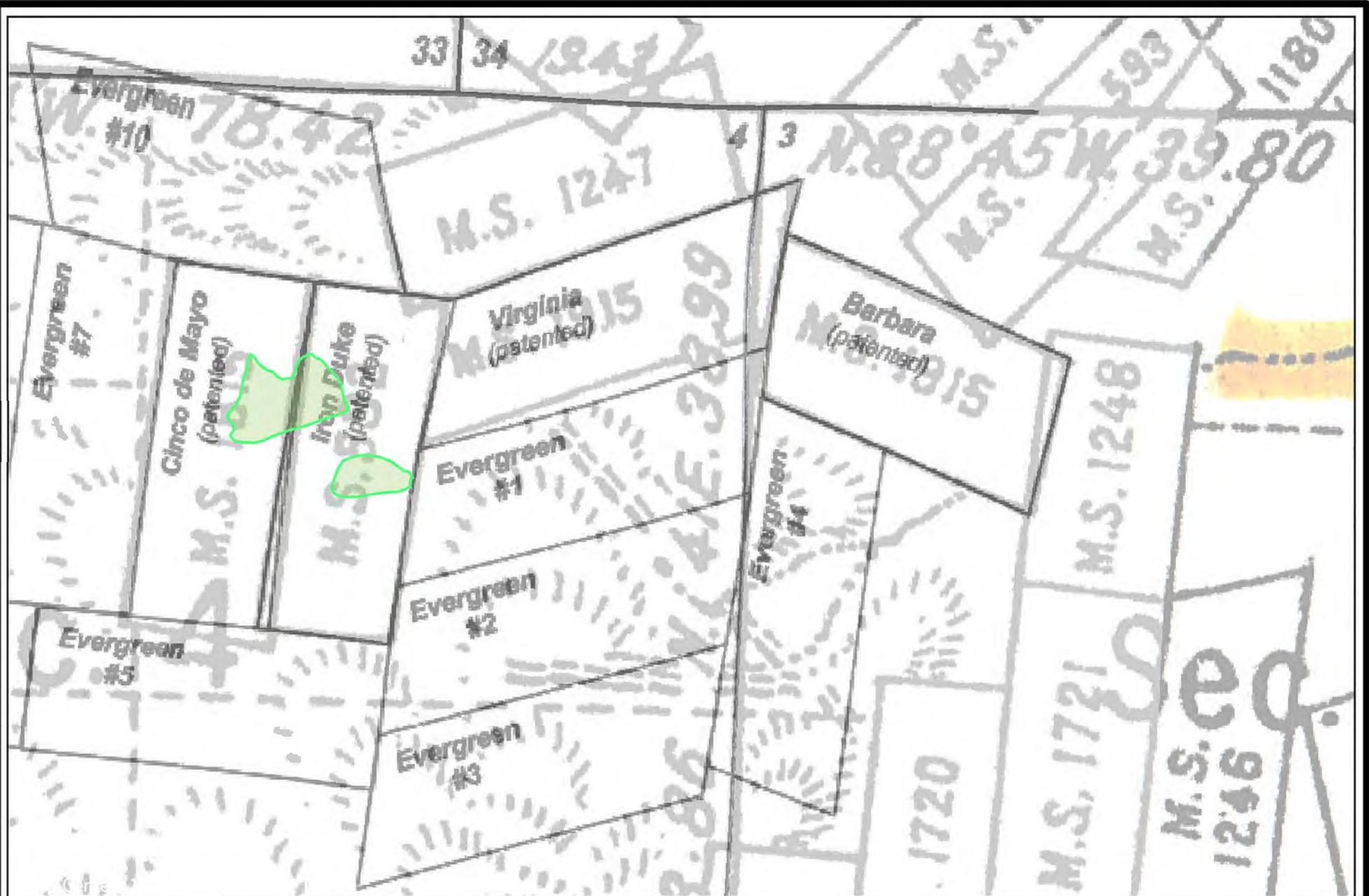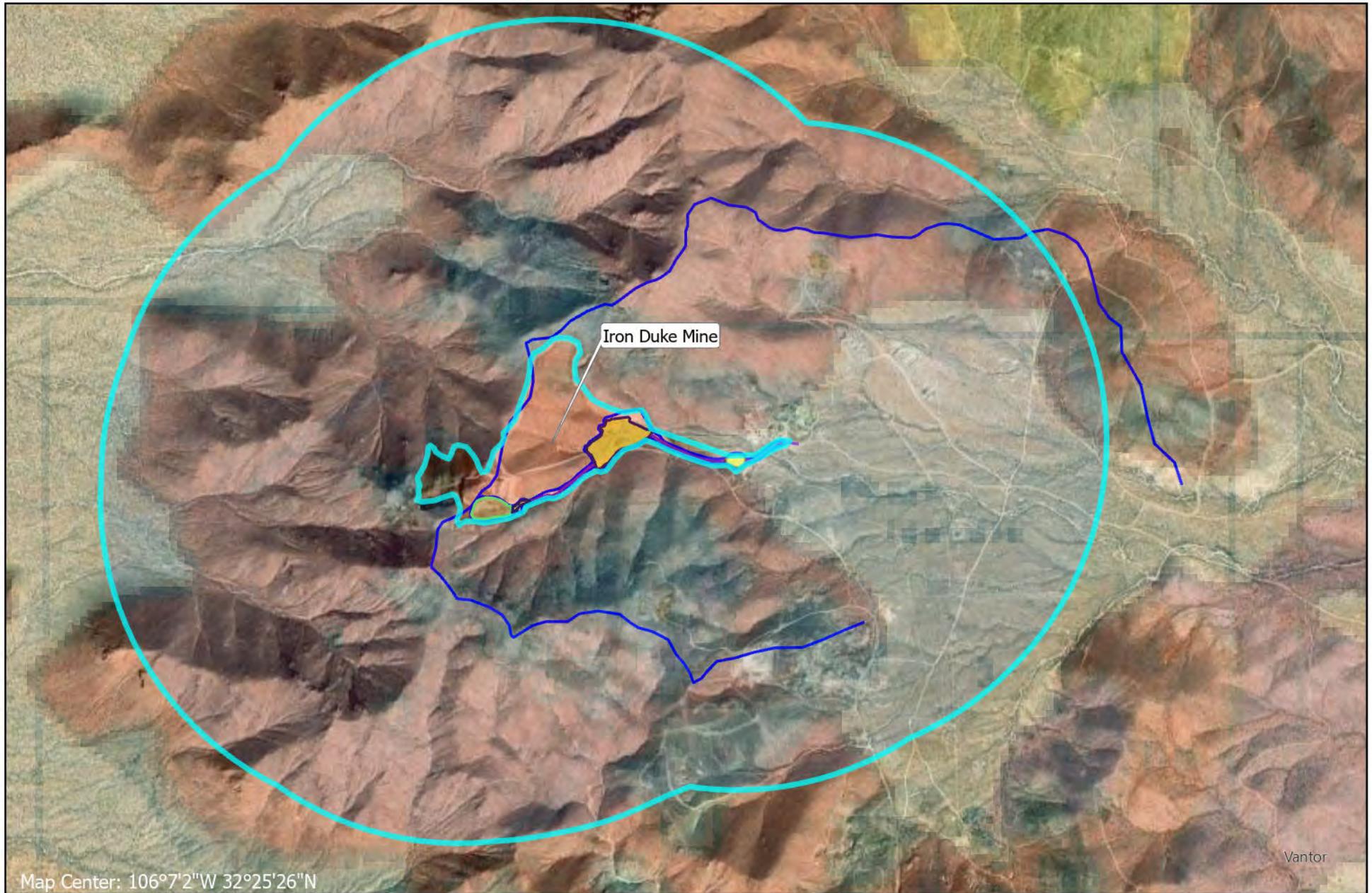
Map Center: 106°6'46"W 32°25'19"N

Maxar

N W E S	R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	1941 Aerial with Roads (in red)	Plate 6a
0 500 1,000 Feet Scale: 1:10,500		Iron Duke Mine	July 2025

P:\OrograndeThree\OrograndeThree.aprx

Map Center: 106°6'46"W 32°25'19"N

Maxar, Microsoft

N W E S	0 500 1,000 Feet Scale: 1:10,500	**R.T. Hicks Consultants, Ltd** 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	2022 Aerial with 1941 Roads (in red)	Plate 6b
		Iron Duke Mine	July 2025
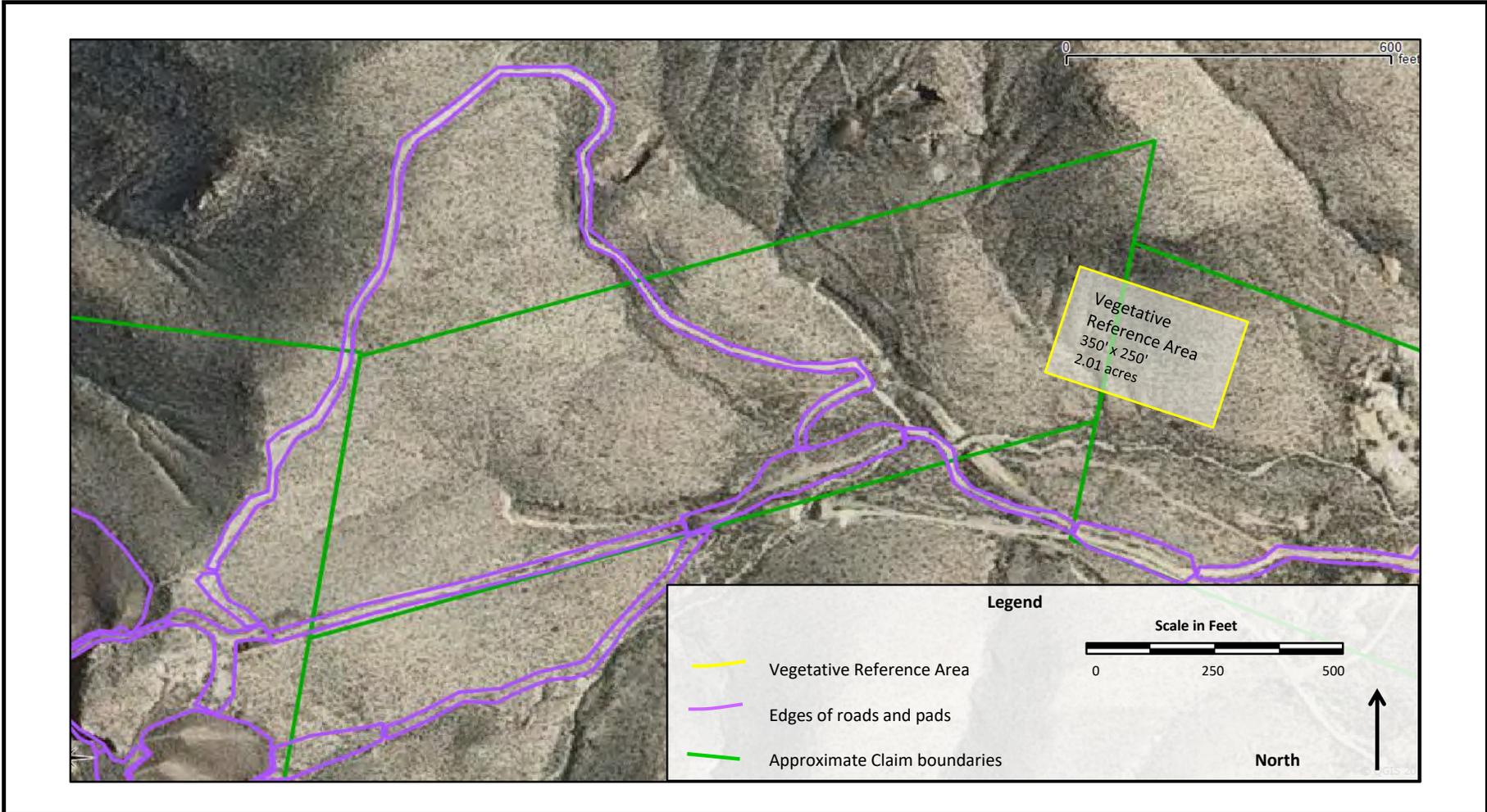
Vegetative
Reference Area
350' x 250'
2.01 acres

Legend

Scale in Feet

—— Vegetative Reference Area

—— Edges of roads and pads

—— Approximate Claim boundaries

0   250   500

North

0   600 feet

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Vegetative Reference Area in Relation to Mining Areas	Plate 7
	Gulf Coast Mining Claims, LLC	**December, 2025**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4947' - 4920' = 27'
Gradient = (Length of berm)/Vert. Relief
= 112'/27' = **4.1/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele.
= 4992' - 4962' = 20'
Gradient = (Length of berm)/Vert. Relief
= 104'/27' = **3.8/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4905' - 4887' = 18'
Berm Gradient = (Length of berm)/Vert. Relief
= 96'/18' = **5.3/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4870' - 4850' = 20'
Berm Gradient = (Length of berm)/Vert. Relief
= 73'/20' = **3.6/1**

0   53   106
Scale in feet   North

Cross Section B - B'
Interior Berms
Perimeter Berms

Marks end of Waste Rock on Cross Section
Marks berm location on Cross Section
Riprap

Pad below Waste Rock Area
(Area No. 15)
Catchment and riprap Outlet

Vert. Relief = UpperBerm Ele. - LowerBerm Ele. = 4872' - 4850' = 22'
Berm Gradient = (Length of berm)/Vert. Relief
= 112'/22' = **5.1/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4908' - 4882' = 26'
Berm Gradient = (Length of berm)/Vert. Relief
= 88'/22' = **4.0/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4985' - 4960' = 25'
Gradient = (Length of berm)/Vert. Relief
= 114'/25' = **4.5/1**

Vert. Relief = Upper Berm Ele. - Lower Berm Ele. = 4948' - 4920' = 28'
Gradient = (Length of berm)/Vert. Relief
= 122'/22' = **5.5/1**

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Schematic Plan of Berming on the Iron Duke Waste Rock Area	Plate 8a
	Gulf Coast Mining Claims, LLC	**February 2026**

Denotes edge of Waste Rock on Cross Section
Denotes location of berm on Cross Section
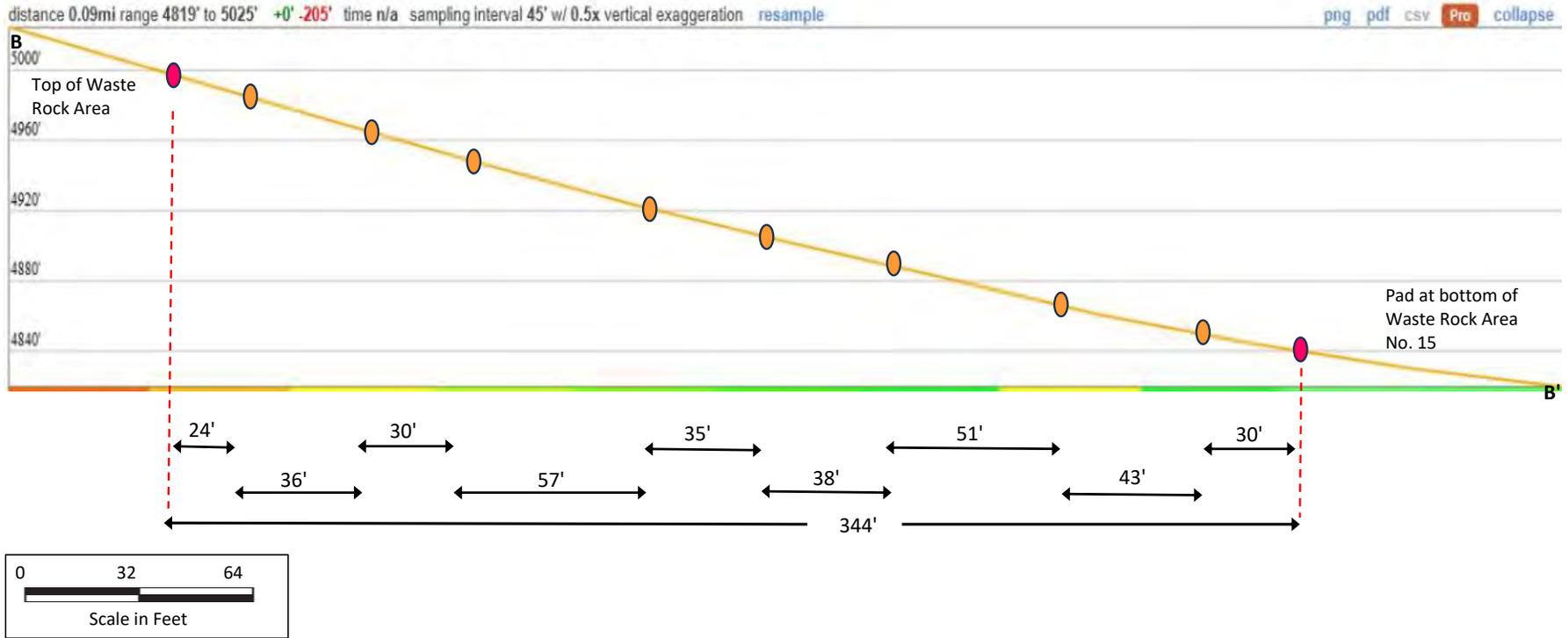
distance 0.09mi range 4819' to 5025'   +0' -205'   time n/a   sampling interval 45' w/ 0.5x vertical exaggeration   resample   png   pdf   csv   Pro   collapse

B
5000'

Top of Waste
Rock Area

4960'

4920'

4880'

Pad at bottom of
Waste Rock Area
No. 15

4840'

B'

24'
30'
35'
51'
30'
36'
57'
38'
43'
344'

0   32   64

Scale in Feet

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Cross Section with Berm Locations of the Iron Duke Waste Rock Area	Plate 8b
	Gulf Coast Mining Claims, LLC	February 2026

Processing Pad (Area No. 3)

D'

4880'

4720'

4800

4760'

D

Pad below Waste Rock Area (Area No. 15)

Waste Rock Area (No. 13)

4840'

4800'

0   53   106
Scale in feet   North

Legend:
- Cross Section D - D'
- Interior Berms
- Perimeter Berms
- Marks end of Waste Rock on Cross Section
- Marks berm location on Cross Section
- Riprap to Arroyo
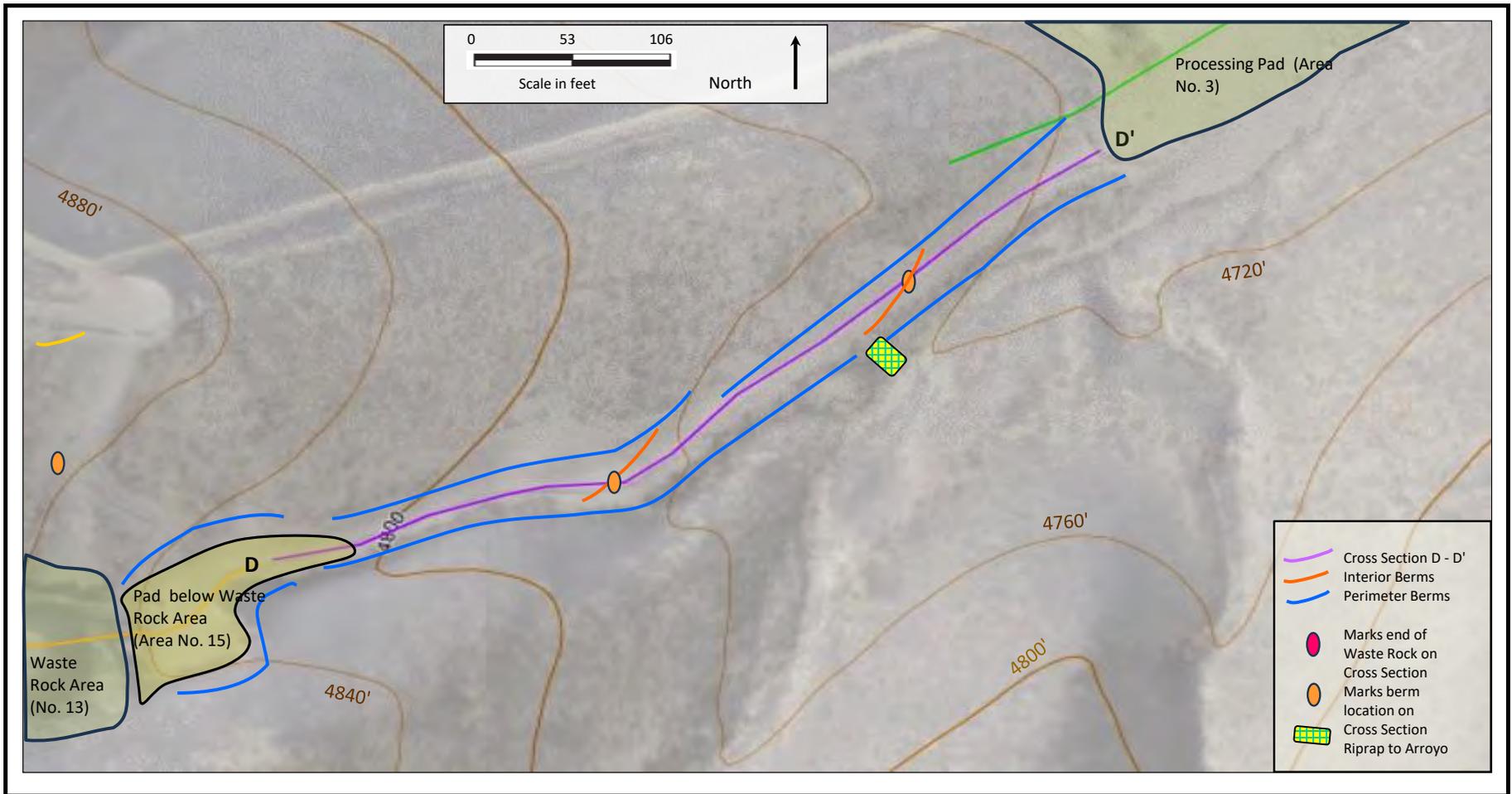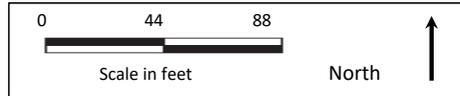
R.T. Hicks Consultants, Ltd
901 Rio Grande Blvd NW, Suite F-142
Albuquerque, NM 87104
505-266-5004

Schematic Plan of Berming on Road Section, Area No. 16

Plate 9a

Gulf Coast Mining Claims, LLC

February 2026

Scale in feet

0   44   88

North

distance 0.12mi range 4713' to 4817'   +0' -104'   time n/a   sampling interval 60' w/ 1.2x vertical exaggeration   resample   png pdf csv Pro collapse

D'

D
4800'
Pad below
Waste Rock Area
(Area No. 15)

4760'

4720'

Processing Pad
(Area No. 3)

D'

0.1mi

Legend:

— Cross Section D D'
— Interior Berms
— Perimeter Berms

⬤ Marks berm location on Cross Section

⬤ Marks lower end of Pad, Area No.15

▦ Riprap to Arroyo

Vert. Relief = Upper Ele. - Lower Ele. = 4812' - 4716' = 96'
Road Gradient = (Length of road)/Vert. Relief
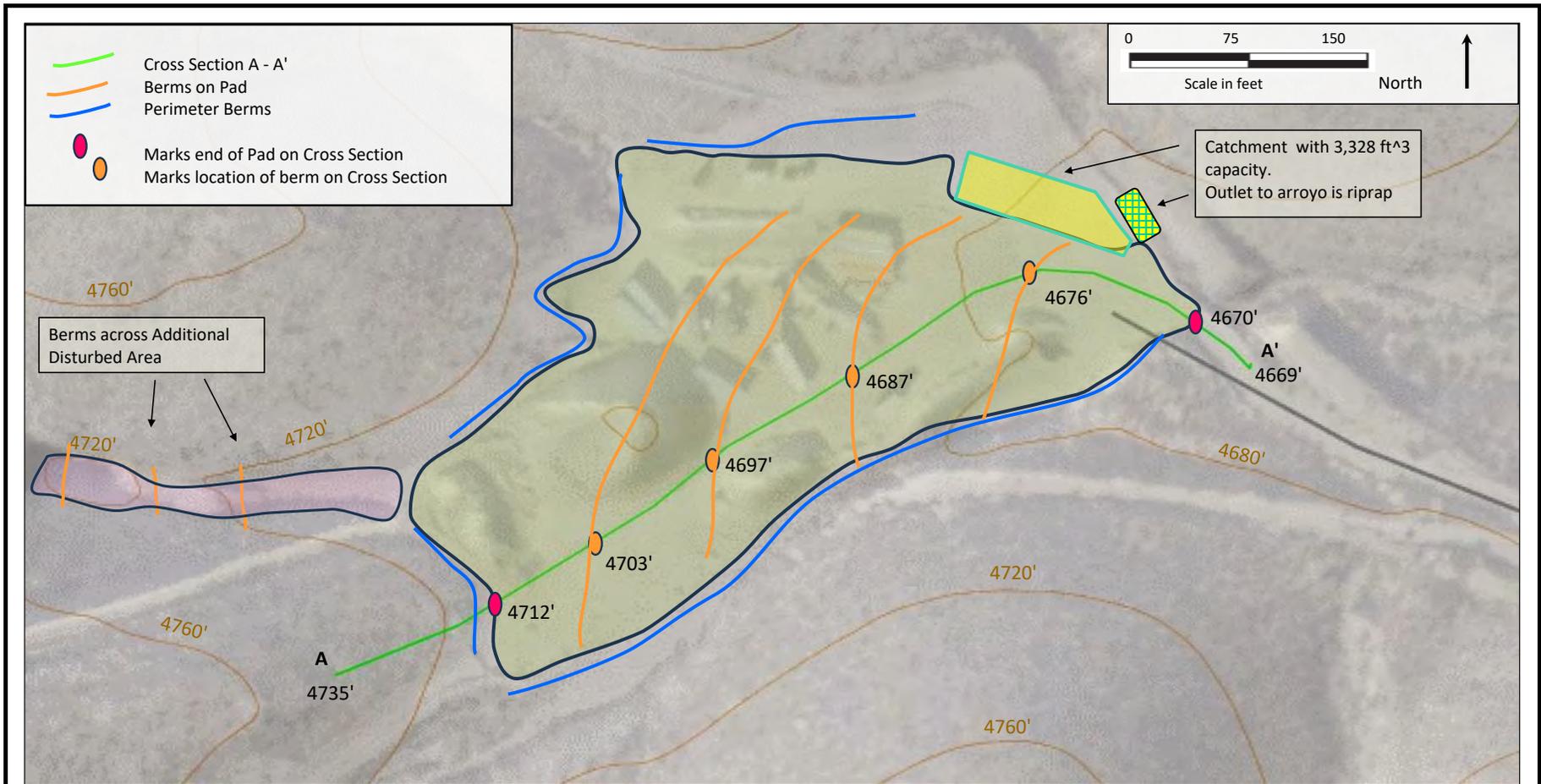= 633'/96' = **6.5/1**

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Cross Section of Road Section No.16, Iron Duke Project	Plate9b
	Gulf Coast Mining Claims, LLC	**February 2026**

Legend:
- Cross Section A - A'
- Berms on Pad
- Perimeter Berms
- Marks end of Pad on Cross Section
- Marks location of berm on Cross Section

Catchment with 3,328 ft^3 capacity.
Outlet to arroyo is riprap

Berms across Additional Disturbed Area

4760'
4720'
4720'
4760'
4760'

4676'
4670'
A'
4669'
4680'
4687'
4697'
4720'
4703'
4712'
A
4735'

Scale in feet: 0 75 150
North

Schematic Plan of Berming on the Processing Pad, Iron Duke Project

Plate 10a

Gulf Coast Mining Claims, LLC

February 2026

Scale in Feet
0   40   80

● Denotes edge of Pad on Cross Section
● Denotes location of berm on Cross Section

distance 0.14mi range 4669' to 4740' +0' -71' time n/a sampling interval 68' w/ 2x vertical exaggeration resample   png pdf csv Pro collapse

A

4720'
4712'
SW Corner of Process. Pad
4703'
4697'
4687'
4680'
4676'
East Corner of Process. Pad
4670'
0.1mi
A'

0' ←— 72' —→ 72'   168' ←— 126' —→ 294'   441' ←— 121' —→ 562'

Vert. Relief = Upper Ele. - Lower Ele. = 4712' - 4703' = 9'
Gradient = (Dist. between berms)/Vert. Relief
= 72'/9' = **8/1**

Vert. Relief = Upper Ele. - Lower Ele. = 4697' - 4687' = 10'
Gradient = (Dist. between berms)/Vert. Relief
= 126'/10' = **12.6/1**

Vert. Relief = Upper Ele. - Lower Ele. = 4676' - 4670' = 6'
Gradient = (Dist. between berms)/Vert. Relief
= 121'/6' = **20.1/1**

←— 96' —→   ←— 147' —→

Vert. Relief = Upper Ele. - Lower Ele. = 4703' - 4697' = 6'
Gradient = (Dist. between berms)/Vert. Relief
= 96'/6' = **16/1**

Vert. Relief = Upper Ele. - Lower Ele. = 4687' - 4676' = 11'
Gradient = (Dist. between berms)/Vert. Relief
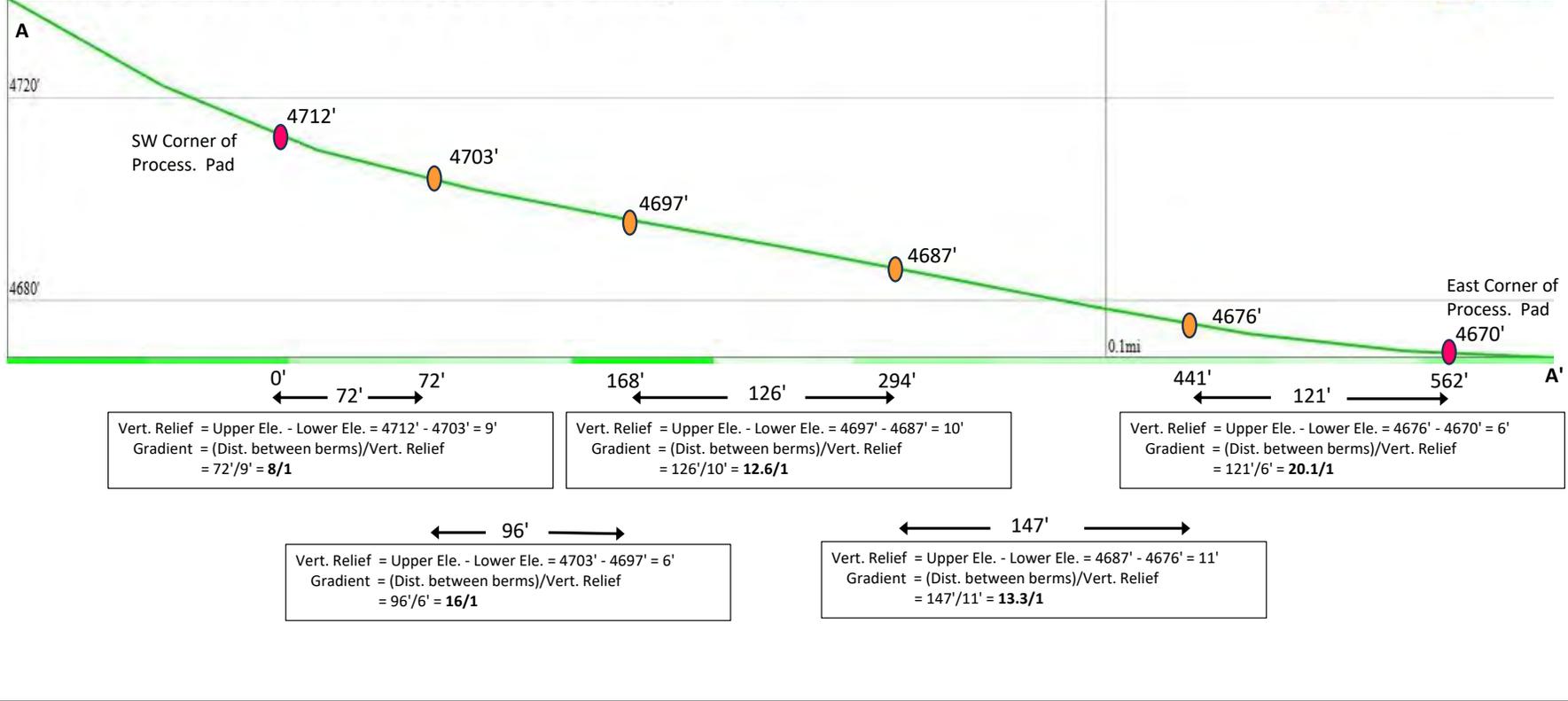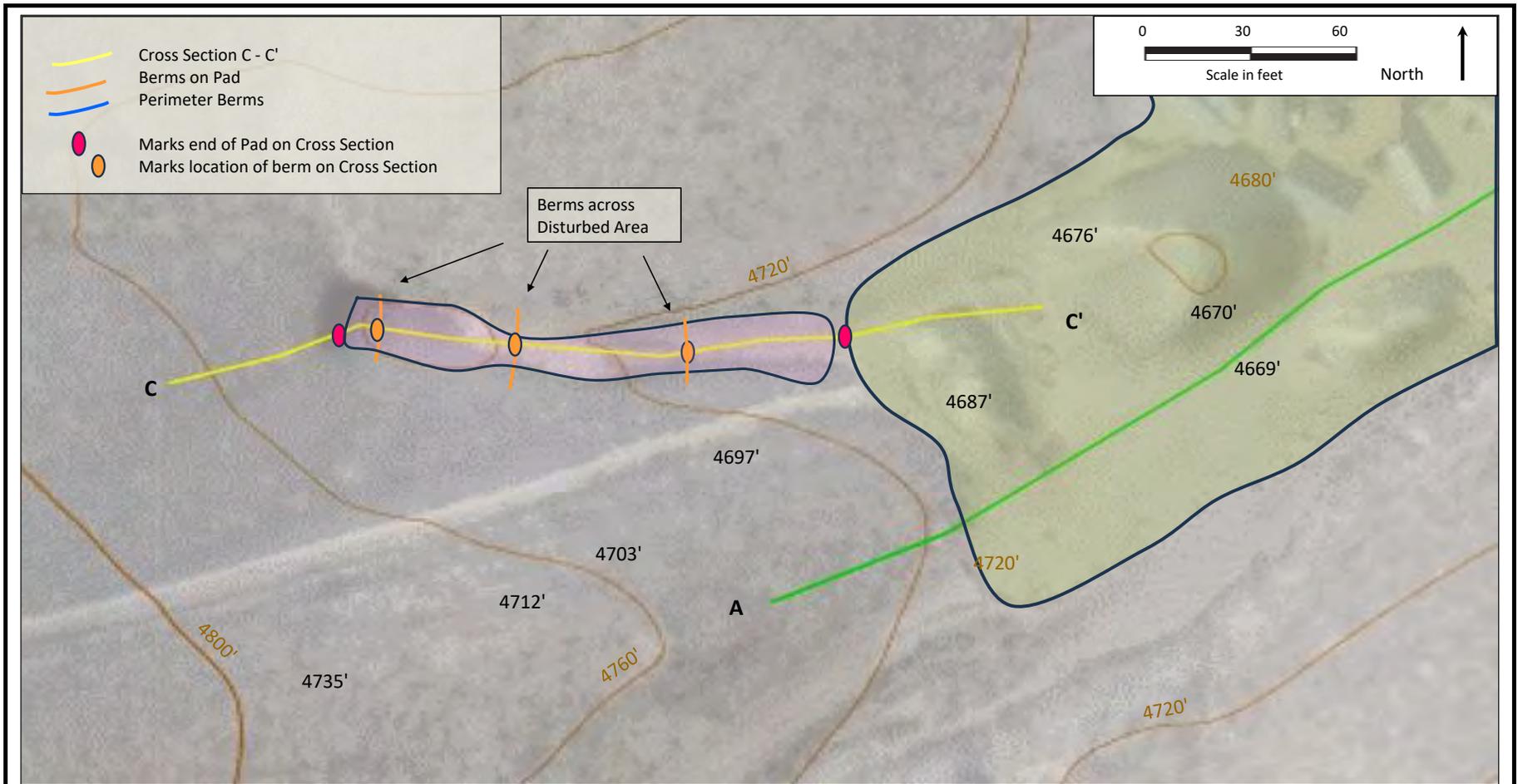= 147'/11' = **13.3/1**

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Cross Section and Berm Locations on Processing Pad. Iron Duke Project	Plate 10b
	Gulf Coast Mining Claims, LLC	February 2026

Legend:
- Cross Section C - C'
- Berms on Pad
- Perimeter Berms
- Marks end of Pad on Cross Section
- Marks location of berm on Cross Section

Berms across Disturbed Area

4680'
4676'
4720'
C'
4670'
4669'
C
4687'
4697'
4720'
4703'
A
4712'
4800'
4760'
4735'
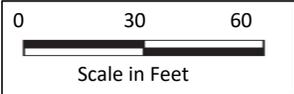4720'

0 30 60
Scale in feet   North

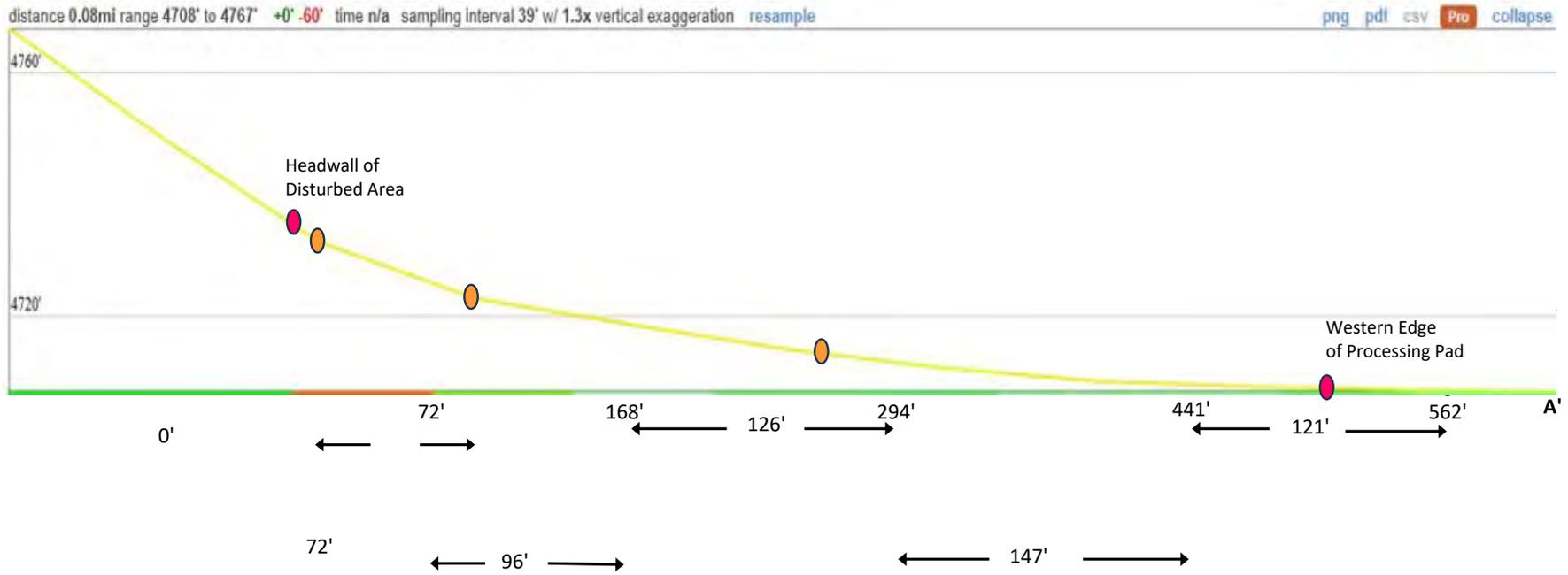| R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Schematic Plan of Berming on Disturbed Area West of Processing Pad, Iron Duke Project	Plate 10c
	Gulf Coast Mining Claims, LLC	**February 2026**

Cross Section and Berm Locations on Processing Pad. Iron Duke Project

Scale in Feet
0 30 60

🔴 Denotes edge of Pad on Cross Section
🟠 Denotes location of berm on Cross Section

distance 0.08mi range 4708' to 4767' +0' -60' time n/a sampling interval 39' w/ 1.3x vertical exaggeration resample
png pdf csv Pro collapse

4760'
4720'

Headwall of Disturbed Area

Western Edge of Processing Pad

0'
72'
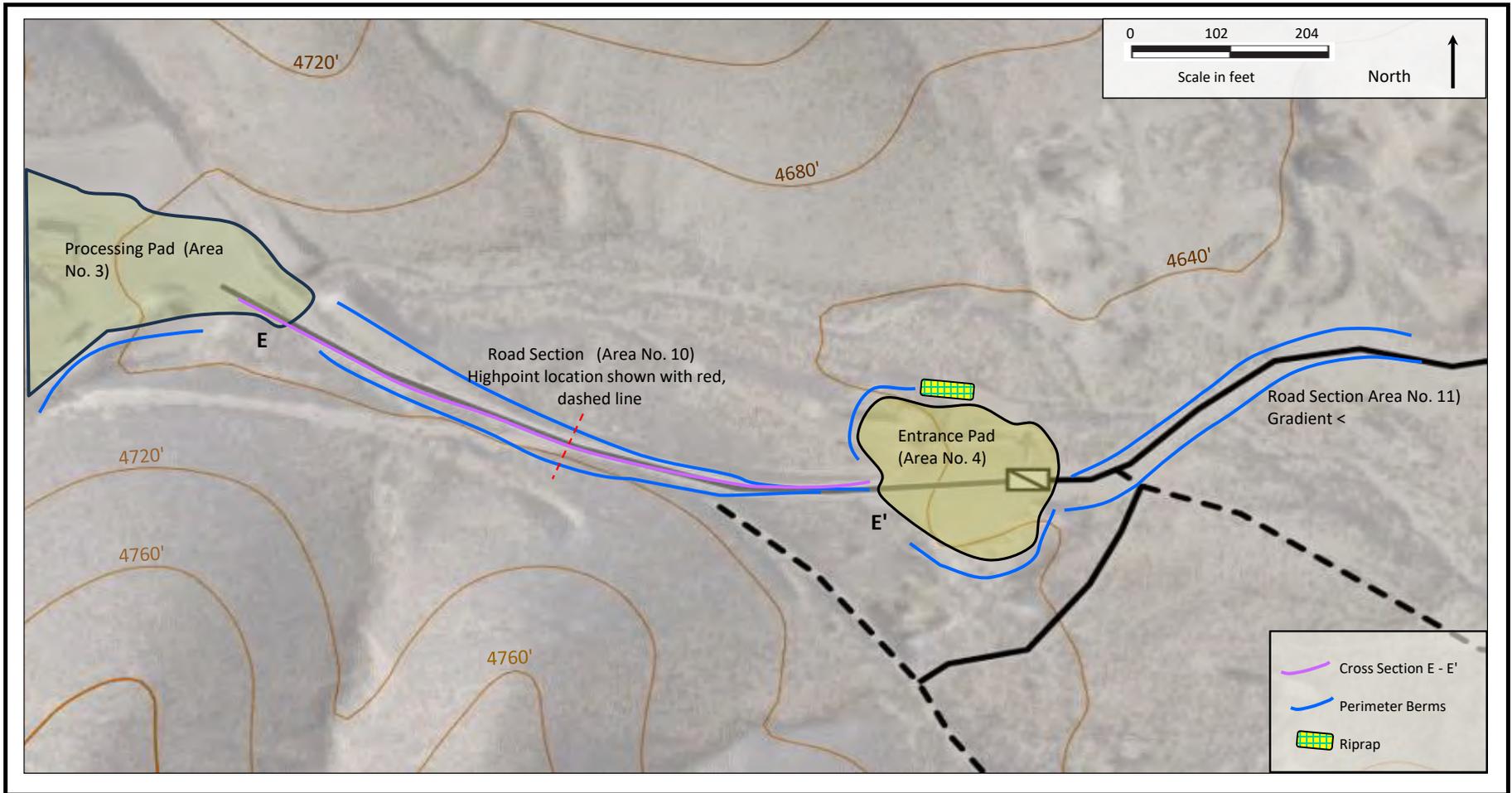168'
294'
441'
562'
A'

72'
96'
126'
121'
147'

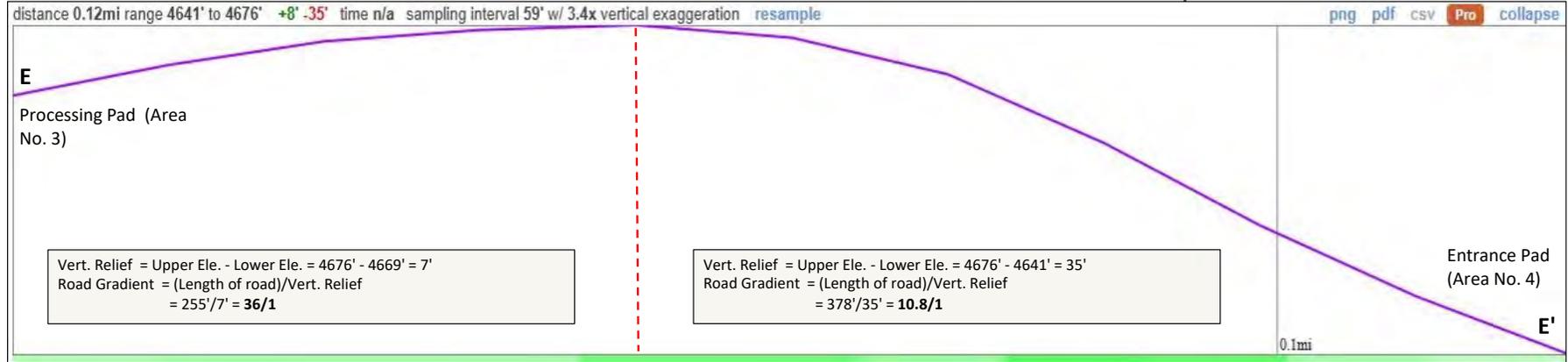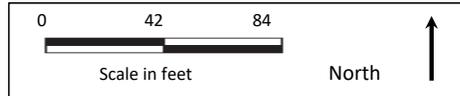| R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Cross Section and Berm Locations on Processing Pad. Iron Duke Project	Plate 10d
	Gulf Coast Mining Claims, LLC	February 2026

Schematic Plan of Berming on Road Section, Area No. 16

Map labels:
- 4720'
- 4680'
- 4640'
- Processing Pad (Area No. 3)
- E
- Road Section (Area No. 10) Highpoint location shown with red, dashed line
- 4720'
- 4760'
- 4760'
- E'
- Entrance Pad (Area No. 4)
- Road Section Area No. 11) Gradient <
- 0   102   204
- Scale in feet
- North

Legend:
- Cross Section E - E'
- Perimeter Berms
- Riprap

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Schematic Plan of Berming on Road Section, Area No. 16	Plate 11a
	Gulf Coast Mining Claims, LLC	February 2026

0   42   84

Scale in feet   North

distance 0.12mi range 4641' to 4676'   +8' -35'   time n/a   sampling interval 59' w/ 3.4x vertical exaggeration   resample   png pdf csv **Pro** collapse

E

Processing Pad (Area
No. 3)

Vert. Relief = Upper Ele. - Lower Ele. = 4676' - 4669' = 7'
Road Gradient = (Length of road)/Vert. Relief
                        = 255'/7' = **36/1**

Vert. Relief = Upper Ele. - Lower Ele. = 4676' - 4641' = 35'
Road Gradient = (Length of road)/Vert. Relief
                        = 378'/35' = **10.8/1**

Entrance Pad
(Area No. 4)

E'

0.1mi

⌒ Cross Section E-E'

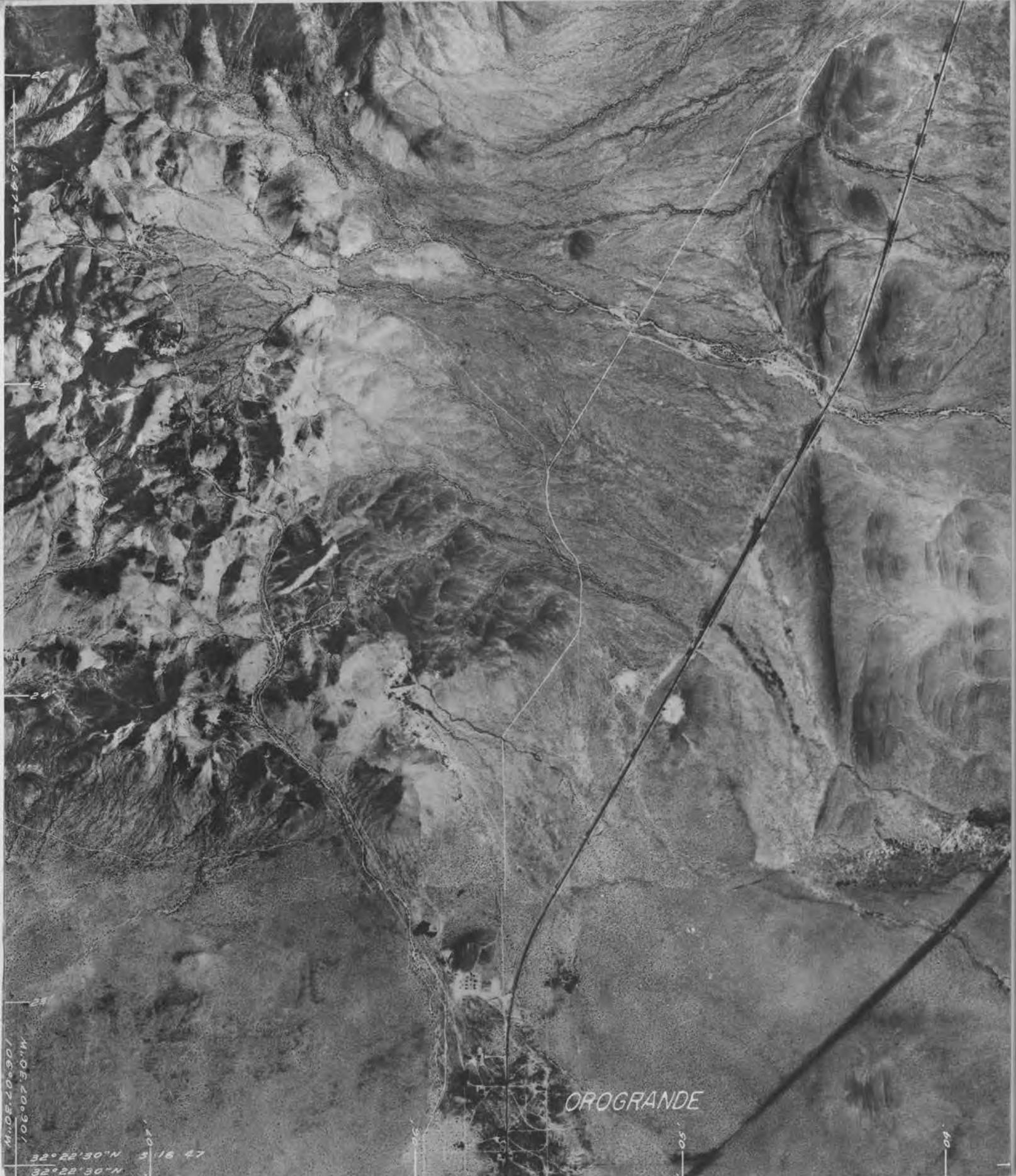| R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Cross Section of Road Section No.10, Iron Duke Project	Plate 11b
	Gulf Coast Mining Claims, LLC	**February 2026**

Appendix Miscellaneous

1946 Aerial Photograph

Weather Data for Alamogordo NM

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

OROGRANDE

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: NM

Data description

Data type: [Precipitation depth ▾] Units: [English ▾] Time series type: [Partial duration ▾]

Select location

1) Manually:

   a) By location (decimal degrees, use "-" for S and W): Latitude: [_____] Longitude: [_____] [Submit]

   b) By station (list of NM stations): [Select station ▾]

   c) By address [Search_____] [🔍]

2) Use map:

[Map ▾]

a) **Select location**
   Move crosshair or double click
b) **Click on station icon**
   ☐ Show stations on map

Location information:
Name: Alamogordo, New Mexico, USA*
Latitude: 32.4066°
Longitude: -106.0808°
Elevation: 4309 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 1, Version 5

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.229 (0.202-0.261)	0.296 (0.263-0.337)	0.401 (0.354-0.455)	0.480 (0.423-0.546)	0.586 (0.513-0.667)	0.672 (0.588-0.766)	0.762 (0.660-0.865)	0.855 (0.737-0.974)	0.984 (0.835-1.12)	1.09 (0.918-1.24)
10-min	0.349 (0.307-0.397)	0.451 (0.400-0.513)	0.610 (0.539-0.693)	0.730 (0.643-0.832)	0.892 (0.781-1.02)	1.02 (0.892-1.17)	1.16 (1.00-1.32)	1.30 (1.12-1.48)	1.50 (1.27-1.70)	1.66 (1.40-1.89)
15-min	0.433 (0.381-0.492)	0.559 (0.496-0.636)	0.756 (0.668-0.859)	0.905 (0.797-1.03)	1.11 (0.968-1.26)	1.27 (1.11-1.45)	1.44 (1.24-1.63)	1.61 (1.39-1.84)	1.86 (1.58-2.11)	2.05 (1.73-2.34)
30-min	0.583 (0.513-0.663)	0.753 (0.668-0.856)	1.02 (0.900-1.16)	1.22 (1.07-1.39)	1.49 (1.30-1.70)	1.71 (1.49-1.95)	1.94 (1.68-2.20)	2.17 (1.87-2.48)	2.50 (2.12-2.84)	2.76 (2.33-3.16)
60-min	0.721 (0.635-0.820)	0.932 (0.827-1.06)	1.26 (1.11-1.43)	1.51 (1.33-1.72)	1.84 (1.61-2.10)	2.11 (1.84-2.41)	2.40 (2.08-2.72)	2.69 (2.32-3.06)	3.10 (2.63-3.52)	3.42 (2.89-3.90)
2-hr	0.843 (0.744-0.960)	1.10 (0.973-1.25)	1.48 (1.31-1.69)	1.78 (1.56-2.02)	2.18 (1.90-2.47)	2.49 (2.15-2.82)	2.81 (2.42-3.18)	3.16 (2.68-3.57)	3.62 (3.04-4.09)	3.98 (3.31-4.50)
3-hr	0.907 (0.807-1.03)	1.17 (1.04-1.33)	1.56 (1.38-1.77)	1.86 (1.64-2.10)	2.27 (1.99-2.56)	2.59 (2.25-2.92)	2.92 (2.52-3.29)	3.27 (2.80-3.68)	3.74 (3.16-4.22)	4.11 (3.43-4.63)
6-hr	1.04 (0.932-1.17)	1.33 (1.19-1.50)	1.74 (1.55-1.97)	2.05 (1.82-2.31)	2.48 (2.18-2.77)	2.81 (2.46-3.14)	3.14 (2.73-3.51)	3.48 (2.99-3.90)	3.93 (3.35-4.42)	4.29 (3.63-4.81)
12-hr	1.14 (1.02-1.27)	1.46 (1.30-1.63)	1.89 (1.68-2.10)	2.22 (1.97-2.47)	2.64 (2.34-2.94)	2.97 (2.62-3.30)	3.30 (2.89-3.67)	3.63 (3.16-4.03)	4.07 (3.50-4.52)	4.40 (3.77-4.91)
24-hr	1.30 (1.16-1.46)	1.65 (1.47-1.86)	2.11 (1.87-2.38)	2.47 (2.18-2.78)	2.93 (2.58-3.32)	3.29 (2.88-3.74)	3.65 (3.18-4.18)	4.02 (3.47-4.62)	4.50 (3.85-5.23)	4.87 (4.13-5.72)
2-day	1.38 (1.23-1.54)	1.74 (1.56-1.96)	2.23 (1.99-2.50)	2.61 (2.32-2.93)	3.13 (2.76-3.52)	3.53 (3.09-3.99)	3.94 (3.42-4.48)	4.36 (3.74-4.99)	4.92 (4.16-5.69)	5.36 (4.48-6.27)
3-day	1.47 (1.32-1.64)	1.86 (1.68-2.08)	2.39 (2.14-2.67)	2.80 (2.50-3.12)	3.34 (2.97-3.74)	3.76 (3.31-4.22)	4.19 (3.66-4.73)	4.62 (3.99-5.25)	5.20 (4.43-5.97)	5.66 (4.77-6.55)
4-day	1.57 (1.41-1.74)	1.98 (1.79-2.20)	2.55 (2.30-2.83)	2.98 (2.67-3.31)	3.56 (3.17-3.96)	4.00 (3.54-4.46)	4.44 (3.89-4.98)	4.89 (4.25-5.52)	5.48 (4.70-6.25)	5.95 (5.06-6.84)
7-day	1.81 (1.64-2.00)	2.30 (2.08-2.54)	2.96 (2.67-3.28)	3.47 (3.12-3.84)	4.16 (3.72-4.61)	4.70 (4.18-5.22)	5.26 (4.64-5.87)	5.82 (5.08-6.53)	6.58 (5.66-7.47)	7.17 (6.09-8.21)
10-day	1.98 (1.78-2.22)	2.53 (2.27-2.81)	3.27 (2.94-3.64)	3.86 (3.45-4.29)	4.65 (4.12-5.18)	5.26 (4.62-5.90)	5.90 (5.14-6.64)	6.55 (5.66-7.43)	7.43 (6.34-8.48)	8.11 (6.84-9.36)
20-day	2.49 (2.25-2.75)	3.16 (2.87-3.50)	4.08 (3.69-4.51)	4.76 (4.29-5.26)	5.67 (5.09-6.28)	6.35 (5.67-7.05)	7.05 (6.26-7.85)	7.74 (6.83-8.65)	8.65 (7.54-9.77)	9.34 (8.07-10.6)
30-day	2.90 (2.63-3.20)	3.70 (3.36-4.06)	4.72 (4.28-5.18)	5.48 (4.97-6.01)	6.47 (5.84-7.10)	7.20 (6.47-7.92)	7.92 (7.07-8.77)	8.63 (7.65-9.63)	9.56 (8.38-10.8)	10.2 (8.90-11.6)
45-day	3.50 (3.18-3.84)	4.44 (4.05-4.68)	5.62 (5.12-6.18)	6.47 (5.88-7.10)	7.55 (6.84-8.31)	8.35 (7.53-9.19)	9.12 (8.20-10.1)	9.85 (8.80-10.9)	10.8 (9.56-12.1)	11.5 (10.1-12.9)
60-day	4.00 (3.66-4.38)	5.08 (4.65-5.54)	6.42 (5.87-7.02)	7.37 (6.73-8.05)	8.56 (7.79-9.35)	9.42 (8.54-10.3)	10.2 (9.26-11.2)	11.0 (9.91-12.1)	12.0 (10.7-13.3)	12.7 (11.2-14.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates ⌄ [Submit]

Note: Temporary disruptions may occur Wednesdays from 4-7 pm ET during routine maintenance.

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