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August 6, 2021

Certified Mail #70182290000117918260

Mr. John Rhoderick, Deputy Director
New Mexico Environment Department
Water Protection Division
P.O. Box 5469
Santa Fe, New Mexico 87502

Dear Mr. Rhoderick:

Re:

**Vegetation Monitoring Report, Razorback Ridge IRA
Smelter/Tailing Soils Investigation Unit - Chino AOC**

Freeport-McMoRan Chino Mines Company (Chino) submits under separate cover the 5-year Vegetation Monitoring Report for the Razorback Ridge Interim Remedial Action Site (IRA), Smelter/Tailing Investigation Unit under the Chino Administrative Order on Consent (AOC). This report was submitted today to Mr. David Mercer, New Mexico Environment Department (NMED) AOC Project Manager.

Please contact Ms. Pam Pinson at (575) 912-5213 if you have any questions regarding this quantitative vegetation survey report.

Sincerely,

A handwritten signature in black ink that reads 'Sherry BurtKested'.

Sherry Burt-Kested
Manager, Environmental Services

SBK:pp
20210805-001

C (via email):

David Mercer, NMED
Joseph Fox, NMED
Petra Sanchez, US EPA
DJ Ennis, MMD
Michael Steward, FCX



REPORT

2019 Quantitative Vegetation Monitoring
Razorback Ridge - East Removal Borrow Area

Submitted to:

Pam Pinson

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Submitted by:

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1.0 INTRODUCTION

Freeport McMoRan Chino Mines Company (Chino) conducted an interim remedial action (IRA) within the Smelter/Tailing Soil Investigations Unit (STSIU) at the Razorback Ridge Area in 2013 and 2014. Razorback Ridge is east of Lake One in areas adjacent to the Whitewater Creek Diversion Channel (Figure 1). The IRA fulfilled part the mitigation requirements within the Smelter/Tailing Soils Investigation Unit (STSIU) as part of an Administrative Order on Consent (AOC) with the New Mexico Environment Department (NMED 1994).

The STSIU IRA was performed at the Razorback Ridge Area where surface soils had been impacted by fallout from historical smelter emissions. The Razorback Ridge Area was originally identified for soil removal action in the Draft Interim Removal Action for the STSIU (BBL 2006) but was also designated as a future borrow area to close the historical Lake One and Slag Pile under Discharge Permit 1340 (DP-1340). The final IRA Work Plan (ARCADIS 2007) describes how impacted Razorback Ridge Area surface soils would be removed as borrow under DP-1340. The remediation plan for the area was not a formal AOC IRA plan but was part of the draft work plan for the Lake One and Slag Pile closure. The Razorback Ridge Area soil excavation and removal activities were reported in detail in the Lake One Construction Design Quality Assurance Report (EMC² 2014). Post-excavation soil sampling and analysis were completed in accordance with the NMED approved STSIU Work Plan using X-ray fluorescence (XRF).

Pursuant to the commitments in the Razorback Ridge Supplemental Completion Report (Golder 2015), Chino performed quarterly qualitative vegetation and erosion monitoring of the remediated areas for four years after initial vegetation establishment. These quarterly reports are provided in Appendix C of this report. To fulfill the vegetation monitoring requirements described in the Completion Report, Chino retained Golder Associates Inc. (Golder) to conduct a quantitative vegetation survey of the East Removal Borrow portion of the Razorback Ridge Area to document the status of the revegetated area five years after seeding. This report conveys the results of the vegetation survey the East Removal Borrow Area conducted in 2019.

1.1 Background

The Razorback Ridge Area is located near the Town of Hurley east of the Lake One reclamation. The area is divided into two sub-areas noted as Razorback Ridge and the East Removal Borrow Area on Figure 2. The two areas are separated by the operational pipeline corridor and the Whitewater Creek Diversion Channel.

This area was characterized during the background investigation (Chino 1995) and the STSIU RI (SRK 2008) as having elevated copper concentrations. The remedial action objectives were specified in the Draft IRA Work Plan (BBL 2006) and the NMED-approved IRA Work Plan (ARCADIS 2007) for the STSIU soil removal. The objective of the IRA was to remove soils in areas with copper concentrations higher than 5,000 milligrams per kilogram (mg/kg). The area identified for soil removal in the Razorback Ridge Area was originally about 123 acres; but under the Draft IRA Work Plan (BBL 2006) the perimeter was adjusted to account for areas that were 1) too steep to safely operate equipment, 2) overlapped with the Lake One reclamation/borrow footprint and 3) part of current operations.

Soil removal for the Razorback Ridge Area was performed from the first quarter of 2013 through June 2014 by Freeport-McMoRan Reclamation Services (FMRS) with confirmation sampling performed by Golder. Soils were excavated to a depth of approximately 12 inches down to 40 feet. Soil removal was accomplished using dozers and a loader. Large dozers pushed the soil to staging areas where it was loaded in haul trucks with the loader. Small dozers were used along excavation boundaries, around trees on the East Removal Borrow Area slope, and to achieve final grade following excavation activities. The upper foot of surface soil at the Razorback Ridge

and East Removal Borrow Area were considered impacted and used as construction fill for Lake One closure that was covered with clean soil material.

The final excavation area was approximately 94 acres. Confirmation sampling and analysis was performed at the East Removal Borrow Area February and March 2014 and on Razorback Ridge during September 2014 (Golder 2015). Analyses were conducted using XRF to verify that the RAC had been achieved by soil removal. Results from the confirmation sampling are found in the IRA completion report (Golder 2015).

Following soil removal and confirmatory sampling, the site was seeded in June 2014, with the exception of an area that was still being used as a borrow source. Revegetation activities at the borrow source was completed in May 2015. All revegetation work was performed by FMRS. The seedbed was prepared by disking the soil surface to approximately 6 inches. Seeding was accomplished with a rangeland drill using a combined drill/broadcast process. The site was then mulched with straw at a rate of 2 tons per acre and crimped to protect the soil surface from erosion during the establishment phase. The seed mix and application rates for the remedial action are listed in Table 1 and are consistent with the Work Plan. Quarterly inspections were performed by Chino beginning in April 2015 for 4 years following seeding and mulching. The inspections confirmed that vegetation was sufficiently established for erosion control.

1.2 Objectives

The primary objective for revegetation of the Razorback Ridge Area is to limit erosion and provide dust control for remediated areas through the re-establishment of a native plant community. A secondary benefit of the reclamation is to establish wildlife habitat.

Per the Completion Report (Golder 2015), Chino is required to conduct a quantitative survey of revegetated areas and submit a report evaluating the site relative to Chino's *Vegetation Success Standards* (Appendix C, Mining and Minerals Division's [MMD] Revision 01-1 to Permit GR009RE). The post-mining land use (PMLU) for Chino Mine is wildlife habitat. Under MMD's guidance for a wildlife PMLU, total canopy cover, shrub density, and plant diversity are evaluated to determine vegetation success (Section 2). The western portion of the IRA, the Razorback Ridge sub-area, is a designated borrow site for cover materials for future closure activities associated with DP-1340. As such, the vegetation survey was limited to only the East Removal Borrow Area for compliance under the AOC.

The intent of this document is to detail the methods and results of the quantitative vegetation monitoring in the remediated areas at the East Removal Borrow Area. On October 4 and 5, 2019, Golder conducted a quantitative vegetation survey of the East Removal Borrow Area to evaluate the progress of the revegetation after five growing seasons. The survey covered approximately 37.5 acres.

2.0 SUCCESS CRITERIA

Revegetation of the Razorback Ridge Area was intended primarily to limit erosion and provide dust control for disturbed areas through re-establishment of a native plant community (Golder 2013). Reclamation success at AOC sites at Chino is evaluated by a reference area approach as described in the *Interim Technical Standards* (ITS, DBS&A 1999) and the *Closure/Closeout Plan* (CCP, Chino 2007). The reclamation success criteria were developed for reclaimed tailing areas and are based upon analysis of vegetation data collected in the Tailing Reference Area (Figure 1). Vegetation monitoring and data analysis procedures are described in Section 3.0.

Under the reference area approach, revegetation success criteria are established for the reclamation in proportion to a mature, native reference area. Reclaimed areas over mine waste are typically eligible for bond release 12

years after seeding. In such cases, both the reclaimed and reference areas are monitored to allow formal hypotheses testing to determine whether the success standards are met. The East Removal Borrow Area technically is not a formal reclamation site as only disturbed native ground was revegetated. Nor is the revegetation expected to have fully progressed in just five years. Therefore, the Tailing Reference Area was not monitored as part of this study. Benchmarks or technical guidance to evaluate the progress and success of the Razorback Ridge Area remediation were developed using reference area data presented in the ITS report (DBS&A 1999) and three quantitative vegetation monitoring reports for the Chino tailing reclamation (Golder 2018, 2019, and 2020). For this report we averaged four years of canopy cover from 1-square meter quadrats and three years of belt transect shrub density data from the Tailing Reference Area to gauge interim vegetation establishment on the East Removal Borrow Area.

Table 2 provides the reclamation success criteria for Chino and the technical guidance used to evaluate the Razorback Ridge Area vegetation status five years after seeding. In summary, revegetation efforts are considered successful when the canopy cover on the reclaimed facility is at least 70% of the reference area canopy cover. Average total canopy cover in the Tailing Reference Area since 1999 was 64.6%, making the success criterion 45.2%. Shrub density is considered adequate if it is at least 60% of the reference area. Average shrub density at the Tailing Reference Area was 3,193 stems per square acre (stems/acre) based on belt transect data collected since 2017 (shrub density was evaluated using a different method in 1999). Thus, the technical guidance for the Razorback Ridge Area IRA vegetation monitoring was set at 1,915 stems/acre.

Revegetation success also evaluates plant community composition in terms of plant form (grasses, forbs, and shrubs). Diversity is evaluated against numerical guidelines established in the ITS (DBS&A 1999) for different structural components of the vegetation (Table 2). In summary, the diversity guideline would be met if at least three warm season grasses and two shrubs each have cover levels of at least 1%, and one perennial, cool- or intermediate-season grass with a minimum cover level of 0.5%. In addition, two non-weedy forb species with a minimum cover level of at least 0.1% are required to meet the diversity guideline. Diversity is also demonstrated by evidence of colonization or recruitment of native plants from adjacent undisturbed areas (i.e., species that were not in the seed mix). Recruitment of native plant species is indicative of ecological succession and the capacity of the site to support a self-sustaining ecosystem. Recruitment is evaluated by inventorying the total number of plant species that occur in the reclamation in comparison to the original seed mix.

3.0 METHODS

Golder conducted the quantitative vegetation survey of the East Removal Borrow Area between October 4 and 5, 2019. Vegetation attributes were quantified using sampling methods approved by the MMD. Golder collected vegetation data using a systematic random sampling procedure employing a transect/quadrat system. A 50-square foot grid was imposed over the reclamation to delineate vegetation sample plots, and random points created in a geographic information system were used to select plots for vegetation sampling. The locations of randomly selected vegetation plots are shown on Figure 2 for the East Removal Borrow Area. In the field, the transect locations were assessed in numerical order. If the transect location was determined to be unsuitable, the next alternative location was assessed for suitability. Unsuitable transects were those that fell on or would intersect roads, drainage ways, or extend beyond the reclamation into native or areas not-representative of the reclamation. For the 2019 sampling, two primary transects were replaced by alternates because the primary transects extended beyond the reclamation into a talus slope and a drainage way.

Transects originated from the southeastern corner of the vegetation plot. Each transect was 30 meters (m) long in a dog leg pattern (Figure 3). Four 1-m² quadrats were located at pre-determined intervals along the transect for quantitative vegetation measurements. Each quadrat is considered an individual sample where measurements were made of total canopy, species canopy and basal cover; and surface litter, surface rock fragments, and bare soil. Not all plant species observed during the quantitative vegetation monitoring are expected to occur in the sampling quadrats. Prior to and during formal sampling, the site was traversed on foot to inventory the plant community.

3.1 Vegetation and Ground Cover

Field scientists determined species canopy cover, total canopy cover, basal cover, surface litter, surface rock fragments, and bare soil in each quadrat. Plant frequency was determined on a species-basis by counting the number of individual plants rooted in each quadrat. Percent area cards with a minimum resolution of 0.05 percent were used to increase accuracy and consistency of the measurements. Cover estimates less than 0.05 percent were entered as trace amounts.

Canopy cover is the percentage of quadrat area included in the vertical projection of the canopy (Daubenmire 1968). Canopy cover estimates made on the species basis may exceed 100 percent in individual quadrats where the vegetation overlaps (multi-layered canopies). In contrast, the sum of total canopy cover, surface litter, rock fragments, and bare soil does not exceed 100 percent. Relative canopy cover is presented to assess contributions of individual plant species cover and is calculated by dividing the percent canopy cover of a plant species by the mean total species canopy cover of the sampling unit.

Basal cover is the proportion of ground occupied by the crowns of grasses and rooting stems of forbs and shrubs. Like the total cover estimates, basal cover estimates do not exceed 100 percent. Photographs of each transect and quadrat were taken to preserve a record of the conditions at the time of sampling.

3.2 Shrub Density

Shrub density, or the number of woody plants per area, was determined using a belt transect method (Bonham, 1989). Shrub density was determined from a 2-meter wide, 30-meter long belt transect along the perimeter of the dog-legged transect (Figure 3). Shrubs rooted in the belt transect were counted. Counts were made on a species basis. Shrub density was also calculated based on plant frequency data collected for each quadrat.

3.3 Plant Diversity

Plant diversity is assessed by comparing the number and occurrence of perennial species by life form found in the remediated East Removal Borrow Area to the technical standard developed for Chino (Section 2). The number of perennial grass (warm and cool seasons), perennial forb, and shrub species observed within the quadrats and their associated cover levels were compared to the technical standard (Table 2).

3.4 Sample Adequacy

The number of samples required to characterize a particular vegetation attribute depends on the uniformity of the vegetation and the desired degree of certainty required for the analysis. Sample adequacy is the minimum number of samples required to estimate a parameter within a given level of precision (Cochran 1977) and must be met for classical null hypothesis testing for bond release comparisons (MMD 1999). In contrast, vegetation monitoring activities, like those performed at the East Removal Borrow Area, do not need to have this level of statistical rigor. Often it is impractical to achieve sample adequacy in vegetation monitoring studies and a

minimum sample number approach is taken. MMD recognizes this limitation and has provided minimum sample sizes for various quantitative methods (MMD 1996).

The number of samples necessary to meet sample adequacy was calculated for total canopy cover and shrub density assuming the data were normally distributed using Snedecor and Cochran (1967).

$$N_{min} = \frac{t^2 s^2}{(\bar{x}D)^2}$$

Where N_{min} equals minimum number of samples required, t is the two-tailed t-distribution value based on a 90% level of confidence with $n-1$ degrees of freedom, s is the standard deviation of the sample data, \bar{x} is the mean, and D is the desired level of accuracy, which is 10% of the mean. Sample adequacy (discussed in the Results Section and in Table 4) is achieved when there is 90% confidence that the sample mean for total canopy cover is within 10% of the true population mean. The vegetation monitoring of the remediated site does not require or did not attempt to meet sample adequacy, though the number of samples necessary to meet sample adequacy is reported.

4.0 RESULTS

This section provides a summary of the precipitation regime since the East Removal Borrow Area was seeded and the results of the 2019 monitoring event. Vegetation attributes were measured at 20 quadrats along 5 randomly located transects within the remediated site (Figure 2). Work was performed on October 4 and 5, 2019. The tables in Appendix A summarize individual quadrat data, photographs of the quadrats are provided in Appendix B.

4.1 Precipitation

The amount and distribution of precipitation are important determinants for the progression of vegetation particularly during the establishment phases of reclamation. Once established, the precipitation dynamics affect the vegetation cover levels on a year-to-year basis, with grasses and forbs showing the most immediate affects.

The nearest precipitation gauge to the East Removal Borrow Area is about 4 miles southwest, near Pond 7. Cumulative annual precipitation in 2019 was 13.46 inches and was below the long-term average of 15.8 inches (Table 3). The growing season precipitation in 2019 was 5.49 inches and was also below the long-term average of 9.97 inches. While the total annual precipitation was above the regional average of about 16 inches at Ft. Bayard (WRCC 2019) in 2017, pronounced annual and seasonal precipitation deficits have been common in the region. Since seeding the site in 2014, growing season precipitation has been slightly to well below average for six of the last seven years, with 2017 being above average (Figure 4).

4.2 Canopy Cover

Canopy cover at the East Removal Borrow Area was less than the proportional cover requirement of 70% of the Reference Area (Table 4). Mean total canopy cover was $38.4\% \pm 7.7\%$ (90% CI), which is about 59% of the Reference Area average total canopy cover (64.6%). Vegetation canopy cover in the 20 individual quadrats ranged from 3.3 to 77.5% (Appendix A, Table A1). Mean perennial canopy cover was $36.0\% \pm 8.0\%$ (90% CI) and ranged from 2.7 to 79.2% in the individual quadrats. The ground cover components for the East Removal Borrow Area are displayed on Figure 5a and consists of 38.4% vegetation, 17.1% rock, 13.4% litter, and 31.1% bare soil.

These values are within expectations for the site and age of the remediation. The calculated N_{\min} for canopy cover was 88 samples (Table 4).

The proportional or relative canopy cover for the plant classes (annual grasses, perennial grasses, annual forbs, perennial forbs, and shrubs) is illustrated in Figure 5b for the East Removal Borrow Area. Perennial grasses contribute the most to vegetation canopy cover with a relative contribution of 62.2%. Sideoats grama (*Bouteloua curtipendula*), a warm-season perennial grass and spike dropseed (*Sporobolus contractus*) an intermediate season perennial grass, were the most abundant (Table 5). Perennial forbs represented 17.3% of the total relative canopy, with Wright's thimblehead (*Hymenothrix wrightii*) contributing the most canopy cover of the forb species recorded by the quadrats. Relative annual forb cover was 10.88% and included eight species, with New Mexico goosefoot (*Chenopodium neomexicanum*) contributing the most canopy cover (Figure 5). Relative shrub cover was 9.55% and included four species, with four-wing saltbush (*Atriplex canescens*) contributing the most canopy cover. Annual grasses contributed the least to canopy cover with 0.05% relative canopy cover on the reclamation.

4.3 Basal Cover

Basal cover associated with vegetation is a fraction of the total canopy cover and reflects the morphology of the predominant vegetation in the Chino Mine operational area (i.e., bunchgrasses, annual forbs, and shrubs). Although basal cover is not evaluated for revegetation success, it was measured to aid in ecological interpretations of a site. Basal cover is an important attribute because it is less affected by annual climatic variations than canopy cover, and thus, provides a consistent basis for evaluating reclamation success and changes in community structure.

The mean basal cover at the East Removal Borrow Area was $2.4\% \pm 0.6\%$ (90% CI, Table 4). Vegetation basal cover in the individual quadrats ($n=20$) ranged from 0.1 to 5.7% (Appendix A, Table A2). The ground cover components on a basal basis for the East Removal Borrow Area are displayed on Figure 6a and consists of 2.4% vegetation, 24.4% rock, 24.7% litter, and 48.5% bare soil. The calculated N_{\min} for basal cover was 123 samples (Table 4).

The proportional or relative basal cover for the plant classes (annual grasses, perennial grasses, annual forbs, perennial forbs, and shrubs) is illustrated in Figure 6b for the East Removal Borrow Area. Basal cover on the reclamation is dominated by perennial grasses with almost 82% relative basal cover.

4.4 Shrub Density

Shrub density at the East Removal Borrow Area was equivalent the proportional shrub density requirement of 60% of the Reference Area (Table 4) as determined by the belt transect ($n=5$) but was less than the shrub frequency in the quadrats ($n=20$). Based on stem frequency in the quadrats, mean shrub density was 2,023 stems/ac on the reclamation and 11,001 stems/ac on the Reference Area. Four of the of the 14 woody plant species identified on the East Removal Borrow Area were captured in the quadrat data (Table 5). Mean shrub density determined by belt transects was 1,916 stems/ac on the reclamation which is equivalent to the 60% Reference Area standard (Table 4). Shrub density for the remediated East Removal Borrow Area is considered more than satisfactory at this stage of the reclamation. Nine shrub species were encountered in the belt transects with four-wing saltbush being the most frequently measured species (Appendix A, Table A4). The calculated N_{\min} for shrub density on the East Removal Borrow Area was 944 samples for frequency data and 76 samples for the belt transects (Table 4).

4.5 Diversity

In the fall of 2019, 72 species were identified in the reclaimed plant community on the East Removal Borrow Area (Table 5). With only 15 species in the seed mix (Table 1), these data indicate plant diversity is increasing in response to colonization of native species from the surrounding ecosystems. Annual weedy species like cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*) occur at very low levels. In 2019, 46 species were captured in the 20 individual quadrats on the reclamation.

The vegetation on the East Removal Borrow Area meets the diversity requirements for warm-season grasses, cool/intermediate-season grasses, and forbs but not for shrubs. Four warm-season perennial grasses met the 1.0% cover diversity standard, including sideoats grama (8.6%), James' galleta (4.1%, *Pleuraphis jamesii*), blue grama (4.0%, *Bouteloua gracilis*), and green sprangletop (3.7%, *Leptochloa dubia*) (Table 5). The intermediate season grass spike dropseed (4.3%) meets the diversity standard for one cool- or intermediate season grass with 0.5% cover. Without consideration for duration, 17 forbs exceed the 0.1% cover diversity standard for forb cover. Excluding annuals, the forbs with the greatest canopy cover are Wright's thimblehead (1.7%) and tansyleaf tansyaster (1.5%, *Machaeranthera tanacetifolia*). Four-wing saltbush was the only shrub meeting the 1.0% canopy cover diversity standard, with canopy cover estimated at 3.5%. Other shrubs that contributed to canopy cover included soaptree yucca (0.4%, *Yucca elata*), with both broom snakeweed (*Gutierrezia sarothrae*), and threadleaf groundsel (*Senecio flaccidus*) contributing <0.1% each. Although four-wing saltbush is recorded as dominant, 14 woody plants are present on the reclamation in the East Removal Borrow Area. A representative photograph of the vegetation on the East Removal Borrow Area for 2019 is shown in Figure 7.

5.0 SUMMARY

The primary objective for revegetation of the East Removal Borrow Area is to limit wind and water erosion for remediated areas through the re-establishment of a native plant community. Golder conducted a quantitative vegetation survey of the site to document the progress of revegetation five years after completion of the IRA. Canopy cover, shrub density and diversity were measured and compared to the reference area technical guidance for Chino South Mine. This guidance is typically applied in 2 of the last 4 years of the 12-year liability period after seeding as part of demonstrating reclamation success.

The revegetation efforts associated with the IRA at the Razorback Ridge Area are considered successful. An early-seral stage mixed grama-shrub community is well established across the East Removal Borrow Area. Based on the 2019 sampling, mean total canopy cover in the fifth growing season is 38.4%, which is 65% of the 12-year Reference Area guidance for canopy cover. Given the less than favorable precipitation during the vegetation establishment period and the condition of the plant community in 2019, the strong canopy cover demonstrates that the remediated site is resilient and self-sustaining. Shrub density was considered satisfactory at about 2,000 stems/acre as measured by both the belt transect or quadrat frequency method but was lower than the average shrub density for the Reference Area.

Fifty-seven plant species that were not included in the reclamation seed mix were identified at the East Removal Borrow Area. Recruitment of native plant species into the reclaimed plant community demonstrates the process of ecological succession and the gradual establishment of self-sustaining ecosystem. Vegetation on the remediated site meets the diversity requirements for forbs and warm-season and cool/intermediate-season grasses. Four warm-season, perennial grasses met the minimum occurrence of 1% canopy cover. One intermediate-season perennial grass met the cool/intermediate-season grass standard of 0.5%. Three biennial/perennial forbs met the

minimum occurrence of 0.1% canopy cover. Only one woody plant species met the 1% canopy cover minimum occurrence.

No significant erosion issues were documented during the 5-year monitoring period, and the currently established plant community meets the overall objective as a best management practice for erosion control. The reclaimed plant community provides significant canopy cover, while also providing both ecological and rangeland values to the area.

Results from the 2019 vegetation survey of the Razorback Ridge Area IRA indicate that revegetation efforts were successful, and the remediated area can support a self-sustaining ecosystem. The survey data demonstrate that the vegetation on the East Removal Borrow Area is performing well for this early stage of the reclamation. The site supports a viable self-sustaining vegetated cover that is approaching Chino's vegetation success standards for total canopy cover and diversity and progressing toward the IRA objective to return the area to a post-mining beneficial use (i.e., wildlife habitat). No additional vegetation monitoring is recommended as the interim remedial action for the remediated site will remain under the oversight of the Chino AOC and will be addressed and released under the STSIU's Record of Decision.

6.0 REFERENCES

- ARCADIS US, Inc. (ARCADIS). 2007. Administrative Order on Consent, Interim Removal Action Work Plan, Smelter/Tailing Soil Investigation Units. Prepared for Chino Mines Company, November 2007.
- BBL. 2006. Administrative Order on Consent, Excavation Interim Action Work Plan, Smelter/Tailing Soil Investigation Units Work Plan, Chino Mines Company. August 2006.
- Bonham, C.D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons, New York.
- Chino Mines Company (Chino), 1995. Administrative Order on Consent, Investigation Area, Remedial Investigation Background Report, Chino Mine Investigation Area. Hurley, New Mexico, October 5, 1995.
- Chino. 2007. Chino Closure/Closeout Plan Update. Chino Mines Company, Hurley, New Mexico. Prepared for New Mexico Environment Department. August 28, 2007.
- Cochran, W.G. 1977. Sampling Techniques, 3rd edition. John Wiley & Sons, New York.
- Daniel B. Stephens and Associates (DBS&A). 1999. Interim Technical Standards for Revegetation Success, Prepared for Chino Mines Company, Hurley, New Mexico. November 30, 1999.
- Daubenmire, R. 1968. Plant Communities: A Textbook of Plant Synecology. Harper & Row, Publishers, New York.
- EMC². 2014. Agency Draft Construction Quality Assurance Report Lake One Reclamation Chino Mines Company – Hurley, New Mexico, submitted to Chino Mines Company, dated August 29, 2014
- Golder Associates Inc. (Golder). 2013. Supplemental Completion Report: Interim Remedial Action Smelter/Tailing Soils Investigation Unit. Prepared for Chino Mines Company. May 2013.
- Golder. 2015. Chino Stockpile Test Plots 2015 Addendum Report. Prepared for Chino Mines Company. December 2015.
- Golder. 2015. Supplemental Completion Report, Razorback Ridge Area, Interim Remedial Action, Smelter/Tailing Soils Investigation Unit. Prepared for Chino Mines Company, October 2015.

- Golder. 2016. Vegetation Monitoring Report: Groundhog Mine Site and Small Stockpile Sites, Interim Remedial Actions, Hanover and Whitewater Creeks Investigation Units. Prepared for Chino Mines Company. September 2016.
- Golder. 2018. Vegetation and Wildlife Monitoring – 2017, Tailing Ponds B/C and Lake One, Prepared for Chino Mines Company. April 2018.
- Golder. 2019. 2018 Quantitative Vegetation Monitoring, Chino Mine, Tailing Ponds 4 & 6 and Reference Area. Prepared for Freeport-McMoRan Chino Mines Company. April 2019.
- Golder. 2020. 2019 Quantitative Vegetation Monitoring, Chino Mine, Tailing Ponds 1&2 and Reference Area. Prepared for Freeport-McMoRan Chino Mines Company. April 2020.
- Mining and Minerals Division (MMD). 1996. Draft Closeout Plan Guidelines for Existing Mines. Mining Act Reclamation Bureau, Santa Fe, NM. April 30.
- MMD. 1999. Coal Mine Reclamation Program Vegetation Standards. 19.8 NMAC Attachment 1. Santa Fe, NM. December 15.
- New Mexico Environment Department (NMED). 1994. Administrative Order on Consent, Chino Mines Company and New Mexico Environmental Department. December 23.
- NMED. 2010. Letter from Ron Curry (NMED) to Timothy Eastep (Chino) Re: Pre-Feasibility Study Remedial Action Criteria (Pre-FS RAC), Smelter and Tailing Soils Investigation Unit (S/TSIU), Chino Administrative Order on Consent (Chino AOC). September 16, 2010.
- NMED. 2011. Letter from William Olsen (NMED) to Ned Hall (Chino) Re: Chino AOC Informal Dispute Resolution, Smelter and Tailing Soils Investigation Unit. March 3, 2011.
- Snedecor, G.W., and W.G. Cochran. 1967. Statistical Methods. Iowa State University Press. 593 pp.
- SRK Consultants (SRK), 2008. Administrative Order on Consent Remedial Investigation Report, Smelter/Tailing Soil Investigation Unit (revised). Hurley, New Mexico, February 6, 2008.

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Tables

Figures

APPENDIX A

Vegetation Quadrat Data

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Vegetation Quadrat Photos

APPENDIX C

Quarterly Erosion and Vegetation Monitoring



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Table 1: Seed Mix Used for the Razorback Ridge Area

Scientific Name	Common Name	Code	Life Form	Duration	Seasonality	Approximate Application Rate ¹
<i>Achnatherum hymenoides</i>	Indian ricegrass	ACHY	Grass	Perennial	Cool	1.42
<i>Elymus elymoides</i>	Bottlebrush squirreltail	ELEL	Grass	Perennial	Cool	1.21
<i>Elymus lanceolatus ssp. psammophilus</i>	Streambank wheatgrass	ELLAP	Grass	Perennial	Cool	0.47
<i>Bouteloua curtipendula</i>	Sideoats grama	BOCU	Grass	Perennial	Warm	1.09
<i>Bouteloua gracilis</i>	Blue grama	BOGR2	Grass	Perennial	Warm	0.24
<i>Leptochloa dubia</i>	Green sprangletop	LEDU	Grass	Perennial	Warm	0.48
<i>Pleuraphis jamesii</i>	James' galleta	PLJA	Grass	Perennial	Warm	0.38
<i>Sporobolus cryptandrus</i>	Sand dropseed	SPCR	Grass	Perennial	Warm	0.08
<i>Dalea candida</i>	White prairie clover	DACA	Forb	Perennial	NA	0.18
<i>Linum lewisii</i>	Lewis flax	LILE	Forb	Perennial	NA	0.16
<i>Ratibida columnifera</i>	Upright prairie coneflower	RACO3	Forb	Perennial	NA	0.29
<i>Atriplex canescens</i>	Four-wing saltbush	ATCA	Shrub	Perennial	NA	1.57
<i>Calliandra eriophylla</i>	Fairyduster	CAER	Shrub	Perennial	NA	0.03
<i>Ericameria nauseosa</i>	Rubber rabbitbrush	ERNA	Shrub	Perennial	NA	0.21
<i>Krascheninnikovia lanata</i>	Winterfat	KRLA	Shrub	Perennial	NA	0.55
Total (lbs/ac)						8.37

Notes:

¹ Rate is in pounds of pure live seed (PLS) per acre (lb/ac)

NA = Not applicable

Table 2: Chino Mine Reclamation Success Standards and Technical Guidance for the Razorback Ridge Area

Proportion of Reference Area¹			
<i>Attribute</i>	<i>Value</i>	<i>Reference Area</i>	<i>12-year Success Standard</i>
Canopy Cover	70%	64.6%	45.20%
Shrub Density (stems/acre)	60%	3,193	1,916

Plant Diversity Technical Guidance			
<i>Plant Class</i>	<i>Seasonality</i>	<i>Number of Species</i>	<i>Minimum Occurrence (% cover)</i>
Perennial grass	Warm	3	1
Perennial grass	Cool	1	0.5
Shrub	NA	2	1
Forb	NA	2	0.1

Notes:

¹ Average cover and density attributes are tested at the 90% confidence level

NA - Not Applicable

Table 3: Monthly and Annual Precipitation for Pond 7

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual	Seasonal
2010	2.09	0.95	0.49	0.24	0.12	0.29	6.37	1.82	1.01	0.42	0.00	0.20	14.00	9.61
2011	0.01	0.05	0.00	0.00	0.00	0.09	1.64	3.58	0.66	0.51	0.92	3.08	10.54	5.97
2012	0.18	0.70	0.16	0.00	0.08	0.02	0.92	2.04	0.68	0.08	0.00	0.23	5.09	3.74
2013	0.56	0.00	0.00	0.04	0.00	0.00	3.80	1.92	1.75	0.00	0.78	0.74	9.59	7.47
2014	0.00	0.00	0.39*	0.24	0.00	1.14	1.49	1.70	4.98	1.57	0.21	0.61	11.94	9.31
2015	1.66	0.34	0.39	0.11	0.17	1.65	2.54	2.89	1.36	1.85	0.66	0.41	14.03	8.61
2016	0.58	0.13	0.01	0.51	0.13	0.42	1.59	2.60	1.07	0.15	3.82	1.60	12.61	5.81
2017	2.73	1.04	0.02	0.01	0.36	1.29	2.92	6.49	0.39	0.30	0.23	0.34	16.12	11.45
2018	0.07	1.50	0.01	0.00	0.00	1.09	2.87	0.49	1.96	2.38	0.18	1.34	11.89	6.41
2019	0.70	0.33	0.52	0.19	0.14	0.50	1.14	1.79	1.92	0.85	4.23	1.15	13.46	5.49
Fort Bayard**	0.88	0.85	0.68	0.38	0.47	0.82	3.32	3.30	2.06	1.24	0.75	1.05	15.80	9.97

Notes:

Seasonal = Growing Season months are assessed for May through September

* Partial data for month

** Long-term average from Western Regional Climate Center

Table 4: Summary Statistics for the East Removal Borrow Area

	East Removal Borrow Area	Chino Tailing Reference Area ⁴
Total Canopy (%)		
Mean	38.4	64.6 (45.2)
Standard Deviation	20.9	
90% Confidence Interval	7.7	
N _{min} ³	88	
Probability within true mean ²	0.59	
Basal Cover (%)		
Mean	2.4	NA
Standard Deviation	1.6	
90% Confidence Interval	0.6	
N _{min} ³	123	
Probability within true mean ²	0.61	
Shrub Density (stems/acre) from Quadrats		
Mean	2,023	11,001 (6,600)
Standard Deviation	3,596	
90% Confidence Interval	1,323	
N _{min} ³	944	
Probability within true mean ²	0.78	
Shrub Density (stems/acre) from Belt Transect		
Mean	1,916	3,193 (1,916)
Standard Deviation	785	
90% Confidence Interval	577	
N _{min} ³	76	
Probability within true mean ²	0.53	

Notes:

¹ Minimum number of samples required to obtain 90% probability that the sample mean is within 10% of the population mean

² Probability the true value of the mean is within 10 percent of the mean for the sample size

³ Minimum number of samples required at 80 percent level of confidence that the sample mean is within 10 percent of the population mean

⁴ Reference Area total cover means are based on four years of data (1998, 2017-2019). Shrub density means based on 3 years of data (2017-2019). Proportional success standard in parenthesis

Table 5: Comprehensive Plant List, Vegetation Cover, and Density for the East Removal Borrow Area

Scientific Name	Common Name	Code	Mean Vegetation Cover (%)			Mean Density (plants/m ²) ^b
			Canopy	Basal	Relative Cover ^a	
Cool-Season Grasses						
<i>Annual</i>						
<i>Bromus tectorum</i>	Cheatgrass	BRTE	<0.1	<0.01	0.01	0.05
<i>Perennial</i>						
<i>Achnatherum hymenoides</i>	Indian ricegrass	ACHY	0.4	0.01	0.86	0.35
<i>Elymus elymoides</i>	Bottlebrush squirreltail	ELEL	obs	obs	obs	obs
Intermediate Season Grasses						
<i>Perennial</i>						
<i>Sporobolus contractus</i>	Spike dropseed	SPCO4	4.3	0.21	10.73	3.70
<i>Sporobolus cryptandrus</i>	Sand dropseed	SPCR	<0.1	<0.01	0.07	0.15
Warm-Season Grasses						
<i>Annuals</i>						
<i>Aristida adscensionis</i>	Six-weeks threeawn	ARAD	<0.1	<0.01	0.04	0.25
<i>Bouteloua barbata</i>	Sixweeks grama	BOBA2	obs	obs	obs	obs
<i>Chloris virgata</i>	Feather fingergrass	CHV14	obs	obs	obs	obs
<i>Perennial</i>						
<i>Aristida purpurea</i>	Purple threeawn	ARPU	obs	obs	obs	obs
<i>Aristida ternipes</i>	Spidergrass	ARTE3	<0.1	0.02	0.23	0.40
<i>Bothriochloa barbinodis</i>	Cane bluestem	BOBA3	obs	obs	obs	obs
<i>Bouteloua curtipendula</i>	Sideoats grama	BOCU	8.6	0.77	21.34	13.45
<i>Bouteloua gracilis</i>	Blue grama	BOGR2	4.0	0.52	9.92	10.20
<i>Dasyochloa pulchella</i>	Low woollygrass	DAPU7	<0.1	<0.01	0.02	0.25
<i>Leptochloa dubia</i>	Green sprangletop	LEDU	3.7	0.22	9.01	5.50
<i>Pleuraphis jamesii</i>	James' galleta	PLJA	4.1	0.25	10.00	6.25
<i>Setaria leucopila</i>	Streambank bristlegrass	SELE6	obs	obs	obs	obs
Forbs						
<i>Annual</i>						
<i>Amaranthus palmeri</i>	Carelessweed	AMPA	<0.1	<0.01	0.22	0.20
<i>Chenopodium neomexicanum</i>	New Mexico goosefoot	CHNE	1.6	<0.01	3.95	0.05
<i>Chamaesyce prostrata</i>	Spurge	CHPR	0.2	<0.01	0.41	0.65
<i>Eriogonum polycladon</i>	Annual pink buckwheat	ERPO	0.4	<0.01	0.89	0.65
<i>Heliomeris longifolia</i>	Longleaf false goldeneye	HELO6	<0.1	<0.01	0.06	0.05
<i>Heterotheca subaxillaris</i>	Telegraph plant	HESU3	0.5	0.02	1.15	1.50
<i>Machaeranthera gracilis</i>	Slender goldenweed	MAGR	0.3	<0.01	0.73	1.80
<i>Salsola tragus</i>	Russian thistle	SATR	1.4	0.04	3.47	5.05
<i>Annual/Biennial/Perennial</i>						
<i>Astragalus nuttallianus</i>	Smallflowered milkvetch	ASNU4	<0.1	<0.01	0.19	0.10
<i>Glandularia bipinnatifida</i>	Dakota mock vervain	GLBI2	obs	obs	obs	obs

Table 5: Comprehensive Plant List, Vegetation Cover, and Density for the East Removal Borrow Area

Scientific Name	Common Name	Code	Mean Vegetation Cover (%)			Mean Density (plants/m ²) ^b
			Canopy	Basal	Relative Cover ^a	
Forbs (cont.)						
<i>Annual/Biennial/Perennial</i>						
<i>Hymenothrix wrightii</i>	Wright's thimblehead	HYWR	1.7	0.05	4.20	1.20
<i>Machaeranthera canescens</i>	Purple aster	MACA	obs	obs	obs	obs
<i>Machaeranthera tanacetifolia</i>	Tansyleaf tansyaster	MATA	1.5	0.03	3.71	3.95
<i>Medicago sativa</i>	Alfalfa	MESA	obs	obs	obs	obs
<i>Mentzelia multiflora</i>	Adonis blazingstar	MEMU	0.5	<0.01	1.15	0.20
<i>Portulaca pilosa</i>	Rose purslane	POPI3	<0.1	<0.01	0.19	0.10
<i>Ranunculus species</i>	Unknown buttercup species	RANUN	obs	obs	obs	obs
<i>Tragopogon dubius</i>	Yellow salsify	TRDU	obs	obs	obs	obs
<i>Perennial</i>						
<i>Astragalus mollissimus</i>	Woolly locoweed	ASMO7	<0.1	<0.01	0.09	0.05
<i>Astragalus parryi</i>	Parry's milkvetch	ASPA13	<0.1	<0.01	<0.01	0.05
<i>Chamaesyce albomarginata</i>	Rattlesnake weed	CHAL11	0.3	<0.01	0.62	0.20
<i>Chaetopappa ericoides</i>	Rose heath	CHER	<0.1	<0.01	0.10	0.45
<i>Cirsium species</i>	Unknown thistle species	CIRSI	<0.1	<0.01	0.12	0.05
<i>Dalea candida</i>	White prairie clover	DACA	obs	obs	obs	obs
<i>Dalea lanata</i>	Woolly prairie clover	DALA3	<0.1	<0.01	<0.01	0.05
<i>Dalea nana</i>	Dwarf dalea	DANA	<0.1	<0.01	0.20	0.15
<i>Eriogonum racemosum</i>	Redroot buckwheat	ERRA3	0.3	<0.01	0.62	0.25
<i>Eriogonum wrightii</i>	Bastardsage	ERWR	<0.1	<0.01	0.04	0.05
<i>Hoffmannseggia glauca</i>	Hog potato	HOGL2	0.3	<0.01	0.65	0.85
<i>Linum lewisii</i>	Lewis flax	LILE	0.4	0.05	0.86	0.05
<i>Lotus wrightii</i>	Wright's deervetch	LOWR	<0.1	<0.01	<0.01	0.05
<i>Mirabilis linearis</i>	Narrowleaf four-o'clock	MILI	0.6	<0.01	1.36	0.05
<i>Ratibida columnifera</i>	Upright prairie coneflower	RACO3	obs	obs	obs	obs
<i>Senna bauhinioides</i>	Twinleaf senna	SEBA3	0.7	0.10	1.64	1.25
<i>Solanum douglasii</i>	Greenspot nightshade	SODO	<0.1	<0.01	0.12	0.10
<i>Solanum elaeagnifolium</i>	Silverleaf nightshade	SOEL	0.2	<0.01	0.43	0.55
<i>Sphaeralcea coccinea</i>	Scarlet globemallow	SPCO	obs	obs	obs	obs
<i>Sphaeralcea fendleri</i>	Fendler's globemallow	SPFE	obs	obs	obs	obs
<i>Sphaeralcea emoryi</i>	Emory's globemallow	SPEM	<0.1	<0.01	0.03	0.05
<i>Stephanomeria pauciflora</i>	Skeleton weed/ brownplume wirelettuce	STPA4	obs	obs	obs	obs
<i>Thelesperma megapotamicum</i>	Hopi tea greenthread	THME	0.4	<0.01	1.00	11.25

Table 5: Comprehensive Plant List, Vegetation Cover, and Density for the East Removal Borrow Area

Scientific Name	Common Name	Code	Mean Vegetation Cover (%)			Mean Density (plants/m ²) ^b
			Canopy	Basal	Relative Cover ^a	
Shrubs, Trees, and Cacti						
<i>Artemisia ludoviciana</i>	White sagebrush	ARLU	obs	obs	obs	obs
<i>Atriplex canescens</i>	Four-wing saltbush	ATCA	3.5	0.04	8.58	0.25
<i>Baccharis salicifolia</i>	Mule-fat	BASA4	obs	obs	obs	obs
<i>Calliandra eriophylla</i>	Fairyduster	CAER	obs	obs	obs	obs
<i>Gutierrezia sarothrae</i>	Broom snakeweed	GUSA	<0.1	<0.01	<0.01	0.10
<i>Isocoma tenuisecta</i>	Burroweed	ISTE2	obs	obs	obs	obs
<i>Juniperus deppeana</i>	Alligator juniper	JUDE2	obs	obs	obs	obs
<i>Juniperus monosperma</i>	Oneseed juniper	JUMO	obs	obs	obs	obs
<i>Krascheninnikovia lanata</i>	Winterfat	KRLA	obs	obs	obs	obs
<i>Prosopis glandulosa</i>	Honey mesquite	PRGL	obs	obs	obs	obs
<i>Senecio flaccidus</i>	Threadleaf groundsel	SEFL3	<0.1	<0.01	0.01	0.05
<i>Ulmus pumila</i>	Siberian elm	ULPU	obs	obs	obs	obs
<i>Yucca elata</i>	Soaptree yucca	YUEL	0.4	0.02	0.93	0.10
<i>Zinnia grandiflora</i>	Rocky Mountain zinnia	ZIGR	obs	obs	obs	obs
Cover Components						
Perennial Cover			36.0	NA		
Total Vegetation Cover			38.4	2.44		
Rock			17.1	24.37		
Litter			13.4	24.71		
Bare Soil			31.1	48.48		

Notes:

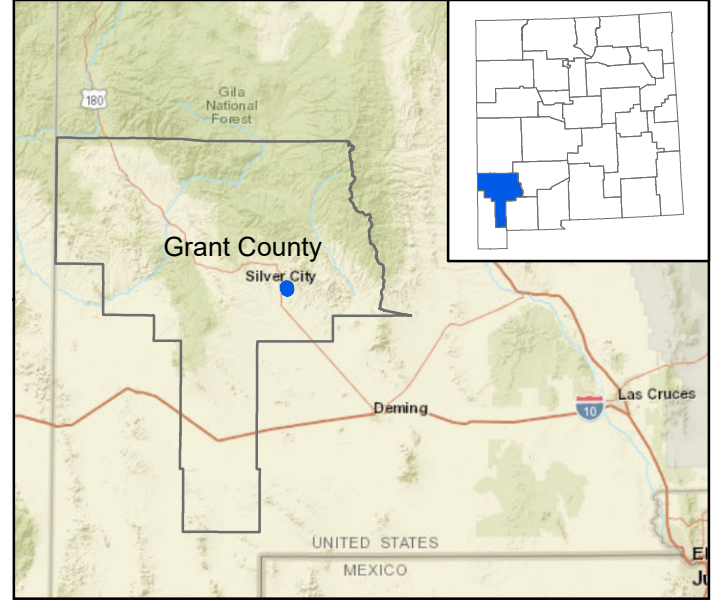
^a Relative Cover = the percent canopy cover of a plant species divided by the mean total species canopy cover of the sampling unit^b 0.01 plants per square meter (plants/m²) is equal to 40.5 stems per acre (plants/ac)

obs = observed on the site during monitoring, but not recorded in the quadrats

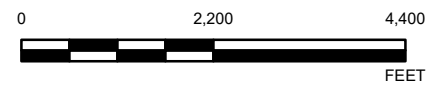
-- = annual plants and the unknown thistle species were not used to calculate relative cover

Duration for plants is from the USDA Plants Database

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- LEGEND**
- Razorback Ridge Borrow Area East
 - Removal Borrow Area
 - Chino Tailing Impoundments
 - Tailing Reference Area



DRAFT

REFERENCE(S)
 1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
 SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET
 PROJECTION: TRANSVERSE MERCATOR
 DATUM: NORTH AMERICAN 1983

CLIENT
 FREEPORT MCMORAN CHINO MINES COMPANY
 RAZORBACK RIDGE AREA IRA
 GRANT COUNTY, NEW MEXICO

PROJECT
 2019 QUANTITATIVE VEGETATION MONITORING
 RAZORBACK RIDGE AREA

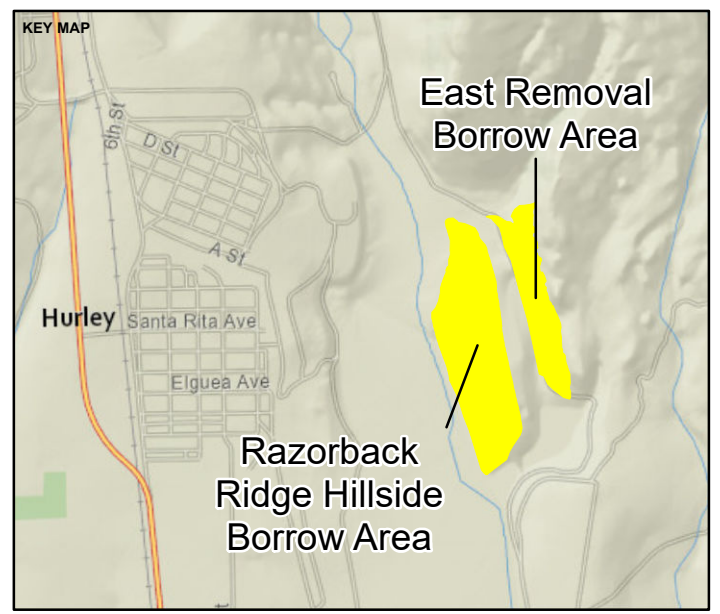
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CONSULTANT	YYYY-MM-DD	2020-04-23
GOLDER	DESIGNED	DSW
	PREPARED	GFD
	REVIEWED	DR
	APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
19128014	A003	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS I B

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- LEGEND**
- Vegetation Monitoring Transects
 - Razorback Ridge Borrow Area East
 - Removal Borrow Area
 - Lake One Reclamation



DRAFT

REFERENCE(S)
 1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY NATIONAL GEOGRAPHIC, ESRI, GARMIN, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, INCREMENT P CORP.

COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET
 PROJECTION: TRANSVERSE MERCATOR
 DATUM: NORTH AMERICAN 1983

CLIENT
 FREEPORT MCMORAN CHINO MINES COMPANY
 RAZORBACK RIDGE AREA IRA
 GRANT COUNTY, NEW MEXICO

PROJECT
 2019 QUANTITATIVE VEGETATION MONITORING
 RAZORBACK RIDGE AREA

TITLE
 RAZORBACK RIDGE AREA
 VEGETATION TRANSECT LOCATIONS, 2019

CONSULTANT	YYYY-MM-DD	2020-04-23
GOLDER	DESIGNED	DSW
	PREPARED	GFD
	REVIEWED	DR
	APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSIB

Figure 3: Vegetation Plot, Transect, and Quadrat Layout

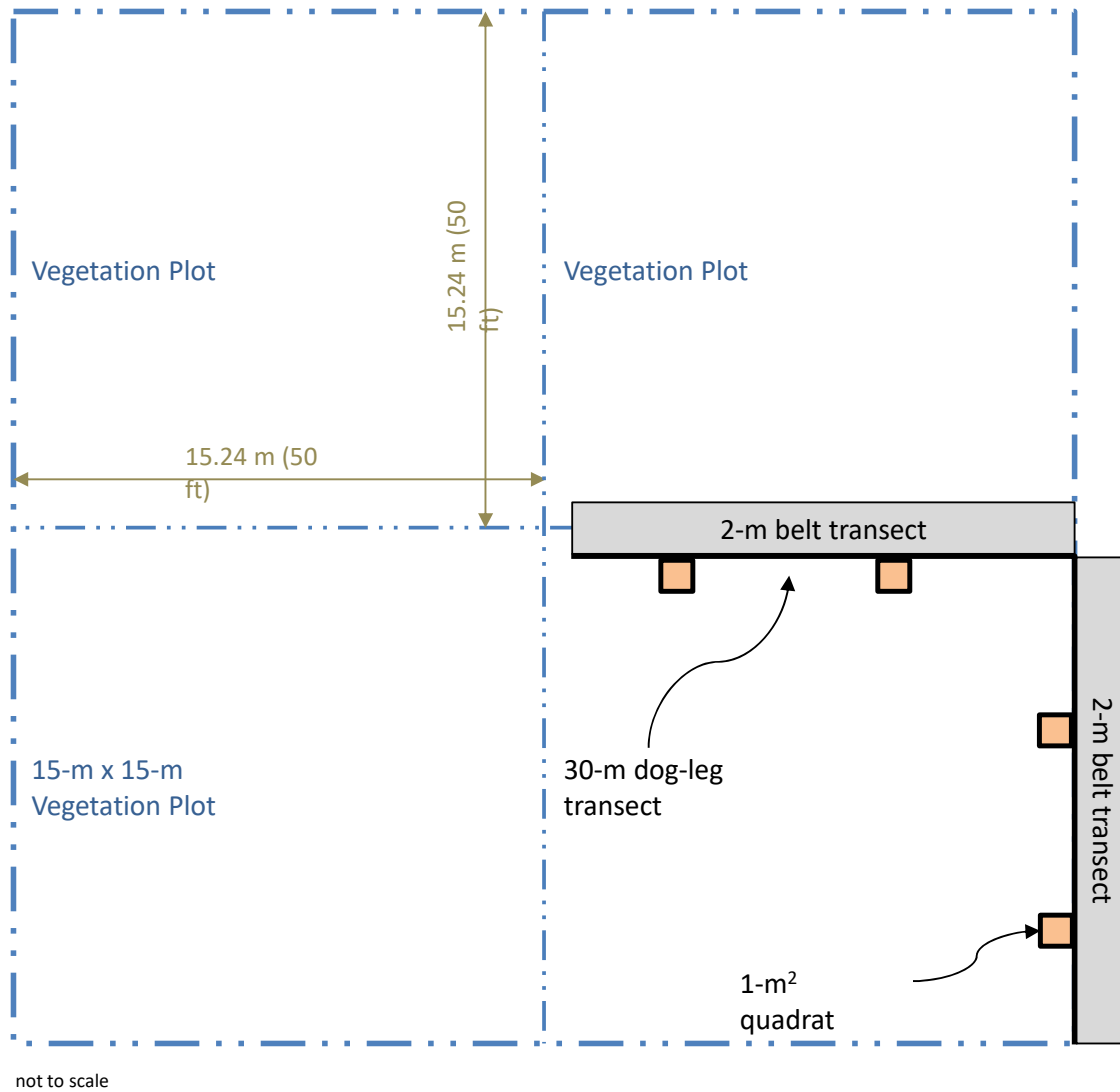
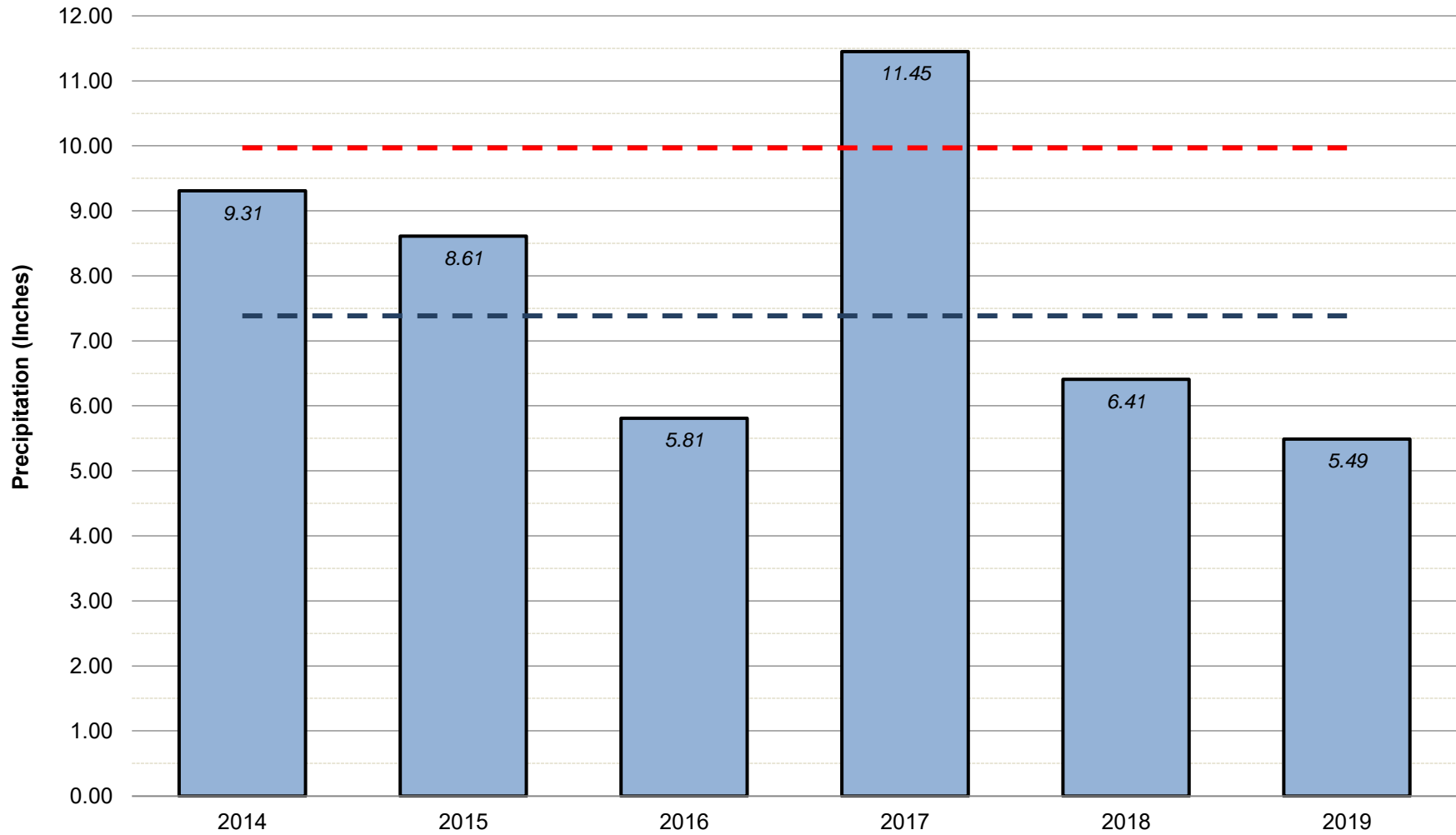


Figure 4: Growing Season Precipitation (2014-2019)



Notes:

Fort Bayard Average Based on 1897 - 2006
Pond 7 Average Based on 2010 - 2019

█ Pond 7 - - - Fort Bayard Average - - - Pond 7 Average

Figure 5: Vegetation Canopy Cover Components and Proportional Canopy Cover by Plant Class

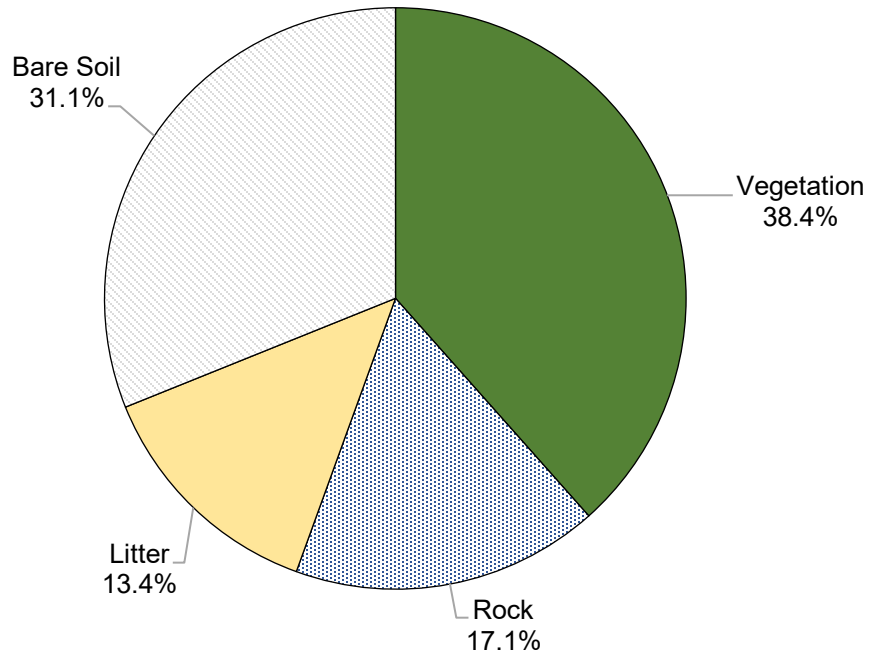


Figure 5a: Canopy Cover Components

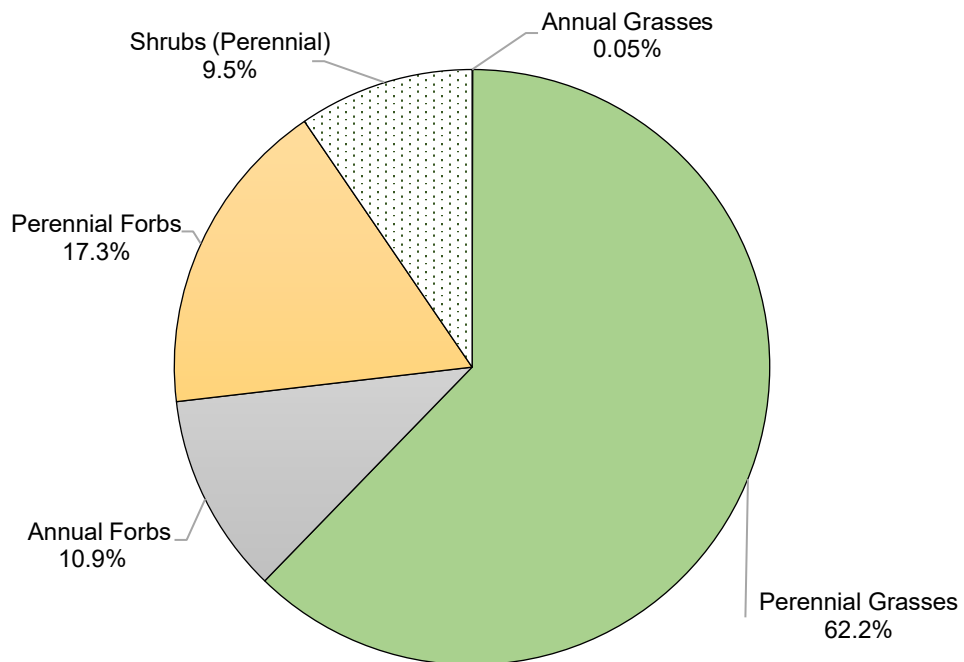


Figure 5b: Proportional Canopy Cover by Plant Class

Figure 6: Vegetation Basal Cover Components and Proportional Basal Cover by Plant Class

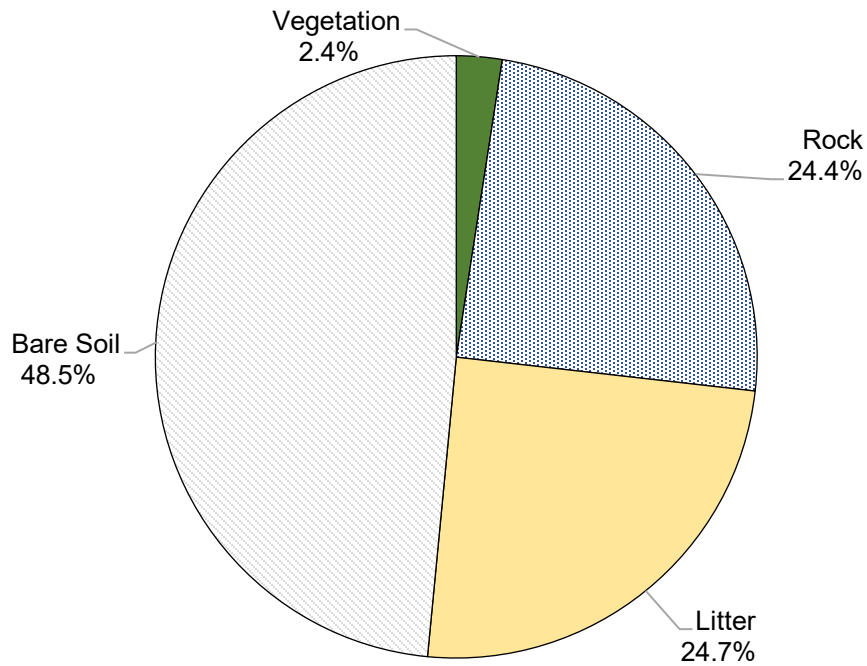


Figure 6a: Basal Cover Components

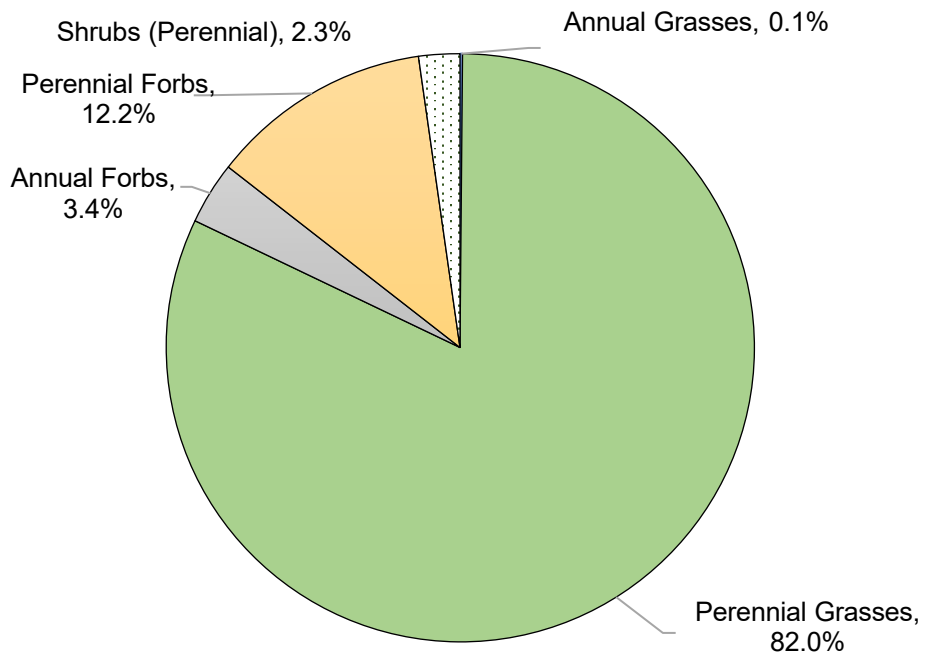


Figure 6b: Proportional Basal Cover by Plant Class

Figure 7: Typical Vegetation in the East Removal Borrow Area, October 2019



Table A1: East Removal Borrow Area Canopy Cover (%)

Transect Quadrat	RR19-T1(A)				RR19-T2				RR19-T2(A)				RR19-T4				RR19-T5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
<i>Annuals</i>																				
ARAD	--	--	--	--	--	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	
BRTE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	
<i>Perennials</i>																				
ACHY	4.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0	
ARTE3	--	1.0	--	--	--	--	--	--	0.9	--	--	--	--	--	--	--	--	--	--	
BOCU	7.0	--	4.5	8.0	--	--	--	--	44.0	36.5	3.0	10.0	13.8	--	--	26.0	--	--	20.0	
BOGR2	--	9.3	1.0	--	--	--	--	--	19.5	28.5	--	7.0	7.1	--	--	--	--	--	8.0	
DAPU7	--	--	--	--	--	0.2	0.1	--	--	--	--	--	--	--	--	--	--	--	--	
LEDU	1.5	5.8	32.0	--	--	--	--	--	--	--	--	--	2.0	3.4	18.0	--	--	2.4	8.0	
PLJA	--	0.3	4.5	--	--	--	--	--	6.5	1.5	23.0	3.0	34.5	5.7	--	--	--	2.0	--	
SPCO4	--	--	--	--	52.5	3.4	2.5	--	--	--	17.0	--	--	--	--	--	11.5	--	--	
SPCR	--	--	--	--	0.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Forbs																				
<i>Annual</i>																				
AMPA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.3	--	--	0.5	
CHNE	--	--	--	--	--	--	--	--	--	--	--	--	--	32.0	--	--	--	--	--	
CHPR	--	--	--	--	2.0	1.3	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERPO	0.2	--	--	--	--	--	7.0	--	--	--	--	--	--	--	--	--	--	--	--	
HELO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	
HESU3	--	--	--	--	1.2	0.1	8.0	--	--	--	--	--	--	--	--	--	--	--	--	
MAGR	--	--	--	--	2.8	0.9	2.0	--	--	0.3	--	--	--	--	--	--	--	--	--	
SATR	20.0	--	--	T	--	--	--	--	--	--	--	--	5.9	--	--	0.8	0.7	--	0.8	
<i>Annual/Biennial</i>																				
MATA	--	--	T	0.2	--	--	2.0	2.0	8.3	--	--	4.0	--	0.3	7.0	--	--	0.4	6.0	
<i>Annual/Perennial</i>																				
ASNU4	--	--	--	--	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	
POPI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.5	0.1	--	--	
<i>Annual/Biennial/Perennial</i>																				
HYWR	--	--	--	--	--	1.0	7.0	26.0	--	--	--	--	--	--	--	--	--	--	--	
MEMU	9.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
<i>Perennial</i>																				
ASMO7	--	--	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
ASPA13	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CHAL11	--	--	--	--	--	--	5.0	--	--	--	--	--	--	--	--	--	--	--	--	
CHER	0.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CIRSI	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DALA3	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DANA	--	--	--	--	--	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERRA3	--	--	--	--	--	--	5.0	--	--	--	--	--	--	--	--	--	--	--	--	
ERWR	--	--	--	--	--	--	--	--	--	--	--	--	0.4	--	--	--	--	--	--	
HOGL2	--	--	--	--	3.8	--	--	1.0	--	--	--	--	--	--	--	--	--	--	0.5	
LILE	--	--	--	--	--	--	--	7.0	--	--	--	--	--	--	--	--	--	--	--	
LOWR	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MILI	--	--	--	--	11.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEBA3	--	--	--	--	--	2.3	11.0	--	--	--	--	--	--	--	--	--	--	--	--	
SODO	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	--	
SOEL	--	0.2	0.3	--	--	0.3	1.5	--	--	1.3	--	--	--	--	--	--	--	--	--	
SPEM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.3	--	--	
THME	--	--	--	--	7.0	1.1	--	--	--	--	--	--	--	--	--	--	--	--	--	
Shrubs, Trees, and Cacti																				
ATCA	--	--	--	7.0	--	--	--	--	--	--	--	28.0	7.5	--	--	--	27.0	--	--	
GUSA	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEFL3	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	
YUEL	--	--	--	--	--	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	
Cover Components																				
Perennial Cover	22.7	16.5	43.2	15.2	74.9	18.9	34.1	37.0	79.2	67.8	43.0	52.0	64.9	9.7	25.0	26.0	40.0	2.7	10.4	37.5
Total Vegetation Cover	42.5	16.0	41.0	15.0	74.5	21.2	48.0	35.0	77.5	57.4	42.0	48.0	63.0	15.3	53.0	26.0	40.5	3.3	10.4	39.0
Rock	2.5	29.5	4.0	12.0	0.5	52.0	12.0	10.0	11.5	2.4	22.0	6.0	7.5	68.0	18.0	25.0	8.0	1.4	50.0	0.0
Litter	38.5	3.6	27.0	25.0	24.0	8.3	2.0	0.0	8.5	11.0	35.0	8.0	2.0	1.3	20.0	15.0	27.0	1.8	9.0	0.5
Bare Soil	16.5	51.0	28.0	48.0	1.0	18.5	38.0	55.0	2.5	29.2	1.0	38.0	27.5	15.5	9.0	34.0	24.5	93.5	30.7	60.5

Notes:
Species codes defined in Table 5

Table A2: East Removal Borrow Area Basal Cover (%)

Transect Quadrat	RR19-T1(A)				RR19-T2				RR19-T2(A)				RR19-T4				RR19-T5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
<i>Annuals</i>																				
ARAD	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
BRTE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	
<i>Perennials</i>																				
ACHY	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	
ARTE3	--	0.20	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	--	
BOCU	1.00	--	0.30	1.50	--	--	--	--	2.50	1.70	0.10	2.00	1.30	--	--	3.00	--	--	2.00	
BOGR2	--	2.00	0.10	--	--	--	--	--	2.80	2.35	--	1.00	1.30	--	--	--	--	--	0.75	
DAPU7	--	--	--	--	--	0.05	T	--	--	--	--	--	--	--	--	--	--	--	--	
LEDU	0.10	0.15	3.00	--	--	--	--	--	--	--	--	--	0.20	0.40	0.40	--	--	T	0.20	
PLJA	--	0.05	0.30	--	--	--	--	--	0.12	0.25	2.00	0.10	1.65	0.35	--	--	--	--	0.20	
SPCO4	--	--	--	--	1.75	0.05	T	--	--	--	2.00	--	--	--	--	--	0.30	--	--	
SPCR	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Forbs																				
<i>Annual</i>																				
AMPA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	T	
CHNE	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	--	--	--	--	--	
CHPR	--	--	--	--	T	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERPO	T	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	
HELO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	
HESU3	--	--	--	--	0.05	T	0.30	--	--	--	--	--	--	--	--	--	--	--	--	
MAGR	--	--	--	--	0.05	T	T	--	--	0.08	--	--	--	--	--	--	--	--	--	
SATR	0.55	--	--	T	--	--	--	--	--	--	--	--	0.05	--	--	0.05	T	--	T	
<i>Annual/Biennial</i>																				
MATA	--	--	T	T3	--	--	0.10	0.01	0.10	--	--	0.05	--	T	0.20	--	--	--	0.10	
<i>Annual/Perennial</i>																				
ASNU4	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
POPI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.10	T	--	--	
<i>Annual/Biennial/Perennial</i>																				
HYWR	--	--	--	--	--	T	T	1.00	--	--	--	--	--	--	--	--	--	--	--	
MEMU	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
<i>Perennial</i>																				
ASMO7	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
ASPA13	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CHAL11	--	--	--	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	--	--	
CHER	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CIRS1	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DALA3	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DANA	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERRA3	--	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	
ERWR	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	--	--	--	--	
HOGL2	--	--	--	--	0.05	--	--	T	--	--	--	--	--	--	--	--	--	--	T	
LILE	--	--	--	--	--	--	--	1.00	--	--	--	--	--	--	--	--	--	--	--	
LOWR	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MILI	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEBA3	--	--	--	--	--	T	2.00	--	--	--	--	--	--	--	--	--	--	--	--	
SODO	--	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	
SOEL	--	T	T	--	--	T	T	--	--	T	--	--	--	--	--	--	--	--	--	
SPEM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	
THME	--	--	--	--	0.10	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
Shrubs, Trees, and Cacti																				
ATCA	--	--	--	0.20	--	--	--	--	--	--	--	0.10	0.10	--	--	--	0.30	--	--	
GUSA	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEFL3	--	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	
YUEL	--	--	--	--	--	0.35	--	--	--	--	--	--	--	--	--	--	--	--	--	
Cover Components																				
Total Vegetation Cover	2.00	2.43	3.85	1.77	2.17	0.78	2.73	2.08	5.67	4.41	4.10	3.25	4.55	0.86	0.70	3.00	0.78	0.12	0.43	3.12
Rock	9.00	32.50	7.00	15.00	7.00	61.50	14.00	25.00	37.00	4.50	28.00	8.00	16.50	71.50	55.00	30.00	13.50	1.35	51.00	0.05
Litter	54.00	6.00	30.00	30.00	51.00	3.75	6.00	1.00	41.00	26.00	66.80	18.00	34.00	3.85	30.00	18.00	58.00	1.85	13.00	2.00
Bare Soil	35.00	59.07	59.15	53.23	39.83	33.97	77.27	71.92	16.33	65.09	1.10	70.75	44.95	23.79	14.30	49.00	27.72	96.68	35.57	94.84

Notes:
Species codes defined in Table 5



Table A3: East Removal Borrow Area Frequency (counts)

Transect Quadrat	RR19-T1(A)				RR19-T2				RR19-T2(A)				RR19-T4				RR19-T5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
<i>Annuals</i>																				
ARAD	--	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	
BRTE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	
<i>Perennials</i>																				
ACHY	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	
ARTE3	--	7	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	
BOCU	19	--	5	8	--	--	--	--	62	85	4	9	37	--	--	33	--	--	7	
BOGR2	--	45	3	--	--	--	--	--	19	112	--	10	7	--	--	--	--	--	8	
DAPU7	--	--	--	--	--	4	1	--	--	--	--	--	--	--	--	--	--	--	--	
LEDU	3	22	12	--	--	--	--	--	--	--	--	--	4	17	14	--	--	9	29	
PLJA	--	2	10	--	--	--	--	--	11	15	30	4	33	13	--	--	--	7	--	
SPCO4	--	--	--	--	41	11	2	--	--	--	17	--	--	--	--	--	3	--	--	
SPCR	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Forbs																				
<i>Annual</i>																				
AMPA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	1	
CHNE	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	
CHPR	--	--	--	--	3	10	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERPO	1	--	--	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	
HELO6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	
HESU3	--	--	--	--	3	11	16	--	--	--	--	--	--	--	--	--	--	--	--	
MAGR	--	--	--	--	4	23	5	--	--	4	--	--	--	--	--	--	--	--	--	
SATR	74	--	--	2	--	--	--	--	--	--	--	--	15	--	--	5	2	--	3	
<i>Annual/Biennial</i>																				
MATA	--	--	1	2	--	--	9	10	18	--	--	8	--	2	21	--	--	1	7	
<i>Annual/Perennial</i>																				
ASNU4	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	
POPI3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	--	--	
<i>Annual/Biennial/Perennial</i>																				
HYWR	--	--	--	--	--	4	1	19	--	--	--	--	--	--	--	--	--	--	--	
MEMU	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
<i>Perennial</i>																				
ASMO7	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
ASPA13	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CHAL11	--	--	--	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	
CHER	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
CIRSI	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DALA3	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DANA	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	
ERRA3	--	--	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	
ERWR	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	
HOGL2	--	--	--	--	9	--	--	7	--	--	--	--	--	--	--	--	--	--	--	
LILE	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	
LOWR	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MILI	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEBA3	--	--	--	--	--	5	20	--	--	--	--	--	--	--	--	--	--	--	--	
SODO	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	
SOEL	--	3	3	--	--	1	1	--	--	3	--	--	--	--	--	--	--	--	--	
SPEM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	
THME	--	--	--	--	4	221	--	--	--	--	--	--	--	--	--	--	--	--	--	
Shrubs, Trees, and Cacti																				
ATCA	--	--	--	1	--	--	--	--	--	--	--	1	1	--	--	--	2	--	--	
GUSA	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
SEFL3	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	
YUEL	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	

Notes:
Species codes defined in Table 5

Table A4: East Removal Borrow Area Belt Transect Data

East Removal Borrow Area						
Transect	RR19-T1(A)	RR19-T2	RR19-T2(A)	RR19-T4	RR19-T5	
Species Code	ATCA	20	2	26	5	7
	BRCA	--	--	--	1	--
	CAER	1	--	--	9	--
	GUSA	23	8	--	--	1
	ISTE2	1	--	--	--	--
	PRGL	--	1	1	--	2
	SEFL3	3	14	--	6	1
	YUEL	--	1	--	3	2
	ZIGR	--	--	--	--	4

Notes:

Code	Scientific Name	Common Name
ATCA	<i>Atriplex canescens</i>	Four-wing saltbush
BRCA	<i>Brickellia californica</i>	California brickellbush
CAER	<i>Calliandra eriophylla</i>	Fairyduster
GUSA	<i>Gutierrezia sarothrae</i>	Broom snakeweed
ISTE2	<i>Isocoma tenuisecta</i>	Burroweed
PRGL	<i>Prosopis glandulosa</i>	Honey mesquite
SEFL3	<i>Senecio flaccidus</i>	Threadleaf groundsel
YUEL	<i>Yucca elata</i>	Soaptree yucca
ZIGR	<i>Zinnia grandiflora</i>	Rocky Mountain zinnia

East Removal Borrow Area Vegetation Quadrat Photos, 2019



RR19-T1(A) Q-1



RR19-T1(A) Q-2



RR19-T1(A) Q-3



RR19-T1(A) Q-4



RR19-T2 Q-1




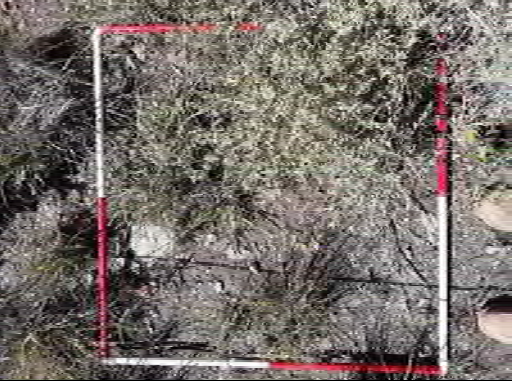




RR19-T2 Q-2



RR19-T2 Q-3



RR19-T2 Q-4

	
RR19-T2(A) Q-1	RR19-T2(A) Q-2
	
RR19-T2(A) Q-3	RR19-T2(A) Q-4
	
RR19-T4 Q-1	RR19-T4 Q-2
	
RR19-T4 Q-3	RR19-T4 Q-4

	
<p>RR19-T5 Q-1</p>	<p>RR19-T5 Q-2</p>
	
<p>RR19-T5 Q-3</p>	<p>RR19-T5 Q-4</p>

CHINO EROSION/RECLAMATION INSPECTION FORM

Quarterly

Monthly

Reclamation Unit: <i>East Razor Back</i>	Weather Conditions: <i>SUNNY WARM</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>1:55 PM 6/23/2021</i>	

Vegetation Conditions:
Live green vegetation visible on lower portion of site along with dry vegetation. Vegetation thin out on slopes and upper portion

Ditches/Water Control:
No visible concerns.

Monitoring Stations:
None.

Other Observations:
None.

CHINO EROSION/RECLAMATION INSPECTION FORM

Quarterly

Monthly

Reclamation Unit: *EAST RAZORBACK*

Weather Conditions:
Clear warm & breezy

Inspector: *Steven M. Garcia*

Time/Date: *12:00 PM 3/11/2021*

Vegetation Conditions:
Dry grass live shrubs visible throughout site

Ditches/Water Control:
Rock Check dam on lower portion washed out in spots and filled in with silt/fines in spots as well. Water control BMPs on site showing signs of that age.

Monitoring Stations:
None.

Other Observations:
None.

CHINO EROSION/RECLAMATION INSPECTION FORM

Quarterly

Monthly

Reclamation Unit:

East RAZORBACK

Weather Conditions:

Partly cloudy/cool

Inspector:

Steven M. Garcia

Time/Date:

12:30^{pm} 11-16-2020

Vegetation Conditions:

Dry grass & Live shrubs visible throughout site.

Ditches/Water Control:

Rock check berms on lower portion are washed out
diversion channel on upper portion of site is washed out
in various spots.

Monitoring Stations:

None.

Other Observations:

Small rills visible throughout site. A few larger rills noted
in various spots, vegetation noted in most rills.

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>EAST RAZORBACK</i>	Weather Conditions: <i>PARTLY CLOUDY AND HOT</i>
Inspector: <i>STEVEN M. GARCIA</i>	
Time/Date: <i>2:40 PM 6-11-2020</i>	
Vegetation Conditions: <i>Vegetation visible throughout site. Thicker vegetation on lower portions of site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Rock check dams washed out.</i>	Significant Erosion (Attach Description): <i>Minor to moderate erosion throughout site.</i>
Monitoring Stations: <i>None</i>	
Other Observations: <i>None.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razorback</i>	Weather Conditions: <i>Sunny & Warm</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>3:15 PM 3/24/2020</i>	
Vegetation Conditions: <i>Lots of dry grass visible along with some new green growth. Live shrubs and other vegetation visible through out site.</i>	Fences/Livestock: <i>No fences. A few cows visible just south of area</i>
Ditches/Water Control: <i>Rock check dams blown out. (located on old road west end of site)</i>	Significant Erosion (Attach Description): <i>Some moderate erosion visible along with some sediment loadings on lower portion of site</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>Noted ATV trail North to south lower west end of site.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: East RAZORBACK	Weather Conditions: Partly cloudy and cool
Inspector: Steven M. Garcia	
Time/Date: 2:30 PM 12/16/2019	
Vegetation Conditions: dry grass, shrubs and other vegetation visible through out site.	Fences/Livestock: None.
Ditches/Water Control: Rock check dams and other portion of site are blown out.	Significant Erosion (Attach Description): A few deeper Rills noticed on site.
Monitoring Stations: None.	
Other Observations:	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razorback</i>	Weather Conditions: <i>warm</i>
Inspector: <i>Steven M. Garcia</i> <i>P. M. P.inson</i> <i>(WYMER)</i> <i>David W. Mercer</i>	
Time/Date: <i>3:30 PM 9/19/2019</i>	
Vegetation Conditions: <i>Abundant vegetation visible throughout site.</i>	Fences/Livestock: <i>None</i>
Ditches/Water Control: <i>Rock berms at lower portion of site are blown out.</i>	Significant Erosion (Attach Description): <i>None visible.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: 	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razor back</i>	Weather Conditions: <i>warm & sunny</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>10:00 Am 6-26-2019</i>	
Vegetation Conditions: <i>Lots of vegetation visible throughout site. Green shrubs and plants & dry grass</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Rock berms on west end are blown out.</i>	Significant Erosion (Attach Description): <i>Erosion cut on southern end of west portion. seems to be slow slowly filling in.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>grasshoppers are noted. Abundant animal scat visible. ATU/vehicle track visible on old road on west end of site.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <p style="text-align: center;"><i>EAST RAZORBACK</i></p>	Weather Conditions: <p style="text-align: center;"><i>Cloudy & warm</i></p>
Inspector: <p style="text-align: center;"><i>Steven M. Garcia</i></p>	
Time/Date: <p style="text-align: center;"><i>2:10 3/27/2019</i></p>	
Vegetation Conditions: <p><i>Lots of dry grass along with some new growth. Also shrubs, live and dead juniper trees.</i></p>	Fences/Livestock: <p style="text-align: center;"><i>None.</i></p>
Ditches/Water Control: <p><i>Rock berms on old road are blown out from storm water runoff.</i></p>	Significant Erosion (Attach Description): <p><i>Rills noted throughout site. Some major and some minor. Major Rills on southeast of old road have filled in.</i></p>
Monitoring Stations: <p style="text-align: center;"><i>None</i></p>	
Other Observations: <p><i>Lots of wildlife sign throughout site.</i></p>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East RAZON BACK</i>	Weather Conditions: <i>Cloudy cold windy</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>1:30pm 12-27-2018</i>	
Vegetation Conditions: <i>Dry vegetation visible through out site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Rock check dams on old Haul Rd. Blown out. Same as last quarter</i>	Significant Erosion (Attach Description): <i>rills visible throughout site. Most significant erosion is on the lower end of old haul Road.</i>
Monitoring Stations: <i>None.</i>	
Other Observations:	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>EAST RAZORBACK</i>	Weather Conditions: <i>Clear, WARM</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>10:00 AM 9-26-2018</i>	
Vegetation Conditions: <i>Green vegetation throughout site along with woody shrubs. Vegetation is not more spread out on the upper portion of the site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Rock check dams on old road blown out. water bars (rock) on slope are either filled in or blown out. Lots of sediment landing on lower portion of site near outfall (SWAPP).</i>	Significant Erosion (Attach Description): <i>Erosion visible throughout site. there are a few cuts that are significant located on slope and on lower portion of the old road.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>Noticed a lot of deer sign, squirrels in rock structures. And some animal bones.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

- Monthly
- Quarterly
- 1" Rain Event

Reclamation Unit: <i>East Razor back</i>	Weather Conditions: <i>Mostly Clear</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>10:40 AM 3-28-2018</i>	
Vegetation Conditions: <i>DM grass & vegetation visible throughout site along with new vegetation.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>No visible concerns.</i>	Significant Erosion (Attach Description): <i>None.</i>
Monitoring Stations: <i>None.</i>	
Other Observations:	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razor back</i>	Weather Conditions: <i>Cloudy & cool</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>1:15 PM 12-5-2017</i>	
Vegetation Conditions: <i>Dry vegetation & grasses along with live shrubs & trees</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>No visible concerns.</i>	Significant Erosion (Attach Description): <i>No visible concerns. Previously noted areas appear to be healing.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>signs of wild life in the area</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: East Slope Razorback IRA		Weather Conditions: Sunny, Clear, & warm	
Inspector: Pam Pinson			
Time/Date: 12:10pm 9-21-17			
Vegetation Conditions: Good grass establish-ment & shrubs.		Fences/Livestock: NA	
Ditches/Water Control: Stabilizing		Significant Erosion (Attach Description): Site erosion has really stabilized & healed runoff cuts on slopes. Looks good	
Monitoring Stations: NA			
Other Observations: David Mercer, NMED, participated in the inspection.			



Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razorback</i>	Weather Conditions: <i>Partly Cloudy and Hot</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>10:50 AM 6-23-2017</i>	
Vegetation Conditions: <i>Lots of green vegetation visible throughout site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Gravel berms at toe of site have been re-established</i>	Significant Erosion (Attach Description): <i>rills visible throughout site. Some are significant and are being monitored.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>None.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razor back</i>	Weather Conditions: <i>Cloudy, Cold & Windy</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>11:00 am 2-28-2017</i>	
Vegetation Conditions: <i>Abundant dry grass & shrubs visible throughout. Some new growth visible.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>Some water bars washed out from previous heavy rains in past months.</i>	Significant Erosion (Attach Description): <i>Several areas of significant erosion noted from heavy rains last year. Being evaluated.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>None.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razer back</i>	Weather Conditions: <i>sunny clear</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>11:00 AM 12-14-2016</i>	
Vegetation Conditions: <i>Shrubs, Trees, and dry grasses and other dry plants visible throughout site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>For three gravel beams on old road road blown out</i>	Significant Erosion (Attach Description): <i>several areas of significant erosion noted from heavy rains at the beginning of November 2016</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>Coyote on site at time of inspection. lots of sign on various wildlife visible throughout site. NOTE: ATV track visible on old haul road and on vegetated area</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Site inspected with David Mercer NMEP

Reclamation Unit: <i>East RAZORBACK</i>	Weather Conditions: <i>Cloudy & Cool</i>
Inspector: <i>S. Garcia / Pam Pinson</i>	
Time/Date: <i>11:30 AM 9/27/2016</i>	
Vegetation Conditions: <i>Abundant grasses & shrubs visible</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>No visible concerns.</i>	Significant Erosion (Attach Description): <i>Erosion Feature Noted. From top to RIPPED PART of old road.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>Signs of wild life in the AREA</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>East Razor Back</i>	Weather Conditions: <i>Cloudy</i>
Inspector: <i>S. Garcia</i>	
Time/Date: <i>1:10 PM 6-28-2016</i>	
Vegetation Conditions: <i>Some New Growth Visible on the Flatter Areas of site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>No Visible concerns.</i>	Significant Erosion (Attach Description): <i>None Visible</i>
Monitoring Stations: <i>None.</i>	
Other Observations:	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>EAST RAZORBACK</i>	Weather Conditions: <i>Clear Skys. Dry</i>
Inspector: <i>Steven M. Garcia</i>	
Time/Date: <i>11:40 3-24-2016</i>	
Vegetation Conditions: <i>Abundant dry vegetation visible throughout site. New green growth becoming visible throughout site.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>No visible concerns.</i>	Significant Erosion (Attach Description): <i>None Visible</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>None.</i>	

Chino Mines Co. Reclamation/Erosion Monitoring Form

Monthly
 Quarterly
 1" Rain Event

Reclamation Unit: <i>Razor Back East</i>	Weather Conditions: <i>Partly Cloudy</i>
Inspector: <i>Steven Garcia</i>	
Time/Date: <i>10:45 12-22-2015</i>	
Vegetation Conditions: <i>Abundant dry GRASS Visible.</i>	Fences/Livestock: <i>None.</i>
Ditches/Water Control: <i>None visible concerns.</i>	Significant Erosion (Attach Description): <i>None visible. seen various small rills visible throughout site.</i>
Monitoring Stations: <i>None.</i>	
Other Observations: <i>None.</i>	