

November 18, 2022

Mr. Holland Shepherd Mr. Clint Chisler Mining Environmental Compliance Section New Mexico Environment Department 1190 S. St. Francis Dr. Santa Fe, New Mexico 87505

RE: 2022 Erosion Mitigation Plan for JJ No. 1 Mine, Permit No. Cl007RE, Cibola County, New Mexico

Dear Holland and Clint,

On behalf of SOHIO Western Mining Company (SWMC) and Rio Tinto Closure, INTERA Incorporated (INTERA) is submitting one electronic and one hard copy of this 2022 Erosion Mitigation Plan (Plan) for the JJ No. 1 Mine Site for your review. In 2011, SWMC submitted a Closeout/ Mitigation As-Built Report (As-Built Report) for the former JJ No. 1 Mine (Site), also known as the L-Bar Mine, as proof of final closure of an existing mining operation, pursuant to the New Mexico Mining and Minerals Division (MMD) original Director's Order dated March 30, 2006 and Amended Director's Order dated May 29, 2009. MMD reviewed and approved the As-Built Report (July 2011), which included the following condition(s):

SWMC will inspect reclaimed lands for signs of erosion and mitigate significant erosion features to prevent further degradation of the Site. As specified in the SWPPP, Site visits will be conducted monthly for erosion monitoring purposes, and will coincide with the revegetation monitoring Site visits. Additional inspections will occur at reclaimed areas after storm events of one-half inch or greater in any one-day period to look for evidence of erosion and/or BMP damage. Inspections will continue until specific units are released per a Director's Order or under the New Mexico Mining Act. The erosion monitoring program will continue for 12 years or as long as required by MMD.

This Plan summarizes the Year 11 inspection summary associated with the erosion monitoring requirements and the recent (August 2022) Site visit, as well as proposed recommendations to mitigate recent, increased erosion at the Site.

2021 Erosion Inspection Summary

On April 14, 2022, INTERA project staff, along with Jesse Dillon of Cedar Creek, presented the 2021 revegetation and erosion status for the fenced reclaimed areas (Reclamation Areas) to MMD, and as part of that, we recommended preliminary erosion mitigation measures. The 2021 erosion status and recommended mitigation were based on several field inspections conducted in 2021. In October 2021, representatives from INTERA and MMD visited the Site for routine sitewide inspections of the revegetation performance and to assess erosion. In addition, on November 12, 2021, INTERA conducted a comprehensive inspection of all the Reclamation Areas, focusing on areas of increased erosion. INTERA

field personnel transected each reclamation area and photo documented areas of erosion (see the Photograph Log in Attachment 1). The approximate locations of the photos, notable erosion, and existing erosion control features are shown on Figures 1 through 9. A summary of the status and recommended mitigation for each reclamation area is included in Table 1.

Based on the 2021 inspections, INTERA confirmed stability of the following Reclamation Areas, and no erosion mitigation measures are being proposed for these areas at this time: VS-2, VS-3, VS-7, VS-8, and VS-9.

Erosion mitigation has been recommended for the following Reclamation Areas: VS-4, VS-5, VS-6, VS-10, VS-11, VS-12, Stockpile, and Borrow Area (**Table 1**). Although measures are being recommended for these areas, the use of heavy equipment will be minimized as much as possible to decrease any further Site disturbance and potentially delay or impair vegetation growth.

As noted in the Year 11 Revegetation Evaluation report, dated March 2022, the Site has had notably severe precipitation events in 2020, 2021, and 2022, which have contributed significantly to the recently observed surface erosion. For the purposes of the 2021 erosion inspections, the erosion was generally categorized and described as having interrilling, rilling, and gully or channeling, in order of respective severity. **Table 1** provides details on the erosion severity in each of the identified areas. In general, the erosion severity was described as follows:

- Interrilling and rilling were present within the VS-5, VS-11, and the Stockpile areas
- Deeper rilling and gully erosion were present within the VS-6 and VS-12 areas
- More severe gully erosion and channeling were present within VS-4, VS-10, and Borrow areas, and equipment may be required to address these more severe erosion areas

2022 Site Visit

On August 30, 2022, representatives from INTERA and MMD visited the Site for follow-up Sitewide inspections. It was noted that increased vegetation growth resulting from recent precipitation events concealed some of the erosion areas, but some of the erosion in the areas identified for mitigation appeared to have deteriorated since the last Site visit. This visit preceded the 2022 Revegetation Evaluation that occurred on September 15, 2022, which will be summarized under separate cover.

Conclusions and Recommendations

Based on the erosion observed in the identified Reclamation Areas, INTERA recommends repairs to mitigate the erosion, while attempting to minimize disturbance. The mitigation measures include installing additional run-on or run-off controls typically utilized for stormwater best management practices (BMPs) such as wattles or erosion matting, as well as aids for revegetation such as native seed mixtures and haybale placement. INTERA recommends the following repairs to the noted erosion areas.

- Haybale Installation VS-4, VS-10, VS-12 and Borrow Area
- Wattles VS-4, VS-5, VS-6, VS-10, VS-11, VS-12, and Borrow Area
- Erosion Matting VS-5, VS-6, VS-10, VS-12, and Stockpile
- Reseeding (see **Table 2** for seed mix) VS-4, VS-5, VS-6, VS-10, VS-12, Stockpile, and Borrow Area



- Berm Repair VS-10 and VS-12
- Rock Check Dam Improvement/Addition VS-4, VS-6, VS-10, VS-12
- Rock Armoring (standard riprap or Zuni bowl placement, as applicable) VS-6, VS-10, VS-12, and Borrow Area

As presented in **Table 2**, Cedar Creek has proposed a salt tolerant native seed mix along with a sterile wheatgrass to address gaps or losses in vegetative coverage and for additional erosional protection, respectively. INTERA recommends that the erosion improvements and repairs proposed above be implemented prior the next monsoonal precipitation season, to improve the seed productivity.

The figures and tables referred to herein are listed below:

Figures:

- Figure 1 Site Features
- Figure 2 VS-3 and VS-4
- Figure 3 VS-2, VS-5, and VS-6
- Figure 4 VS-5, VS-7, and VS-8
- Figure 5 VS-7 and VS-9
- Figure 6 VS-4, VS-6, and Stockpile
- Figure 7 VS-10, VS-11, and Borrow Area
- Figure 8 VS-10, VS-12, and Borrow Area
- Figure 9 VS-10 and Borrow Area

Tables:

- Table 1 Erosion Mitigation Summary
- Table 2 Recommended Seed Mix

Please do not hesitate to contact me via email or phone (505-246-1600) if you have any questions regarding this submittal

Sincerely,

INTERA Incorporated

Ashley Arrossa, P.E.

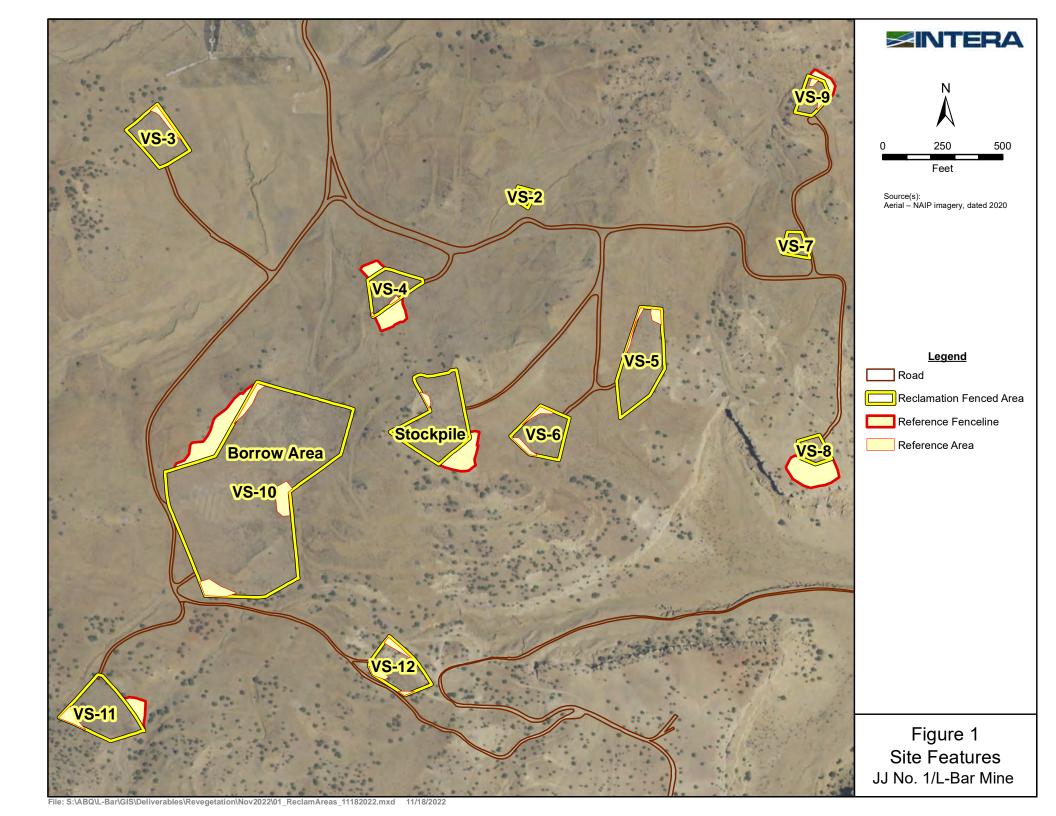
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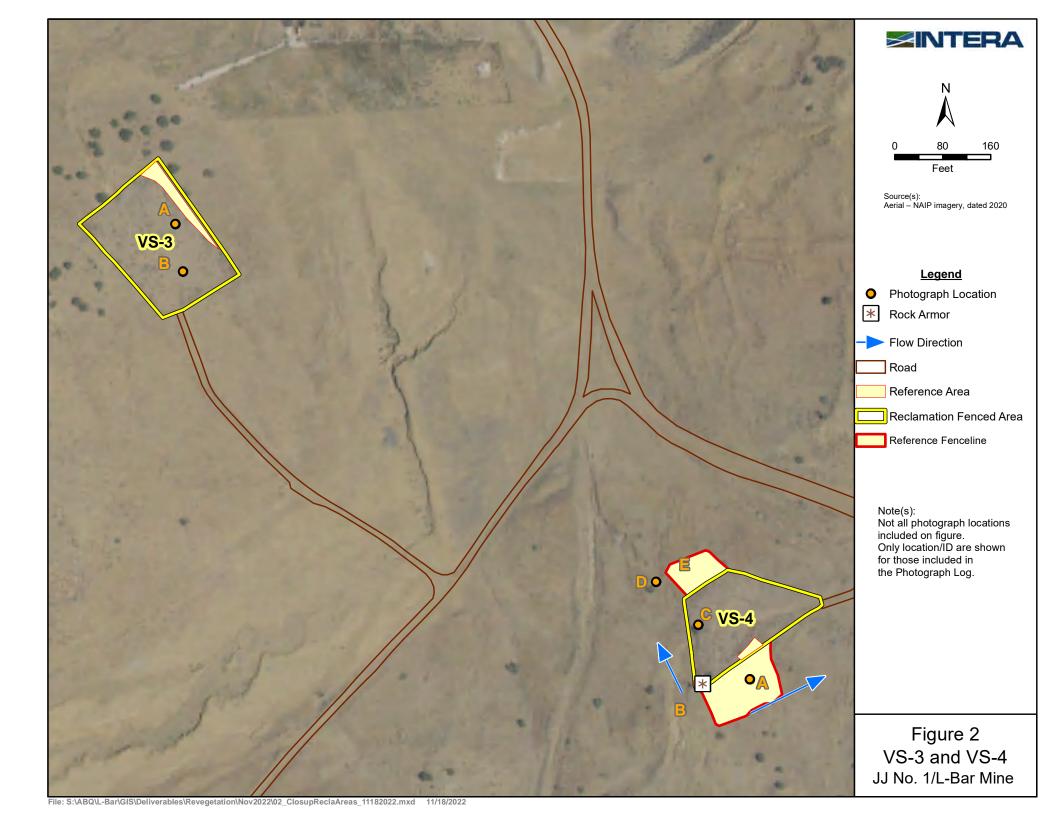
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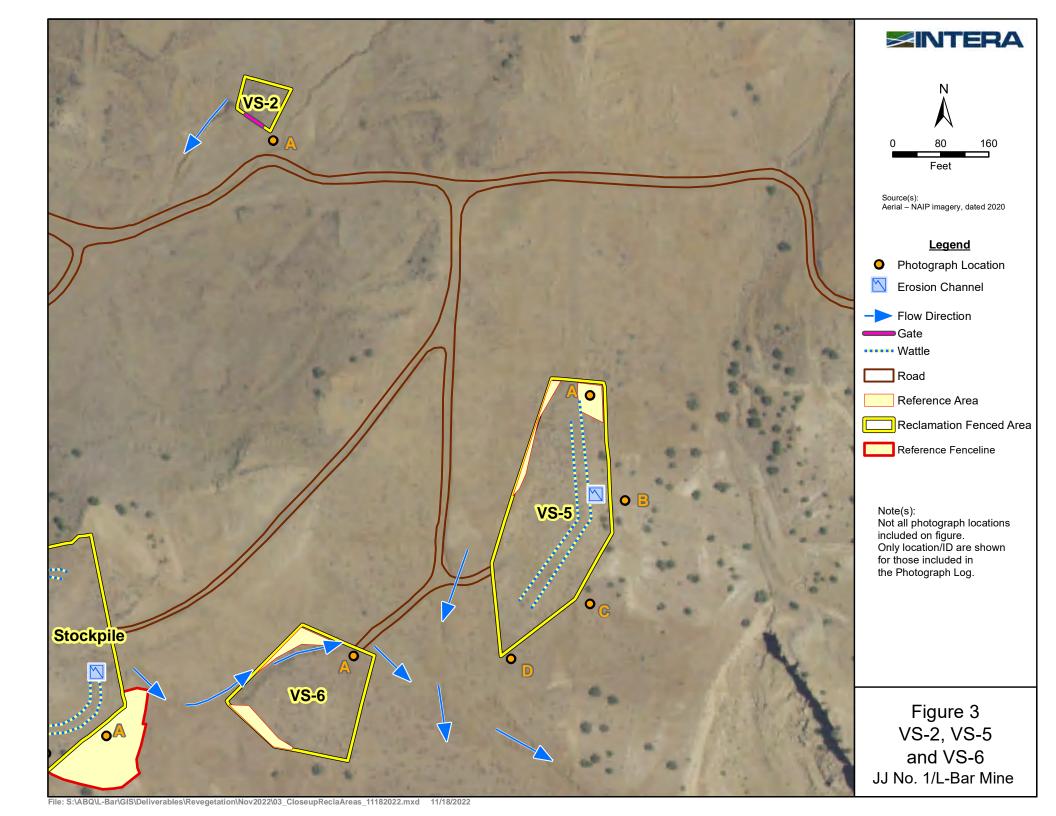


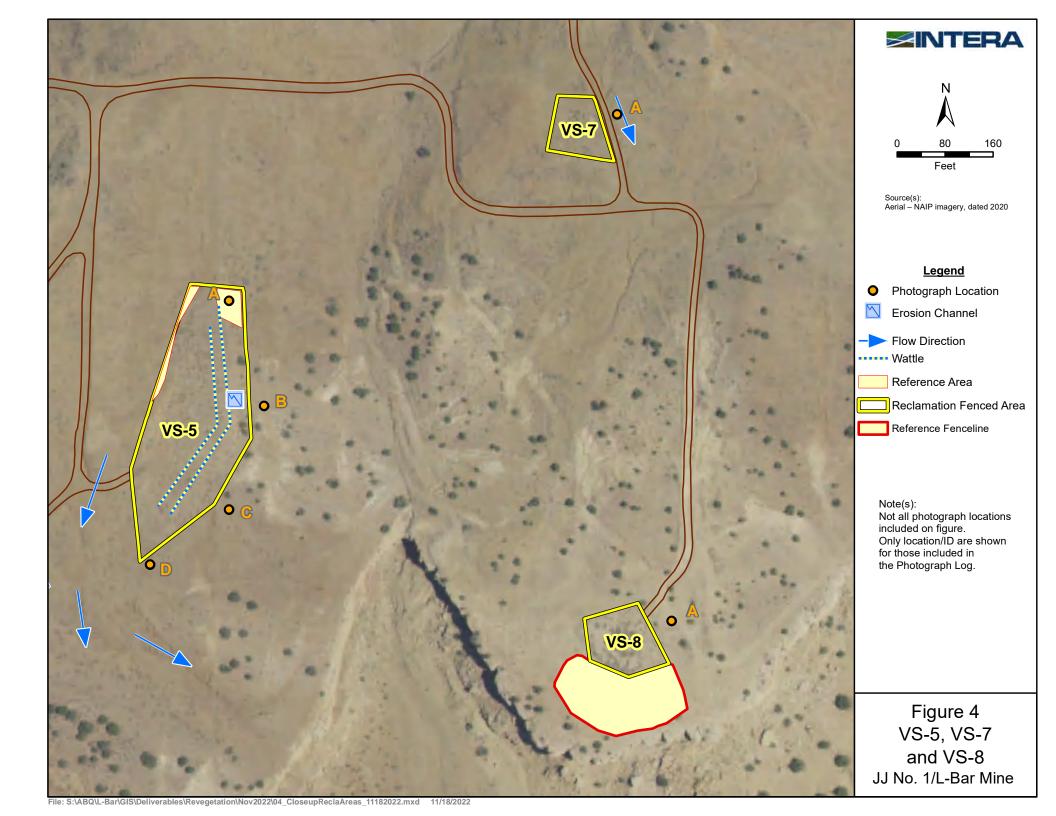
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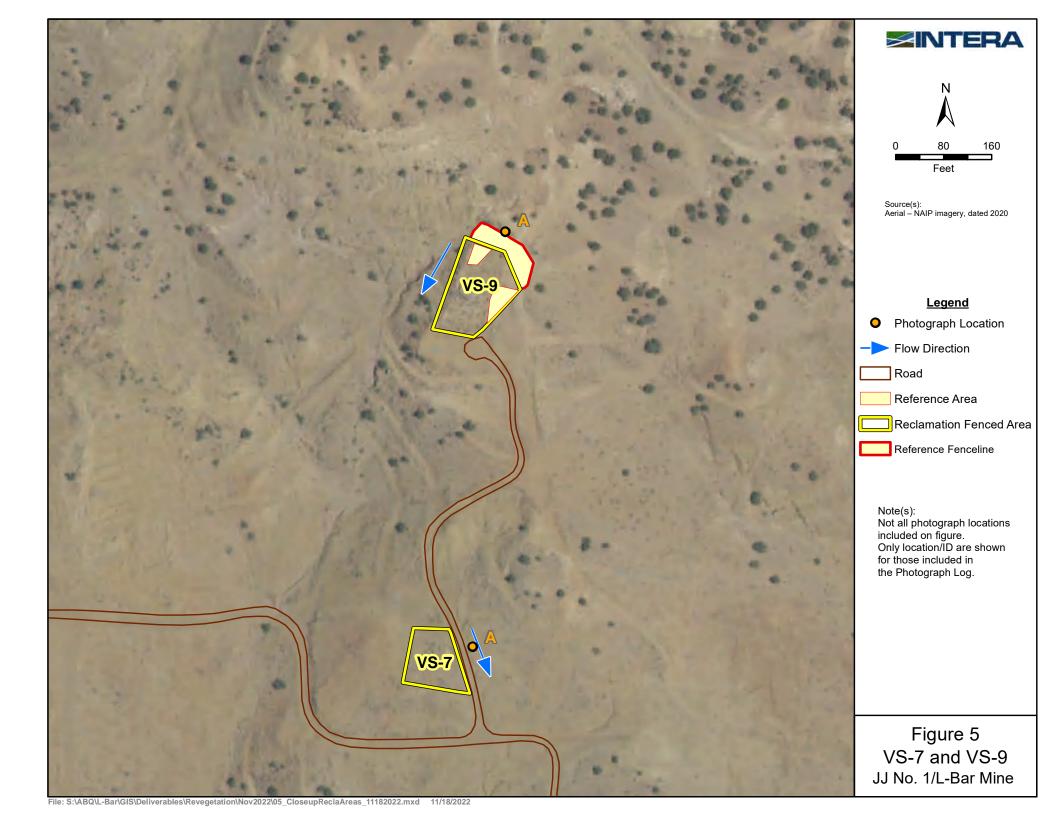


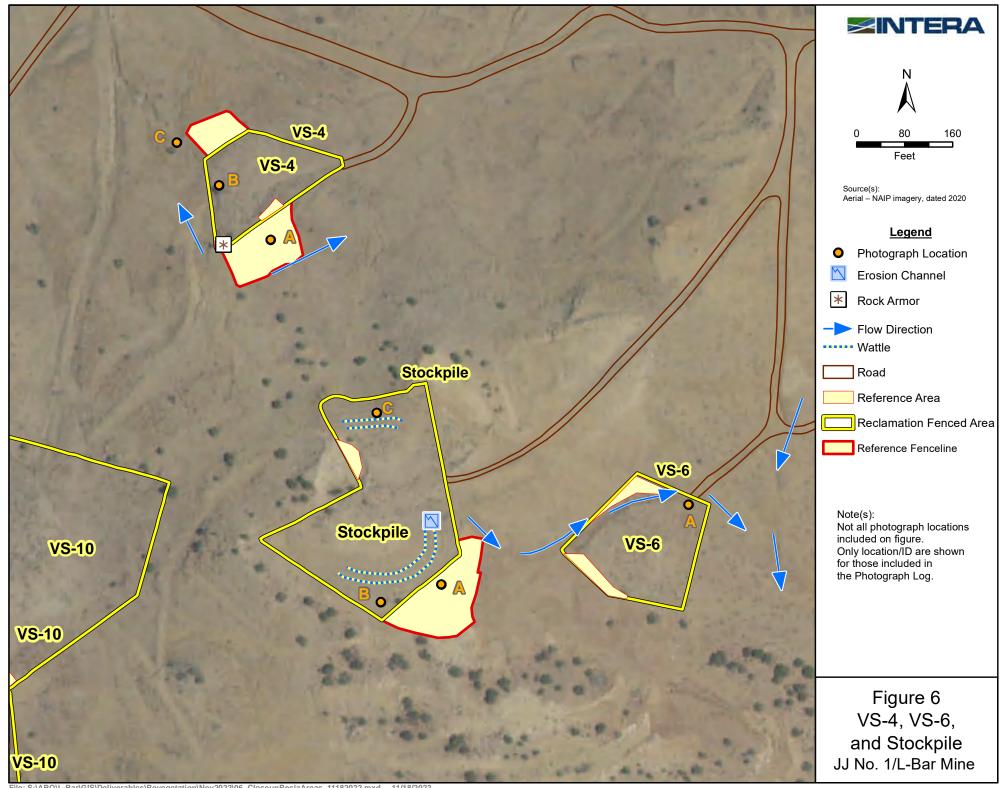


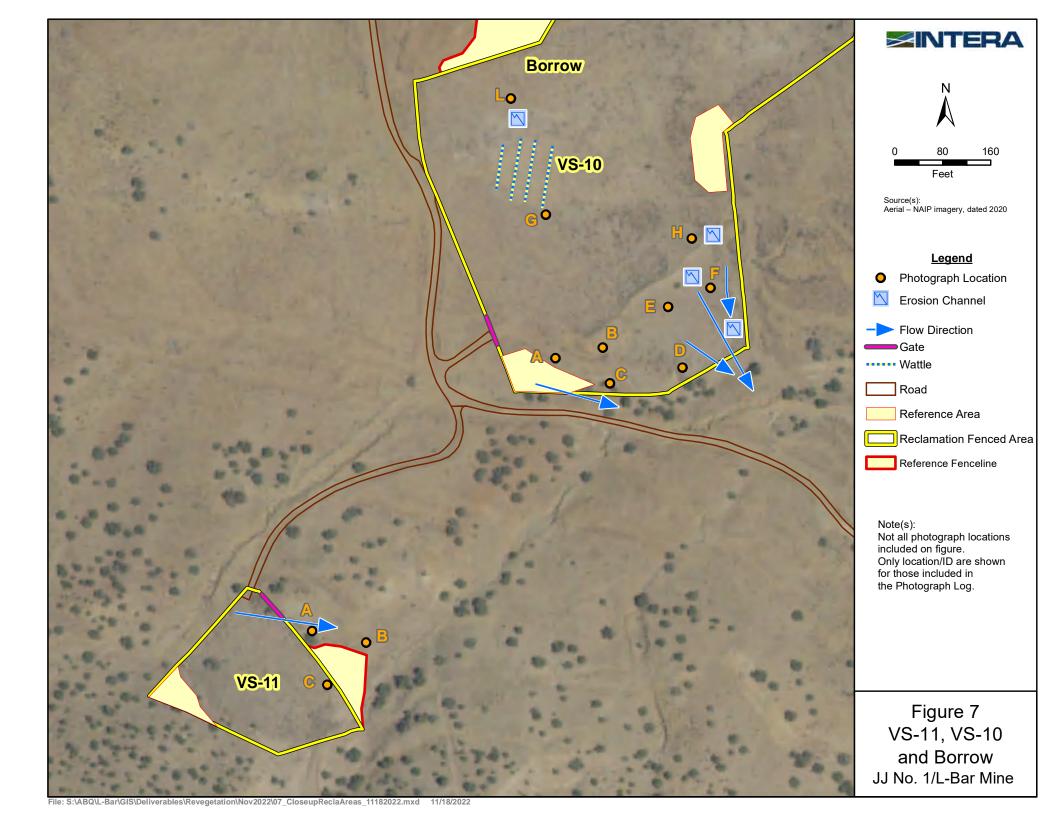


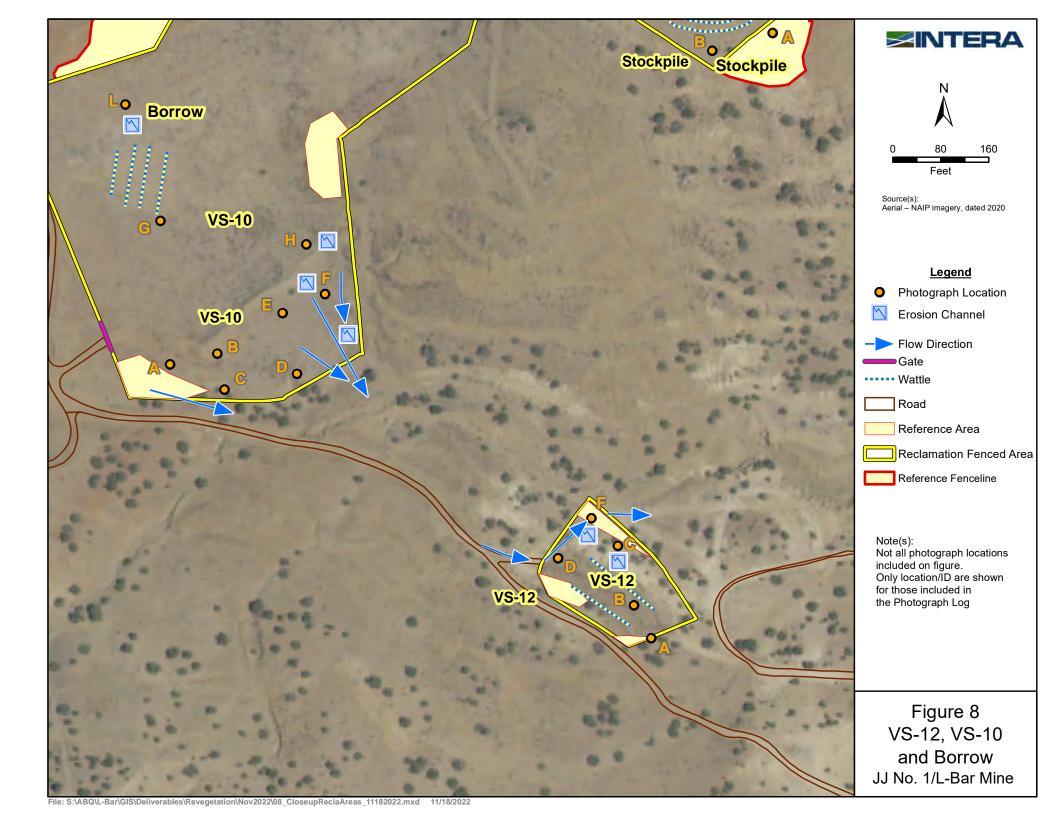


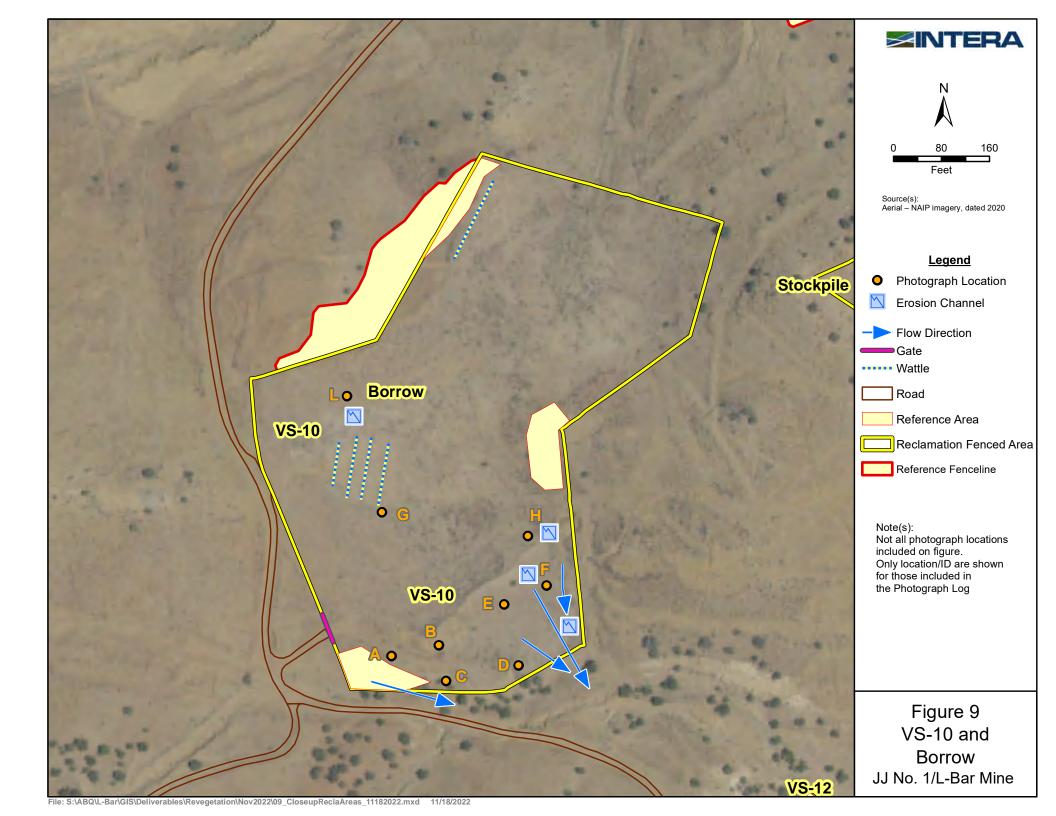












TABLE



TABLE 2 Recommended Seed Mix

JJ No .1/L-Bar Mine Cebolleta, New Mexico

L-Bar - Cedar Creek's Recommended Seed Mix for Broadcast Application (2021)						Recommendations					
No.	Obs. On Site	Salt Tolerance	Common Name	Scientific Nomenclature	PLS/lb.**	Recomd. PLS lbs/ac	PLS/ft ²	% of Seeds in Mix			
1	XX	Mod	Western wheatgrass	Agropyron smithii	110,000	3.00	7.6	2.5%			
2	XX	Low	Sideoats Grama	Bouteloua curtipendula	191,000	0.50	2.2	0.7%			
3	XX	Mod	Blue Grama	Bouteloua gracilis	825,000	0.50	9.5	3.1%			
4	XX	High	Galleta	Hiliaria jamesii	159,000	5.00	18.3	5.9%			
5		Low	Indian Ricegrass	Oryzopsis hymenoides	141,000	1.00	3.2	1.1%			
6		Mod	Bottlebrush Squirreltail	Sitanion hystrix	192,000	1.00	4.4	1.4%			
7	XX	High	Alkali Sacaton	Sporobolus airoides	1,758,000	2.00	80.7	26.3%			
8	XX	High	Sand Dropseed	Sporobolus cryptandrus	5,298,000	1.00	121.6	39.6%			
Grasses Subtotal				14.00	247.5	80.6%					
9		Low	Lewis Flax	Linum lewisii	293,000	1.00	6.7	2.2%			
10		Mod	Mexican Poppy	Eschscholtzia californica	850,000	0.05	1.0	0.3%			
11		Mod	Desert Globemallow	Sphaeralcea ambigua	500,000	1.00	11.5	3.7%			
	Forbs Subtotal					2.05	19.2	6.2%			
12		Low	Wyoming Big Sagebrush	Artemisia tridentata wyo.	2,500,000	0.25	14.3	4.7%			
13	XX	High	Fourwing Saltbush	Atriplex canescens	52,000	3.00	3.6	1.2%			
14		High	Shadscale	Atriplex confertifolia	64,900	1.00	1.5	0.5%			
15	XX	Mod	Winterfat	Ceratoides lanata	56,700	2.00	2.6	0.8%			
16	XX	Mod	Rubber Rabbitbrush	Chrysothamnus naseousus	400,000	2.00	18.4	6.0%			
Shrubs Subtotal				8.25	40.4	13.2%					
				Total		24.30	307.0				



TABLE 1

Erosion Mitigation Summary JJ No .1/L-Bar Mine Cebolleta, New Mexico

00 NO . I/E-Bai Willie Gebolicta, New Wexico										
November 1	2, 2021 Inspection (Verified on August 30, 2022)	Recommended Mitigation								
Reclaimed Area	<u>Status</u>	Specific Remedies	<u>Haybale</u>	Wattle	<u>Matting</u>	Reseed	Berm Repair	Check Dam	Rock Armoring	
VS-2	No major erosion Issues within fenced area. See Photo No. 1; Figure 3.	None at this time.								
VS-3	No major erosion Issues within fenced area. Rilling has increased on the east side and should be monitored closely for progression, though no action is necessary now. See Photo Nos. 2 - 3; Figure 2.	None at this time.								
VS-4	Shallow channeling (Photograph Location B) has developed parallel to rock armor within southwestern fence line. See Photo Nos. 4 - 6; Figure 2.	 Add to bolster check dams. Add bales, wattles, and seed to channels may help to slow erosion and prevent channeling from getting worse. 	x	X		x		x		
VS-5	Interrilling and rilling along western area of fenced area. Rilling and channeling noted, despite rock check dams. See Photo Nos. 7 - 10; Figures 3 and 4.	 Add seed and matting to lightly to moderately rilled areas. Add wattles above rock armor out fall area within fence line to try to mitigate. 		x	x	x				
VS-6	Gully erosion (Photograph Location A) within the revegetation fenced area despite existing rock check dams. Rills and channels forming below rock check dams. See Photo Nos. 11 - 12; Figure 3.	 Add seeding in and wattles across the rills/channels forming below the existing rock check dam area. Add matting to this area. Place additional rock armoring in water conveyance pathways. 		х	х	х		х	х	
VS-7	No major erosion Issues within fenced area. See Photo No. 13; Figure 4.	None at this time.								
VS-8	No major erosion Issues within fenced area. See Photo No. 14; Figure 4.	None at this time.								
VS-9	No major erosion Issues within fenced area. See Photo Nos. 15 - 16; Figure 5.	None at this time.								
VS-10	Deep rilling and channels forming, especially along steep slopes. See Photo Nos. 17 - 27; Figures 7 and 8.	 Add to bolster check dams. Add bales, wattles, and seed to channels to slow erosion and furthering channel severity. May require equipment and berm repair. Place additional rock armoring in water conveyance pathways. 	x	x	x	x	x	x	x	
VS-11	Rilling erosion noted within fenced reference area and the east side of VS-11 (Photograph Location C). See Photo Nos. 28 - 30; Figure 7.	Repair wattles along the fenceline.		Х						
VS-12	Increased rilling erosion along steep slope. Deeper gully erosion on the east side. See Photo Nos. 32 - 39; Figure 8.	 Add additional wattles parallel to crest of slope that has rilling. Add seeds and matting to slope and seed the deeper channels that have formed. Add additional haybales where erosion has bypassed the existing hay bale. Add check dams or create water bars outside of and above the fenced area where a significant erosional channel enters VS-12. This may help to slow the energy of the water or help to divert water away from VS-12. Focus on steep slopes with matting and seeding. Place additional rock armoring in water conveyance pathways. 	x	x	x	x	x	x	х	
Stockpile	Widespread interrilling and rilling on all slopes of the hill near southern edge of fenced area. See Photo Nos. 40 - 42; Figure 6.	Add seed and matting over rilled areas to prevent rills from getting worse or developing deep channels.			х	х				
Borrow Area	Significant gully erosion starts near crest of slopes, between the borrow area and VS-10, and contributes to channel formation downslope on VS-10. Erosion channels are about 5 – 7' wide and 5' deep near crest of hill and about 3-5' deep near outfall at the lower fence line along the southern end of VS-10. See Photo Nos. 43 - 45; Figures 7 and 8.	 Add wattles to outfall channel near bottom fence line and place perpendicular to channel to slow the flow. Add additional wattles at the crest of the upper and middle slope crest to slow energy and promote better sheet flow in an effort to avoid surface flow concentrating at wash out zones. Add seed and haybales to deeper gullies to keep channels from washing out further. It might be worthwhile trying to fix the berm (by hand?) above the slope because water ponds on the borrow area and then breaks through to create the channels on the slope. In addition, water from the ponded area could be redirected to the east and away from the steep slope to the south. Place additional rock armoring in water conveyance pathways. 	х	х		x			х	



ATTACHMENT 1 PHOTOGRAPH LOG







Photograph 1 - (VS-2 Photo Area A, looking north): No erosion within VS-2 fence line.



Photograph 2 - (VS-3 Photo Area A, looking southwest): Rilling and gully formation within fenced area.





Photograph 3 - (VS-3 Photo Area B, looking north): Wood chip wattles and boulders used to control erosion within VS-3 fence line.



Photograph 4 - (VS-4 Photo Area A, looking northwest): Shallow channeling within the Reference area, entering the VS-4 Reclamation fence line. The natural drainage channel runs along the western side VS-4.





Photograph 5 - (VS-4 Photo Area B, looking northwest/north): Rock armor along VS-4 western fence line.



Photograph 6 - (VS-4 Photo Area C, looking southeast): Pre-existing channeling within the Reference Area north of the Reclamation fence.





Photograph 7 - (VS-5 Photo Area A, looking south): Sheet flow erosion visible within VS-5 fence line despite rock armor and vegetation.



Photograph 8 - (VS-5 Photo Area B, looking west): Interrill and gully formation on slope below wattles within the fence line.





Photograph 9 - (VS-5 Photo Area C, looking west): Moderate undercutting starting within armored zone within the fenced area.



Photograph 10 - (VS-5 Photo Area D, looking northwest): Rill and gully formation within the southern corner of the fenced area.





Photograph 11 - (VS-6 Photo Area A, looking west): Gully erosion occurring despite three check dams within fenced area. Channels are part of the natural drainage along the northwestern and northern area of the fenced area.



Photograph 12 - (VS-6 looking west): Closeup of the check dams within VS-6 fenced area.





Photograph 13 - (VS-7 Photo Area A, looking west): No erosion within VS-7 fence line.



Photograph 14 - (VS-8 Photo Area A, looking west): No erosion within VS-8 fence line.





Photograph 15 - (VS-9 Photo Area A, looking west): Interrill erosion within Reference Area fence line; erosional flow existed prior to fence installation.



Photograph 16 - (VS-9 Photo Area A, looking south): No erosion within VS-9 fenced area.





Photograph 17 - (VS-10 Photo Area A, looking northeast): Photo Area taken from southwest corner of VS-10, looking northeast across VS-10 on the right and the Borrow Area on the left.



Photograph 18 - (VS-10 Photo Area B, looking west): Series of small rock check dams, with interrill-rill formation. The rill severity decreases as the slope flattens.





Photograph 19 - (VS-10 Photo Area C, looking east): Natural drainage channel along the southern side of VS-10.



Photograph 20 - (VS-10 Photo Area D, looking east): Undercut and rilling along edge of existing rock armor.





Photograph 21 - (VS-10 Photo Area D, looking northwest): Gully erosion along edge of existing rock armor, forming channels into slope.



Photograph 22 - (VS-10 Photo Area D, looking east): Toe of slope in which a 3' deep channel has formed near the southeast fence line.





Photograph 23 - (VS-10 Photo Area E, looking south): Interrilling along gentle sloped area.



Photograph 24 - (Borrow Area/VS-10 Photo Area F, looking northeast): Significant gully erosion, creating channels along steeper slopes.





Photograph 25 - (VS-10 Photo Area F, looking south): Erosion channel exiting VS-10 under the southeast fence line.



Photograph 26 - (Borrow Area/VS-10 Photo Area F, looking east): Erosion along steep slope between VS-10 and Borrow Area. Channel is about 5' to 7' wide and 5' deep near crest of the hill.





Photograph 27 - (Borrow Area/VS-10, looking northwest): Closeup of deep erosional channel at the crest of the hill between the Borrow Area and VS-10.



Photograph 28 - (VS-11 Photo Area A, looking southwest): Looking into VS-11 fenced area, area not impacted by erosion.



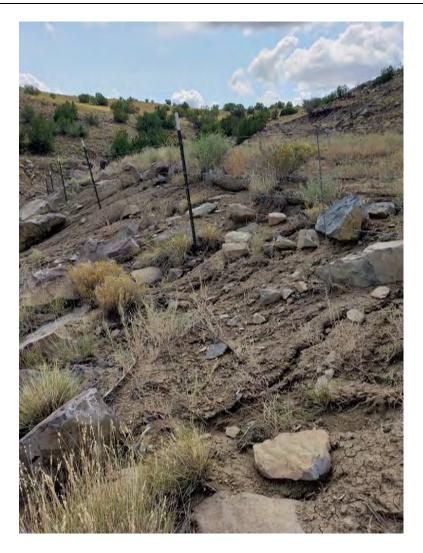


Photograph 29 - (VS-11 Photo Area B, looking southwest): Reference Area along northeast side of VS-11 and adjacent to pre-existing drainage. Rilling erosion does not extend to within the reclamation fenced area.



Photograph 30 -(VS-11 Photo Area C, looking northeast): Reference Area along northeast side of VS-11 and adjacent to pre-existing drainage. (Photo taken September 2021)





Photograph 31 -(VS-11 Photo Area C): Reference Area along northeast side of VS-11 and adjacent to pre-existing drainage. (Photo taken September 2021)





Photograph 32 - (VS-12 Photo Area A, looking northwest): VS-12 condition on the southwest side of the fenced area.



Photograph 33 - (VS-12 Photo Area B, looking northwest): Wood chip wattles providing erosion protection. Interrilling present below wattles.





Photograph 34 - (VS-12 Photo Area B, looking northeast): Looking downhill from wood chip wattles. Wattles have provided some erosion protection. Rilling present on steeper downhill slope.



Photograph 35 -(VS-12 Photo Area C, looking south): Two parallel gullies developing along northwest side of VS-12. Gullies are 1-2' deep in spots.





Photograph 36 - (VS-12 Photo Area D, looking northeast): Two parallel gullies, 1-2' developing along the northeast side of VS-12.



Photograph 37 - (VS-12 Photo Area D, looking west): Hay bales placed at VS-12 fence line. Note channel developing upstream near roadway and entering fence line, along the northwest side of VS-12.





Photograph 38 - (VS-12 Photo Area D, looking west): Close-up of hay bales placed at VS-12 fence line (2014) to slow erosion.



Photograph 39 - (VS-12 Photo Area F, looking southwest): Rilling present at the toe of hill at base of rock armoring.





Photograph 40 - (Stockpile Photo Area A, looking northwest): View of the Stockpile Area.



Photograph 41 - (Stockpile Photo Area B, looking north): Interrilling and rilling on all sides (south, east, and west) of the Stockpile hill despite wattles.





Photograph 42 - (Stockpile Photo Area C, looking north): Wattles on north side of the Stockpile area are controlling erosion.



Photograph 43 - (Borrow Area Photo Area H, looking west): Erosion channel near eastern fence line.





Photograph 44 - (Borrow Area Photo Area G, looking west): Wattles on the borrow area installed to slow surface water runoff.



Photograph 45 - (Borrow Area Photo Area L, looking west): Deep gully/shallow channel forming on the western side of the Borrow Area.