FREEPORT-McMoRan

Freeport-McMoRan Tyrone Inc.
P.O. Drawer 571
Tyrone, NM 88065

October 22, 2021

Via Electronic

Mr. David Ohori
Mining and Minerals Division
Mining Act Reclamation Program
1220 South St. Francis Drive
Santa Fe, NM 87505

Dear Mr. Ohori:

Re: Permit GR010RE – Tyrone Mine Existing Mining Operation, Permit Revision Application for EMMA Expansion Project at the Tyrone Mine

Freeport-McMoRan Tyrone Inc. (Tyrone) is currently operating the Tyrone Mine under the conditions of Revision 09-1 to Permit No. GR010RE. This revision to the permit for active mining became effective on March 29, 2021. Tyrone hereby requests an additional revision to mine permit GR010RE for the Tyrone Mine for the Emma Expansion Project and associated facilities.

The proposed revision will facilitate the expansion of the Tyrone Mine associated with the Emma Expansion Project (Emma), extending the same land uses and activities that have previously been approved. Mineable ore from the Emma area will be transferred to the Tyrone Mine facility for copper extraction. The overburden rock will be non-acid generating material mined from the Emma Pit and transported to the new EMW Waste and 6HW Waste stockpiles (Figure 3), both of which will become valuable cover material resources for closeout work on the south side of Tyrone.

The Emma permit revision will expand the Tyrone Mine Permit and Design Limit Boundary to enable the following new units (for existing mine):

- Construction, operation, reclamation of the new Emma Pit
- Construction, operation, reclamation of the new EMW Waste stockpile
    - Partially located within existing Tyrone Mine Permit and Design Limit Boundary (existing unit)
- Construction, operation, and reclamation of the new Soil Stockpile (stockpile will be removed for use as reclamation cover at closure, footprint area will be reclaimed)
- Construction, operation, reclamation of the new Southern Emma Haul Roads
- Installation of instrumentation, utilities and access for various operational, monitoring, closure and post-closure uses, including but not limited to:
    - Geotechnical instrumentation and monitoring facilities
    - Power distribution system and components

- Emma Pit dewatering system
- Communications facilities
- Access to facilities and components

The 6HW Waste Stockpile and the Northern Emma Haul Road will also be constructed as part of this project but will be located entirely within the current approved Tyrone Mine Permit and Design Limit Boundary (existing units). Currently, the approved Tyrone Mine Permit and Design Limit Boundary incorporates approximately 11,810 acres of land (including the Conditional Waiver Area approved under Modification 09-1). The proposed permit revision will increase the Tyrone Mine Permit and Design Limit Boundary on lands controlled by Tyrone by approximately 337 acres (**Figure 2**).

Specific information required under Section 19.10.5.502 NMAC for this permit revision application is included in **Attachment 1**, and specific information required under Section 19.10.5.508 NMAC for New Units, where applicable, is included in **Attachment 2** to this letter. Additionally, as part of this permit revision application, Tyrone will be submitting the Emma Closure/Closeout Plan (CCP) pursuant to Sections 19.10.5.506.A and B NMAC in the next few weeks along with a Financial Assurance (FA) Third Party cost estimate for closeout of the Emma facilities. The Emma CCP will be consistent with previously approved CCPs at the Tyrone Mine.

In preparing this application, Tyrone has hosted meetings with State Agencies and other stakeholders to receive guidance and feedback on various aspects of the permit applications. We have incorporated significant aspects of that feedback in the application and hope this will facilitate a streamlined permitting process. The Emma project is a key part of Tyrone's ten-year mine plan and critical to keeping the mine operating and the continued positive economic impact for our employees, our community and state for many years to come.

I certify that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals responsible for obtaining this information, I believe the submitted information is true, accurate, and complete.

Sincerely,

Erich J. Bower
President & General Manager
Freeport-McMoRan Tyrone Inc.

EJB
Enclosures
20211022-103

c. Holland Shepherd - MARP, (MMD)
David Ohori - MMD

ATTACHMENT 1
FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS
(Section 19.10.5.502 NMAC)

ATTACHMENT 1 – FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS (Section 19.10.5.502 NMAC)

Section 19.10.5.502 NMAC Requirements:

A. A minimum of six copies of each application for a permit under this Part shall be submitted to the Director. The Director may require additional copies for distribution by the Director to other governmental agencies with an interest in, or jurisdiction over, elements of the proposed operation.

Tyrone Response:
Six copies of this Request to Modify Permit GR010RE for Expansion of the Tyrone Mine associated with the Emma Expansion Project are being submitted to the Director.

B. All information submitted to the Director shall be made available for public inspection and copying at the Director's office, except as designated confidential. Information in the application which the applicant desires to keep confidential shall be clearly indicated and submitted separately from the rest of the application.

Tyrone Response:
Not applicable. No information included within this application is considered by Tyrone to be confidential.

(1) If the operator designates as confidential an exploration map, financial information, information concerning the grade or location of ore reserves or trade secret information, the Director shall maintain the information as confidential and not subject to public records or disclosure laws.

Tyrone Response:
Not applicable. No information included within this application is considered by Tyrone to be confidential.

(2) If a request is made for public review of the information held confidential, the Director shall notify the operator and provide a reasonable opportunity for substantiation of the claim that public disclosure of the information could harm the competitive position of the operator. If the claim is not substantiated to the satisfaction of the Director, the information shall be released.

Tyrone Response:
Not applicable. No information included within this application is considered by Tyrone to be confidential.

(3) When a request is made for public review of information designated as confidential, the Director shall attempt to notify the operator within 24 hours of the request, and shall provide written notification by certified mail.

Tyrone Response:
Not applicable. No information included within this application is considered by Tyrone to be confidential.

C. Each application shall be signed by an applicant or authorized agent of the applicant for the operation with the following certification made: I certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals responsible for obtaining the information, I believe the submitted information is true, accurate, and complete.

Tyrone Response:
This permit revision application is signed and certified by Tyrone's authorized agent in accordance with this requirement.

ATTACHMENT 1 – FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS (Section 19.10.5.502 NMAC)

D. Each application under this Part shall be in a format acceptable to the Director and contain the following:

(1) The name of the applicant to whom the permit will be issued.

Tyrone Response:
Freeport-McMoRan Tyrone Inc. is the applicant to whom the permit will be issued.

(2) A map(s) and list, including names and addresses, of all owners of surface and mineral estates within the proposed permit area, as shown by the most recent county assessor's property tax schedule.

Tyrone Response:
The proposed Emma Expansion area (expanded Tyrone Mine Permit area) will be located exclusively on private land. Tyrone owns both the surface and mineral estate of the proposed Emma area, except for a small portion that is currently owned by LT Ranch LLC; however, a contract of sale is active for Tyrone to acquire the land prior to completion of permitting. A map of the owners of surface and mineral estates within the proposed expanded permit area is included in **Figure 1**. A list, including names and addresses, of all owners of surface and mineral estates within the proposed expanded permit area is provided in **Table 1**.

(3) A statement of the basis on which the applicant has the right to enter the property to conduct the mining and reclamation. The applicant will allow the Director to examine, if necessary, the documents which establish such basis.

Tyrone Response:
Freeport-McMoRan Tyrone Inc. (Tyrone) is a legal entity authorized to do business in the state of New Mexico. Tyrone has the right to enter and conduct mining and reclamation activities on the proposed expanded Tyrone Mine Permit and Design Limit area based on Tyrone's ownership of the patented mining claims (surface and minerals) and current mining claims (unpatented claims) in the area. As this portion of the rules require, the Director will have the opportunity to examine the documents which establish such basis. Note that the surface estate owned by LT Ranch LLC within the proposed project area is currently under a contract of sale to Freeport-McMoRan Tyrone Mining LLC.

(4) The site assessment previously submitted pursuant to Section 69-36-5 of the Act shall be considered part of the application. If information in the site assessment requires updates to provide information necessary for evaluation of the permit or if the site-specific conditions at the time of the assessment significantly deviate from conditions at the time of submittal of the permit application, such updated information or deviations must be described in the application.

Tyrone Response:
A summary of the site assessment components associated with the Emma Expansion Project is provided in **Attachment 3** to this permit revision application package. This summary includes two appendices. Appendix A includes additional information on Economic Impacts to Local Communities. Appendix B is a report describing the wildlife and habitat assessment and potential impacts (WestLand Resources, Inc. 2021).

Updated information on the existing facilities and environmental conditions within the proposed Emma mine permit area will be provided in Section 2.0 of the Emma Closure/Closeout Plan (CCP) which will be provided as part of this permit revision application package in the next few weeks. Because Emma is a new unit to an existing mine, additional assessments have been conducted in support of this permit revision application associated with Emma mining operation's potential impact on local communities, including a blasting plan (Tyrone commissioned this proactively, though the Director had not specifically required it yet). A report detailing Emma mining operation's potential impact to ground and surface water and the hydrologic balance (DBS&A 2021b) is being submitted in the DP 396 Modification application.

(5) A map(s) showing all existing and proposed pits, shafts, adits, stockpiles, waste units, impoundments, leach piles, processing facilities, and support facilities such as office buildings. The map(s) shall identify the proposed permit area and design limits of each unit of the operation.

Tyrone Response:
The existing topography, site features, and existing and proposed Tyrone Mine Permit and Design Limit Boundaries are shown on **Figure 2**. The topography, site features, and section lines associated with the End of Year (EOY) 2026 mine plan are shown on **Figure 3** along with the existing and proposed Tyrone Mine Permit and Design Limit Boundaries. There are small historic mine workings on the existing site of the proposed Emma Pit. If the permit is approved and mining is implemented to the limits shown, a historic shaft that is currently present would be mined out.

(6) A description of undisturbed vegetation including a comprehensive list of species and their relative abundance with regards to cover and production.

Tyrone Response:
Site-specific soil and vegetation surveys were conducted at Tyrone in 1997 as part of the closure/closeout studies (DBS&A 1997). The distribution of soils at the Tyrone Mine is controlled by the climate, geology, age of the land surfaces, and physiography of the area. The vegetation is indicative of the regional climate modified by soil and topographic factors. The distribution of the existing vegetation is locally complex and reflects the influence of both environmental gradients and land management practices. The vegetation communities observed in the proposed Emma permit area in 2021 are locally and regionally extensive. No threatened or endangered plant species are recognized as occurring in the Tyrone Mine permit area. A vegetation survey of the Emma area conducted in October 2020 indicated that no special-status or rare plants in the area (WestLand Resources, Inc. 2021).

Three major plant communities are present in the Emma area during a pedestrian survey conducted by Golder in June 2021. These include the alluvial grassland, piedmont scrub savanna, and mountain slope mixed evergreen woodland plant communities described below.

Alluvial Grasslands: This plant community occupies the nearly level to gently sloping floodplains and alluvial terraces of Oak Grove Wash and its tributaries in the proposed permit area. The dominant soils in the alluvial grassland include coarse-loamy and sandy families of ustic mollisols and entisols (DBS&A 1997). The soils are very deep, nonsaline, nonsodic, and coarse-textured and were formed in thick, alluvial deposits composed predominantly of mixed igneous rocks. The existing vegetation is dominated by tarragon (*Artemisia drunculoides*), a variety of annual forbs and a low density of warm season grasses including sideoats and blue grama (*Bouteloua curtipendula* and *B. gracilis*) and purple three-awn (*Aristida purpurea*). Apache plume (*Fallugia paradoxa*) and California bricklebush (*Brickellia californica*) are important shrubs with Emory Oak (*Quercus emoryi*) the dominant tree along the active floodplain.

Piedmont Scrub Savannas: The scrub savanna plant community occurs on the gently sloping to steep pediments and fan terrace deposits from the Big Burro Mountains along eastern portions of the EMMA project area. Soils are loamy- and clayey-skeletal to fine families of ustic mollisols and alfisols (DBS&A 1997). The soils are moderately to very deep, nonsaline, nonsodic, and medium- to fine-textured. The scrub savanna vegetative community is characteristic of the transition between an open grassland and mixed evergreen woodland. Deeper soils in valleys tend to be dominated by sideoats, blue, and hairy grama (*B. hisuta*) and other warm-season grasses. Important shrubs include beargrass (*Nolina microcarpa*), broom snakeweed (*Gutierrezia sarothorae*), and catclaw mimosa (*Mimosa biuncifera*). In areas with slightly steeper slopes and shallower soils, Pinyon pine (*Pinus edulis*) one-seed (*Juniperus monosperma*) and alligator junipers (*J. deppeana*), and Emory oak become more prevalent.

Mountain Slope Mixed Evergreen Woodlands: This plant community occupies the strongly sloping to very steep backslopes and ridges of the Big Burro Mountains on shallow soils formed in residuum and colluvium. Soils are mostly loamy-skeletal ustic mollisols and alfisols that are shallow, noncalcareous, and medium- to coarse-textured with moderate to high amounts of coarse fragments (DBS&A 1997). Vegetation within the mountain slope mixed evergreen woodland is dominated by a relatively open stand of pinyon pine and

evergreen oaks with one-seed and alligator juniper subdominant. Mixed grama and associated grasses are dominant in the sparsely vegetated understory with mountain mahogany (*Cercocarpus montanus*), point-leaf manzanita (*Arctostaphylos pungens*), and beargrass being important shrub components. Ponderosa pine (Pinus ponderosa) and Gambel oak (Quercus gambelii) are locally important subordinates that may occur in sheltered topographic positions.

The plant species identified in the Emma area in 2021 and their relative occurrence are listed in **Table 2**. A total of 114 species were recognized in the Emma area, including 6 trees, 67 forbs, 26 shrubs, 15 grasses.

(7) Evidence that other applicable state and federal permits to be obtained either have been or will be issued before the activities subject to those permits begin.

Tyrone Response:
Tyrone holds the state and federal permits and authorizations necessary to produce copper from the existing facilities at the Tyrone Mine. Current permits include a New Mexico Mining Act (NMMA) permit from the MMD as an existing mining operation (Mining Act Permit No. GR010RE). The proposed permit revision will increase the Tyrone Mine Permit and Design Limit Boundary on lands controlled by Tyrone by approximately 337 acres (**Figure 3**). The Tyrone Mine is also subject to a series of discharge permits issued by the New Mexico Environment Department (NMED). The proposed Emma Expansion area will be incorporated into operational DP-396 through a permit renewal and modification application being submitted concurrently with this permit revision application. A full description of the applicable state and federal permits under which the Tyrone Mine currently operates will be included in Section 2.4 of the Emma CCP to be submitted as part of this permit package in the next few weeks. A summary list of these permits is included herein in **Table 3**.

(8) The applicant shall designate an agent and provide the agent's street address for the service of notices and orders in writing from the Director. This information shall be kept current if a permit is granted.

Tyrone Response:
The designated agent for the service of notices and orders in writing from the Director is as follows:

Point of Contact Information	
Full Name:	Erich J. Bower
Title:	President and General Manager
Business Name:	Freeport-McMoRan Tyrone Inc.
Telephone Number:	(575) 912-5101
Street Address:	Highway 90 South, Tyrone Mine Road, Tyrone, New Mexico 88065
Business Address:	PO Box 571, Tyrone, New Mexico 88065

(9) A copy of the proposed form of notices required under 19.10.9 NMAC.

Tyrone Response:
Tyrone will distribute and publish a public notice in regard to this permit revision application for expansion of the Tyrone Mine Permit area within 30 days.

(10) A permit fee as determined pursuant to 19.10.2 NMAC

Tyrone Response:
A certified check in the amount of $7,500.00 has been submitted for this permit application in accordance with 19.10.2 NMAC.

(11) Any additional information necessary for evaluation of the permit application as required by the Director.

Tyrone Response:

No additional information has been requested at this time. Tyrone will review any requests from the Director for additional information necessary to evaluate this permit revision application and will provide the pertinent information in a timely manner.

E. To avoid duplication and conflicting requirements, the applicant may include information from environmental permits relevant to the application. Permits issued by other governmental agencies shall be accepted by the Director to the extent such permits satisfy the requirements of the Act and 19.10 NMAC.

Tyrone Response:
The Emma CCP that will be finalized in the next few weeks will be included as part of this permit application and will provide supporting documentation regarding this permit revision application. Individual reports detailing Emma mining operation's potential impact to the wildlife habitat (WestLand Resources, Inc. 2021), water supply (DBS&A 2021b), have been submitted with the MMD in support of this permit revision application.

F. Where physically separate but interrelated mining operations are located in close proximity to each other and are under the control of the same owner or operator, the applicant may request or the Director may determine to issue one permit for all of the operations and require only one permit application and closeout plan.

Tyrone Response:
The Tyrone Mine (MMD Permit GR010RE) is adjacent to the Emma Expansion area (**Figure 3).** The Tyrone Mine Permit and Design Limit Boundary for Permit No. GR010RE will be updated to include the Emma Expansion area as part of this permit revision application.

References:

Dames and Moore. 1994. Mining Operations Site Assessment. Prepared for Phelps Dodge Corporation Tyrone, New Mexico. June 28.

Daniel B. Stephens & Associates, Inc. (DBS&A). 1997. Closure/ Closeout Plan. Prepared for Phelps Dodge Tyrone, Inc., Tyrone, New Mexico. December 19.

DBS&A. 2021b. Hydrogeologic Report for Proposed Open Pit at Emma Exploration Project (See DP-396 Modification Application). Prepared for Freeport-McMoRan Tyrone Inc., Tyrone, New Mexico. October 22.

Life Cycle Geo, LLC (LCG). 2021. Material Characterization and Handling Plan for Two Non-Discharging Facilities: Emma Project (See DP-396 Modification Application). October 22.

Mining and Minerals Division (MMD). 2004. Permit Revision 01-1 to Permit No. GR010RE Tyrone Mine Existing Mining Operation. Mining and Minerals Division Energy, Minerals and Natural Resources Department. April 12.

MMD. 2021. Reissued Permit No. GR010RE Permit Revision 09-1: Updated Site Wide Closure/Closeout Plan Tyrone Mine Existing Mining Operation. Mining and Minerals Division Energy, Minerals and Natural Resources Department. March 29.

WestLand Resources, Inc. 2021. Emma Project Wildlife and Habitat Impact Assessment. Prepared for Freeport-McMoRan Tyrone Inc., Tyrone, New Mexico. October 22.

TABLES

Table 1: Owners of Surface and Mineral Estates Within the Proposed Emma Area

Owner Name and Address	Parcel Name	Claim Name	Claim Number
Surface Ownership			
Freeport McMoRan-Tyrone Mining LLC P.O. Box 571 Tyrone, NM 88065	3085114430053		
LT Ranch P.O. Box 1497 Silver City, NM 88062	30886114330264	Oak 2 & 3	NMMC 143908 & 143909
		---	---
Mineral Ownership			
Freeport McMoRan-Tyrone Mining LLC P.O. Box 571 Tyrone, NM 88065	3085114430053		
U.S. Department of Interior Bureau of land Management 301 Dinosaur Trail Santa Fe, NM 87508	30886114330264	Oak 2 & 3 -NMMC 143908 & 143909	

Notes:
See Figure 1 of this application for the location of individual owners of surface and mineral estates within the proposed Emma area

Table 2: Plant Species Observed at the Emma Site During 2021 Survey Sorted by Lifeform

Scientific Name	Common Name	Relative Abundance
Trees		
Juglans major	Arizona walnut	S
Juniperus deppeana	alligator juniper	C
Pinus edulis	piñon pine	C
Prunus serotina	chokecherry	S
Quercus emoryi	Emory oak	C
Quercus grisea	gray oak	A
Shrubs		
Agave parryi	Parry's agave	S
Ageratina herbacea	fragrant snakeroot	U
Arctostaphylos pungens	manzanita	U
Atriplex canescens	fourwing saltbush	U
Baccharis pteronioides	yerba de pasmo	C
Brickellia californica	California brickell bush	C
Coryphantha vivipara	Arizona spiny star	S
Cylindropuntia spinosior	cane cholla	U
Dasylerion wheeleri	sotol	U
Ericameria laricifolia	turpentine bush	S
Ericameria nauseosa	rubber rabbitbrush	C
Cercocarpus montanus	Mountain mahogany	C
Fallugia paradoxa	Apache plume	C
Eriogonum wrightii	Wright's buckwheat	C
Garrya wrightii	Wright's silktassel	C
Gutierriezia sarothrae	broom snakeweed	A
Isocoma tennuisecta	burroweed	U
Lonicera albiflora	western white honeysuckle	S
Lycium pallidum	pale wolfberry	S
Mimosa biuncifera	catclaw mimosa	A
Nolina microcarpa	beargrass	U
Opuntia chlorotica	pancacke pricklypear	U
Quercus turbinella	shrub live oak	C
Rhus trilobata	three-leaf sumac	C
Yucca bacata	banana yucca	U
Yucca elata	soaptree yucca	U
Forbs		
Acmispon (syn.= *Lotus*) *wrightii*	Wright's deervetch	U
Ambrosia acanthicarpa	flat-spine burr-ragweed	U
Argemone pleiacantha	southwestrn pricklypoppy	U
Artemisia carruthii	Carruth's sagebrush	A
Artemisia dracunculus	tarragon	U
Artemisia ludoviciana	silver sagewort	U
Astragalus mollossimus	woolly locoweed	U
Bahia absinthifolia	hairyseed bahia	S
Baileya multiradiata	desert marigold	S
Cirsium neomexicanum	New Mexico thistle	U
Comandra umbellata	bastard toadflax	S
Croton texensis	doveweed	S
Cryptantha cinerea	James' cryptantha	S
Cucurbita foetidissima	buffalo gourd	S
Dalea sp.	prairie clover	S
Datura wrightii	sacred datura	S

Scientific Name	Common Name	Relative Abundance
Dieteria asteroides	fall tansy-aster	C
Dyssodia papposa	fetid marigold	U
Bouchera sp.	rockcress	U
Brickellia eupatorioides	false boneset	U
Brickellia floribunda	Chihuahuan brickellbush	U
Brickellia lemmonii	Lemmon's brickellbush	U
Chaetopappa ericoides	rose heath	U
Erigeron neomexicanus	New Mexico fleabane	S
Eriogonum alatum	winged buckwheat	S
Eriogonum jamesii	James' buckwheat	U
Eriogonum polycladon	sorrel buckwheat	S
Euphorbia albomarginata	whitemargin spurge	S
Euphorbia revoluta	threadstem spurge	S
Euphorbia serpillifolia	thyme-leaf sandmat	S
Evolvulus sericeus	silver dwarf morningglory	S
Glandularia bipinnatifida	Dakota mock vervain	U
Grindelia arizonica	Arizona gumweed	U
Heliomerus longifolia	longleaf false goldeneye	U
Heterotheca subaxillaris	camphorweed	U
Hymenopappus filifolius	fineleaf hymenopappus	U
Hymenothrix wrightii	Wright's thimblehead	U
Hymenoxys richardsonii	pingue	U
Lactuca serriola	prickly lettuce	U
Lappula occidentalis	flatspine stickseed	U
Lepidium sp.	pepperweed	S
Machaeranthera tanacetifolia	tanseyleaf tansyaster	U
Marrubium vulgare	horehound	S
Mentzelia multiflora	Adonis blazingstar	S
Mentzelia pumila	dwarf mentzelia	S
Noccaea fendleri	alpine pennycress	U
Packera neomexicana	New Mexico groundsel	U
Pectis angustifolia	lemonscent	S
Pectis filipes	five-bract chinchweed	S
Penellia micrantha	mountain cross	S
Penstemon barbatus	beardlip penstemon	S
Penstemon linarioides	toadflax beardtongue	S
Physaria sp.	bladderpod	S
Plantago patagonica	woolly plantain	S
Salsola tragus	Russian thistle	U
Senecio flaccidus	threadleaf groundsel	S
Solanum elaeagnifolium	silverleaf nightshade	S
Sonchus asper	spiny-leaf sow-thistle	S
Sphaeralcea digitata	juniper globemallow	S
Sphaeralcea fendleri	Fendler's globemallow	S
Sphaeralcea laxa	caliche globemallow	S
Stephanomeria pauciflora	brownplume wirelettuce	S
Verbascum thapsus	common mullein	U
Verbesina encelioides	golden crownbeard	S
Xanthisma gracile	grass-leaf sleepy daisy	U
Xanthisma spinulosum	lacy sleepy daisy	S
Zinnia grandiflora	Rocky Mountain zinnia	U
Graminoids (grasses and grass-like plants)		

Scientific Name	Common Name	Relative Abundance
Aristida purpurea	purple threeawn	C
Bothriochloa barbinodis	cane bluestem	U
Bouteloua curtipendula	sideoats grama	C
Bouteloua eriopoda	black grama	A
Bouteloua gracilis	blue grama	C
Bouteloua hirsuta	hairy grama	U
Carex sp.	sedge	S
Festuca arizonica	Arizona fescue	U
Muhlenbergia emersleyi	bullgrass	C
Muhlenbergia longiligula	long-tongue muhly	U
Muhlenbergia torreyi	ring muhly	S
Piptochaetium fimbriatum	piñon ricegrass	S
Schizachyrium scoparium	little bluestem	S
Scleropgoon brevifolius	burro grass	S
Sporobolus cryptandrus	sand dropseed	C

Notes:

Relative Abundance: A=Abundant; C=Common; U=Uncommon; S=Sparse

Reference:

Geosystems Analysis, Inc. 2021. Emma-Oak Grove Rare Plant Survey. Prepared for WestLand Resources. February 8.

Table 3: Summary of Emma Expansion Project Related Permits

Permit or Requirement	Agency	ID Number	Area Covered
Registration	U.S. Department of Labor, Mine Safety and Health Administration		Mine
Mining Act Permit	New Mexico Mining Minerals Division	GR010RE and associated modifications and revisions	Mine
Groundwater Discharge Permits[1]	NMED Ground Water Quality Bureau	DP--396	Mine/Stockpile Unit
DP-1341 Settlement Agreement and Stipulated Final Order	NMED Ground Water Quality Bureau	DP-1341	Mine
NPDES Stormwater General Permit (2021 Multi-Sector General Permit)	U.S. EPA (Region 6)	NMR053073	Mine
Water Rights	New Mexico Office of State Engineer	GSF85, GSF85S, GSF02260, GSF3020, M02680, M04978, M04979, M04980	Surface Water & Groundwater
Air Quality	U.S. EPA (Region 6)	P147-R2 (as of December 2019)	Title V Mine-wide
SARA Title III			
Hazardous Waste Generator	U.S. EPA/New Mexico Department of Public Safety	NMD035806405	Mine
Hazardous Materials Transporter	U.S. Department of Transportation	062406-550-001OP	NA
Individual Liquid Waste Permit	NMED, Construction Industries Division	SC060183	Mine

Notes:
[1] – The Emma Expansion area will be incorporated into DP-396 as part of the DP-396 renewal and modification application.
NA = Not applicable
NMED = New Mexico Environment Department
U.S. EPA = United States Environmental Protection Agency

FIGURES

Emma Land Ownership Map

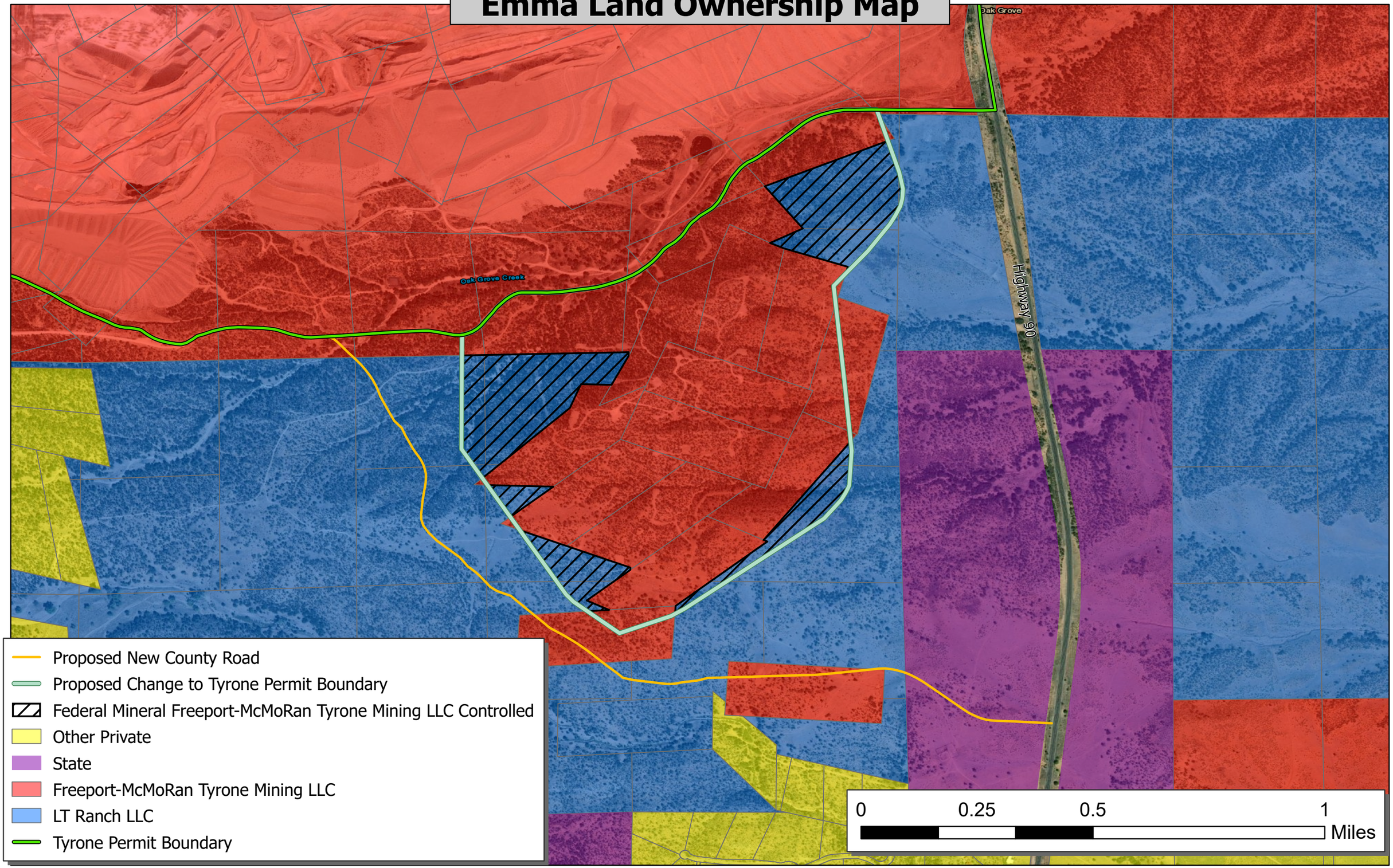

Figure 1 - Owners of Surface and Mineral Estates Within the Proposed Emma Area

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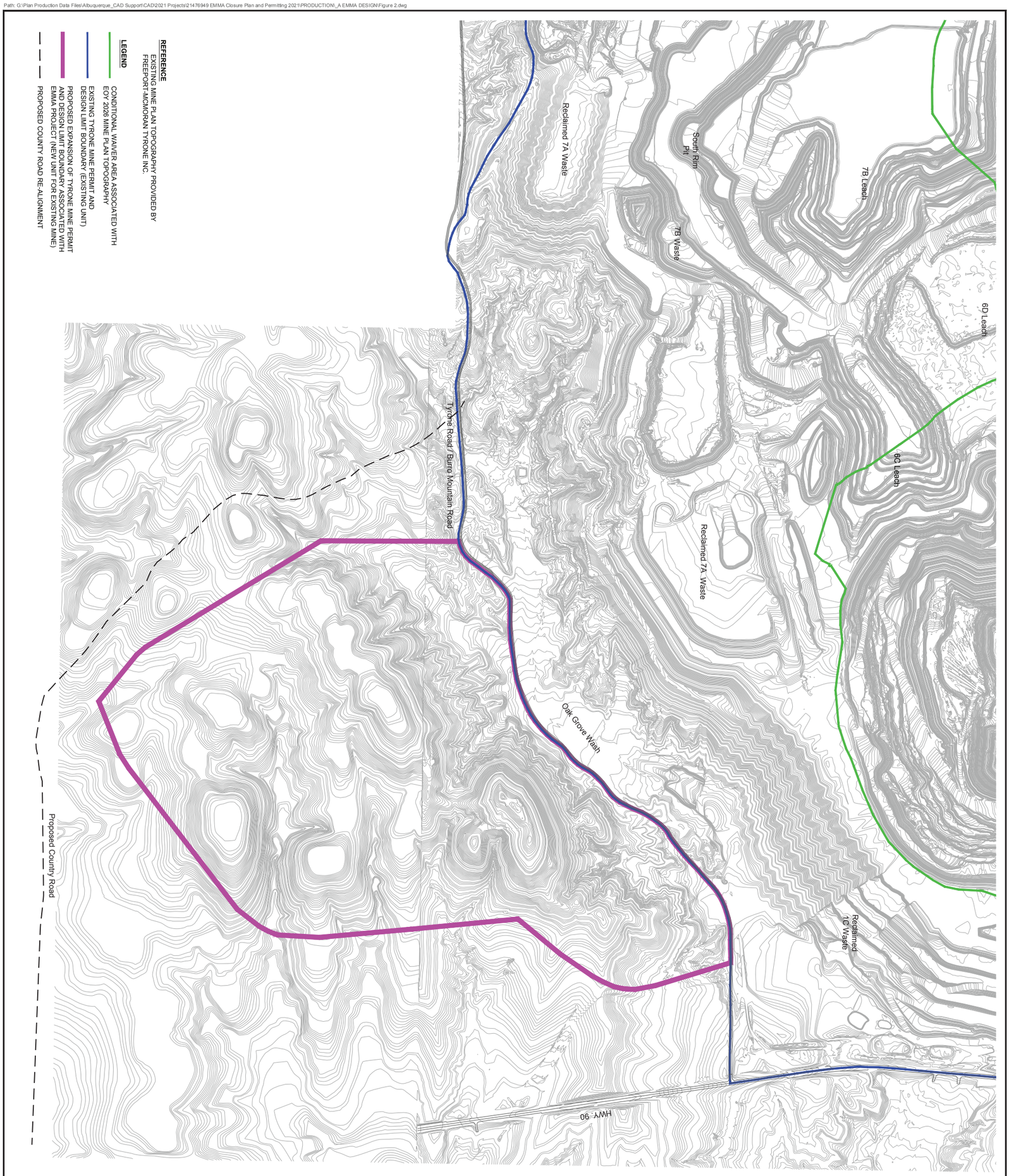
Path: G:\Plan Production Data Files\Albuquerque_CAD Support\CAD\2021 Projects\21476949 EMMA Closure Plan and Permitting 2021\PRODUCTION_A EMMA DESIGN\Figure 2.dwg



SCALE 150 0 150 300 FEET

PROJECT
EMMA EXPANSION PROJECT

TITLE
EXISTING TYRONE MINE PERMIT AND DESIGN LIMIT BOUNDARY AND EMMA EXPANSION AREA

PROJECT NO.
21-476949

REV. 0

FIGURE 2 of

CLIENT
FREEPORT-MCMORAN
TYRONE INC.

CONSULTANT
GOLDER
MEMBER OF WSP

GOLDER ASSOCIATES
2108 WEST LABURNUM AVENUE
SUITE 200
RICHMOND, VA 23227
(804) 358-7900
www.golder.com

SEAL

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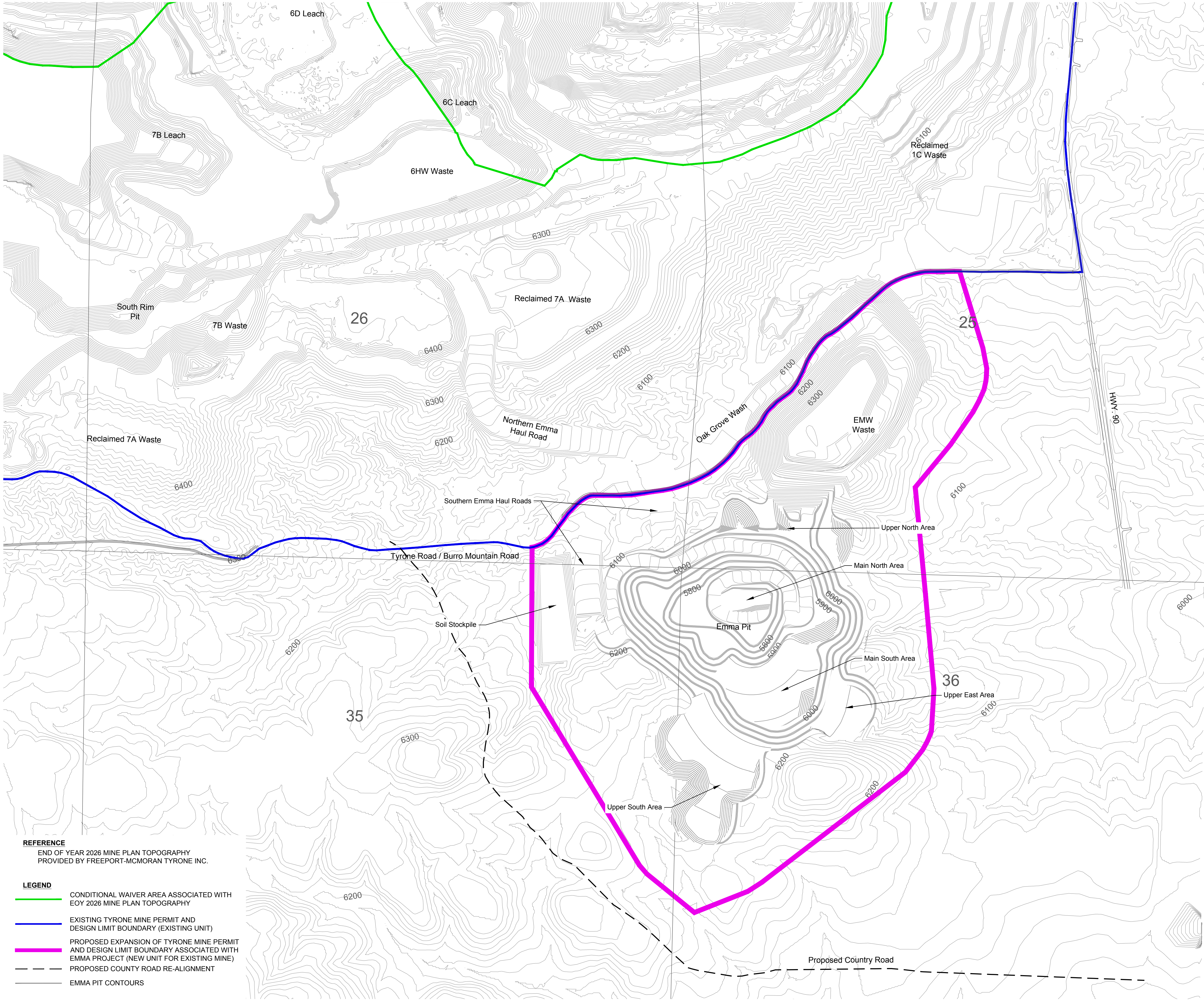

REFERENCE

END OF YEAR 2026 MINE PLAN TOPOGRAPHY
PROVIDED BY FREEPORT-MCMORAN TYRONE INC.

LEGEND

- CONDITIONAL WAIVER AREA ASSOCIATED WITH EOY 2026 MINE PLAN TOPOGRAPHY
- EXISTING TYRONE MINE PERMIT AND DESIGN LIMIT BOUNDARY (EXISTING UNIT)
- PROPOSED EXPANSION OF TYRONE MINE PERMIT AND DESIGN LIMIT BOUNDARY ASSOCIATED WITH EMMA PROJECT (NEW UNIT FOR EXISTING MINE)
- PROPOSED COUNTY ROAD RE-ALIGNMENT
- EMMA PIT CONTOURS

REV.	MM/DD/YY	DESCRIPTION	DESIGN	CADD	CHECK	REVIEW
0	2021-10-04	-		SIB		

SEAL

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PROJECT
EMMA EXPANSION PROJECT

TITLE
LAYOUT OF EMMA FACILITY AT THE END OF YEAR 2026

PROJECT NO. 21-476949

REV. 0

FIGURE 3

ATTACHMENT 2
FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS FOR NEW UNITS
(Section 19.10.5.508 NMAC)

ATTACHMENT 2 – FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS (Section 19.10.5.508 NMAC)

The following conditions apply to new disturbances associated with the Emma Expansion Project located outside the current Tyrone Mine Permit and Design Limit Boundary identified in Permit Revision 09-1 to MMD Permit GR010RE (MMD 2021). These new unit areas are shown on **Figure 3 of Attachment 1** and include the facilities located within the Proposed Expansion of the Tyrone Mine Permit and Design Limit Boundary Associated with Emma Project. These new unit facilities consist primarily of new disturbances associated with the Emma Pit, development of the new EMW Waste stockpile outside the current mine permit and design limit, construction of the new Southern Emma Haul Roads, construction of the new Soil Stockpile, and miscellaneous disturbances that may occur around the perimeter of the Emma Pit associated with the proposed mine operations.

Section 19.10.5.508 NMAC Requirements:

A. ***Most Appropriate Technology and Best Management Practices*** *The mining operation and the reclamation plan shall be designed and operated using the most appropriate technology and the best management practices.*

Tyrone Response:
The Emma mining operation and reclamation plans are designed using the most appropriate technologies and the best management practices. The Emma operations will be conducted in accordance with the Emma Material Characterization and Handling Plan (LCG 2021), Emma blasting plan (**Attachment 4**) and Tyrone Storm Water Management Plan (SWMP) (DBS&A 2021a)that contribute to the environmental quality of the Tyrone operations and provide for environmental monitoring and mitigation.

As will be described in Sections 4 and 5 of the Emma CCP which will be submitted to the agency in a few weeks as part of this permit revision application package, the reclamation plan and associated design criteria conform to the closure requirements described in DP-1341 and the Copper Mine Rules, and closeout requirements described in MMD Permit GR010RE (MMD, 2004; 2021) and Sections 19.10.5.507 and 508 NMAC.

B. ***Assure Protection*** *The mining operation and completed reclamation shall meet the following requirements established to assure protection of human health and safety, the environment, wildlife and domestic animals:*

(1) ***Signs, Markers and Safeguarding*** *Measures will be taken, to safeguard the public from unauthorized entry into shafts, adits, and tunnels and to prevent falls from highwalls or pit edges. Depending on site- specific characteristics, the following measures shall be required:*

(a) closing shafts, adits or tunnels to prevent entry;

Tyrone Response:
Activities at Tyrone are regulated by the Mine Safety and Health Administration. Tyrone maintains security plans that define the approaches used to prevent unauthorized access to each property. Through mandated training programs, all employees and contractors are trained to observe and report suspicious or unusual activity that threatens safety or security. Security personnel control access to the facility 24-hours per day. These measures will be extended for the new Tyrone Mine Permit and Design Limit Boundary area and associated Emma facilities.

(b) posting warning signs in locations near hazardous areas;

Tyrone Response:
As part of site development and as a site safety feature, a perimeter fence beyond the proposed new Tyrone Mine Permit and Design Limit Boundary will be constructed and will include no trespass signs with appropriate safety warnings. For post-closure, additional site access restrictions will be implemented, including signs posted on new 6-foot-high chain link fencing installed around the perimeter of the pit at 500-foot intervals and at all access points, and warnings of potential hazards present.

(c) restricting access to hazardous areas;

Tyrone Response:
See response above for site access restriction measures that are implanted at the Tyrone Mine now and will be implemented at the Emma project as well during operations. Additionally, Security personnel control access to the facility 24 hours per day. The security personnel routinely patrol the facility, and perimeter gates are required to be maintained, closed, and locked.

The perimeter fencing will remain in place post-closure and the additional post-closure safety features for the open pit are described above.

(d) marking the permit area boundaries;

Tyrone Response:
The Tyrone Mine permit area boundaries have been surveyed and staked, and the new Tyrone Mine Permit and Design Limit Boundary area associated with the Emma Expansion Project will be surveyed and staked following approval of this permit revision application.

(e) posting a sign at the main entrances giving a telephone number of a person to call in the event of emergencies related to the mine; or

Tyrone Response:
A sign is currently posted at the main entrance to the Tyrone Mine giving the telephone numbers of persons to call in the event of emergencies related to the mine. The primary access point for the proposed Emma Expansion Project area will be through the main gate of the Tyrone Mine.

(f) other measures as needed to protect human safety.

Tyrone Response:
Tyrone and the processing/stockpiling operations are regulated by safety regulations promulgated by the Mine Safety and Health Administration (MSHA; primarily 30 CFR Parts 47, 48, 56, 58, and 62), which set the standard for safety training, personal protective equipment, mining-related work, and health standards governing occupational exposure to regulated substances and noise. In addition, Tyrone has implemented supplementary safety programs to reflect corporate policies and site-specific considerations. Through MSHA training, all employees are trained to observe and report suspicious or unusual activity that threatens safety or security. These safety measures will be extended to the Emma Expansion Project once it is permitted.

Additionally, the perimeter of the mining area is fenced, and access roads are gated and locked. Security personnel control access to the facility 24 hours per day. The security personnel routinely patrol the facility, and perimeter gates are required to be maintained, closed, and locked. Perimeter gates found damaged are immediately repaired. Tyrone security is to be notified immediately when gates are found open and/or unlocked. Where appropriate, fencing has been or will be constructed around the perimeter of the mining areas to prevent the public from accessing active mining areas. The perimeter fencing and the existing security measures will be extended around the Emma Project area once it is permitted.

(2) ***Wildlife Protection*** *Measures shall be taken to minimize adverse impacts on wildlife and important habitat. Based on site-specific characteristics, the following measures will be required:*

(a) restricting access of wildlife and domestic animals to toxic chemicals or otherwise harmful materials;

Tyrone Response:
Existing wildlife protection measures by Tyrone are effective at minimizing adverse impacts on wildlife and important habitat. The approved measures used within the current permit boundaries will be extended to include the new Tyrone Mine Permit and Design Limit Boundary area once it is permitted. Specifically, to restrict access of domestic animals from entering the Emma Expansion area, the additional fencing (described above for public safety) will prevent access by livestock. Operations and security personnel will monitor the Emma Expansion area and property fence lines and inspect for wildlife entry daily.

Once operations cease, the Emma Expansion area will be reclaimed for a post-mining land use of wildlife habitat. Additional fencing will be installed around the perimeter of the Emma Pit and around the Emma Pit sump to exclude large terrestrial animals at closure. A form of bird exclusion, such as floating balls, will be installed on the pit water management sump to ensure that birds cannot access the water surface within the Emma Pit sump (if present).

Additionally, the Emma operations will be conducted in accordance with the Emma Material Characterization and Handling Plan (LCG 2021) and Tyrone Storm Water Management Plan (DBS&A 2021a) that will contribute to the environmental quality of the Emma operations and provide for environmental monitoring and mitigation.

(b) minimizing harm to wildlife habitat during mining; and

Tyrone Response:
The project will remove wildlife habitat as the project develops; however, there is natural economic incentive to minimize the disturbance to what is necessary to safely develop the project. The Emma operational plans and wildlife protection measures described above will contribute to the environmental quality of the Emma operation and provide for environmental monitoring and mitigation that will all serve to help minimize harm to wildlife habitat during mining.

The recently completed wildlife survey completed in the Emma Expansion area (WestLand Resources, Inc. 2021) has identified several species of plants that are valuable to the wildlife in the area. Some of the pollinator-friendly plants that can be safely and practicably salvaged will be removed and transplanted to existing nearby Tyrone reclamation areas prior to clearing and grubbing the site (Agave, jumping cactus, prickly pear cactus etc.).

Additionally, Tyrone's Environmental Management System (EMS), which will be implemented at Emma, provides the framework within which the company evaluates its environmental impacts and performance. The EMS allows the company to assess environmental risks and issues within its operational structure in order to minimize and mitigate environmental impacts from its activities. Further, the EMS helps demonstrate Tyrone's due diligence in complying with environmental regulations, and includes a number of plans, processes, and tools.

(c) reclaiming areas of wildlife habitat if not in conflict with the approved post-mining land use.

Tyrone Response:
The reclamation plan that will be described in detail in the upcoming Emma CCP will provide for the establishment of a self-sustaining ecosystem consistent with the designated post-mining land uses and life zone of the surrounding area, which for the Emma Expansion area, is wildlife habitat.

(3) ***Cultural Resources*** *Cultural resources listed on or eligible for listing on the National Register of Historic Places or the State Register of Cultural Properties, and any cemeteries or burial grounds shall be protected until clearance has been granted by the State Historic Preservation Office or other appropriate authority.*

Tyrone Response:
Proposed new land disturbances associated with the Emma Expansion Project were compared against previous cultural resource inventories to determine the extent of survey coverage. As the Emma Expansion Project area had not previously been surveyed, Tyrone contracted qualified archaeologists from WestLand Resources to conduct a Class III (100 percent coverage) cultural resource survey of the project area. The Class III survey (Chamorro 2021) did not identify any historic properties eligible for listing on the National Register of Historic Places or State Register of Historic Places. Therefore, this project will have no effect on any Register-eligible properties. Copies of this report were provided to MMD and the State Historic Preservation Office on June 22, 2021.

(4) ***Hydrologic Balance*** *Operations shall be planned and conducted to minimize negative impact to the hydrologic balance in both the permit and potentially affected areas.*

Tyrone Response:
Proposed mining operations at Emma will have minimal impact on the hydrologic balance as defined in 19.10.5.508 NMAC. Stormwater flows in Oak Gove Wash and Cherry Creek will continue around Emma, as they do today, and all stormwater generated within the Emma Pit will be hydrologically contained within the pit perimeter, including stormwater that contacts exposed sulfides and may become impacted.

The proposed location of the Emma Pit is not within a Federal Emergency Management Agency (FEMA) flood zone (**Figure 1**). Oak Grove Wash and Cherry Creek are not recognized as flood zones in the vicinity of Emma; however, sections of them several miles downstream and east of Emma (off the map view shown in **Figure 1**) are recognized as flood zones. The proposed Northern Haul Road will be located within the existing Tyrone Mine Permit and Design Limit Boundary (existing unit) and will cross Oak Grove Wash. An engineered culvert crossing will be constructed at the Oak Grove crossing and will be constructed and maintained to allow stormwater to flow under it without jeopardizing its integrity. Engineering designs for the Oak Grove Wash crossing are found in **Attachment 5**.

The operations and post-closure water quality estimates presented in the Hydrogeologic Report for Proposed Open Pit at Emma Exploration Project (DBS&A, 2021b) estimate that the water quality in the Main North and Main South during operations will meet water quality standards. For the scenario representing post-closure water quality in Main North, water quality will not meet standards and sulfide oxidations is observed to impact water quality. As a result of these water quality predictions, the entire Emma Pit hydrologic capture zone will be managed as a terminal sink that will not flow through to the surrounding groundwater.

(a) Operations shall be designed so that non-point source surface releases of acid or other toxic substances shall be contained within the permit area, and that all other surface flows from the disturbed area are treated to meet all applicable state and federal regulations.

Tyrone Response:
Tyrone maintains several state and federal permits to protect surface water and ground water and to ensure adherence to water quality standards as mandated by the New Mexico Water Quality Act and the WQCC regulations (NMAC 20.6), Sections 401 and 404 of the Clean Water Act, and the EPA's NPDES MSGP. DP-396 has been issued by NMED to address operational water quality issues at the Tyrone Mine, and the Emma Expansion Project area is being proposed to be incorporated into this DP as part of a permit renewal and modification application being submitted to the NMED concurrent with this application. DP-1341 has been issued by NMED to address closure/post-closure water quality issues at the Tyrone Mine, and the Emma CCP (forthcoming) will address closure/post-closure water quality monitoring and reporting specific to Emma. In addition to surface water monitoring and analyses required in DP-396, DP-1341, and the Emma CCP, the Tyrone Storm Water Pollution Prevention Plan (SWPPP) (Freeport McMoRan Tyrone, Inc. 2012), SWMP (DBS&A 2021a) and Spill Prevention Control and Countermeasure (SPCC) Plan (Freeport McMoRan Tyrone, Inc. 2010) serve to protect water quality at Tyrone and will include the Emma Expansion Project area once the permit applications are approved.

During mine operations, potentially acid-generating rock is not projected to be encountered in significant amounts until year 4 of mining. Therefore stormwater that comes into contact with such materials will be collected within the pit during and after operations and will be pumped to the Tyrone Mine process water containment/management system.

During mine site development, BMPs will be installed prior to surface disturbance to control offsite erosion. The majority of the BMPs will consist of brush and rock sediment control berms derived from the clearing and grubbing of the site and placed on the downgradient side of the limit of surface disturbance. These will be placed along the down-gradient perimeter of the Northern Emma Haul Road (existing unit) and Southern Emma Haul Roads (new unit), EMW Waste stockpile and initial pit development areas.

Additionally, upon closure, areas proposed for revegetation will be loosened by ripping to a depth of between 18 and 24 inches and revegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR010RE and associated Permit revisions. If acid-generating material is present on areas proposed for revegetation, the area will be ripped, covered with 36 inches of the suitable cover material and revegetated in accordance with MMD Permit GR010RE and associated Permit revisions. These measures will help control any potential non-point source surface releases from the new disturbance areas.

(b) The disturbed areas shall not contribute suspended solids above background levels, or where applicable the Water Quality Control Commission's standards, to intermittent and perennial streams.

Tyrone Response:
Tyrone will ensure that the new disturbance areas within the new unit will not contribute suspended solids above background levels, or where applicable the Water Quality Control Commission's standards, to intermittent and perennial streams as mandated by the New Mexico Water Quality Act and the WQCC regulations (NMAC 20.6), Sections 401 and 404 of the Clean Water Act, and the EPA's NPDES MSGP.

(c) To provide data to determine background levels for surface water entering the permit area, appropriate monitoring shall be conducted on drainages leading into the permit area.

Tyrone Response:
Stormwater flows in Oak Gove Wash and Cherry Creek will continue around the Emma Expansion area, as they do today, and all stormwater generated within the Emma Pit will be hydrologically contained within the pit perimeter, including stormwater that contacts exposed sulfides and may become impacted. Post-closure surface water monitoring locations within and around Emma will include the following points:

- Depth and water quality of the waters that report to the Emma Pit sump;
- Flows and water quality from the Emma Pit dewatering system reporting to the existing 1C and 7A Seepage Collection System conveyance system.

Surface water monitoring and sampling activities will be performed quarterly at each surface water collection point. In addition to surface water monitoring and analyses required in DP-396, DP-1341, and the Emma CCP, the SWMP, SWPPP and SPCC Plan serve to protect water quality.

(d) All diversions of overland flow shall be designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and to assure the safety of the public.

(i) No diversion shall be located so as to increase the potential for landslides.
(ii) Unless site-specific characteristics require a different standard which is included in the approved permit, diversions which have watersheds larger than 10 acres shall be designed, constructed and maintained to safely pass the peak runoff from a 10-year, 24-hour precipitation event.
(iii) All diversion designs which have watersheds larger than 10 acres shall be certified by a professional engineer registered in New Mexico as having been designed in accordance with 19.10 NMAC. Diversion designs shall be kept on-site or otherwise be made available, upon request, to the Director for inspection.
(iv) When no longer needed, temporary diversions shall be removed and the disturbed area reclaimed.

Tyrone Response:
There are no overland flow diversions associated with the Emma Expansion area, thus overland flow diversion requirements for new units are not applicable. Engineering designs for the Oak Grove Wash crossing are found in **Attachment 5**.

(5) ***Stream Diversions*** *When streams are to be diverted, the stream channel diversion shall be designed, constructed, and removed in accordance with the following:*

(a) *Unless site-specific characteristics require different measures to meet the performance standard and are included in the approved permit, the combination of channel, bank and flood plain configurations shall be adequate to safely pass the peak run-off of a 10-year, 24-hour precipitation event for temporary diversions, a 100-year, 24-hour precipitation event for permanent diversions;*

(b) *The design and construction of all intermittent and perennial stream channel diversions shall be certified as meeting 19.10 NMAC by a professional engineer registered in New Mexico. As-built drawings shall be completed promptly after construction and be retained on site or otherwise made available upon request to the Director; and*

(c) *When no longer needed, temporary stream channel diversions shall be removed and the disturbed area reclaimed.*

Tyrone Response:
There are no stream diversions associated with the Emma Expansion area, stream diversion requirements for new units are not applicable. The proposed Northern Haul Road will be located within the existing Tyrone Mine Permit and Design Limit Boundary (existing unit) and will cross Oak Grove Wash and will be a temporary structure used during operations and then removed at closure. An engineered culvert crossing will be constructed at the Oak Grove crossing and will be constructed and maintained to allow stormwater run-off from a 10-year, 24-hour precipitation event to safely pass under it without jeopardizing its integrity. Engineering designs for the Oak Grove Wash crossing are found in **Attachment 5**. Once removed, the Oak Grove crossing will be reclaimed by regrading the channel to its original topography, ripping the surface and revegetating the disturbed surface in accordance with MMD Permit GR010RE and associated Permit revisions.

(6) ***Impoundments*** *If impoundments are required they shall be designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and adjoining property and to assure the safety of the public.*

(a) *Unless site-specific characteristics require different measures to meet the performance standard and are included in the approved permit, impoundments having earthen embankments but not subject to the jurisdiction of the Mine Safety and Health Administration or the State Engineer shall:*

(i) *have a minimum elevation at the top of the settled embankment of 1.0 foot above the water surface in the pond with the spillway flowing at the design depth;*

(ii) have a top width of the embankment not less than 6 feet;
(iii) have combined upstream and downstream side slopes of the settled embankment not less than 5 horizontal : 1 vertical with neither slope steeper than 2 horizontal : 1 vertical. Slopes shall be vegetated or otherwise stabilized to control erosion;
(iv) have the embankment foundation cleared of all vegetative matter, all surfaces sloped to no steeper than 1 horizontal : 1 vertical and the entire foundation area scarified;
(v) have fill material free of vegetative matter and frozen soil;
(vi) have spillways provided to safely discharge the peak runoff of a 25-year, 24-hour precipitation event, or an event with a 90-percent chance of not being exceeded for the design life of the structure;
(vii) have other site-specific design criteria for embankments as long as they result in a minimum static safety factor of 1.3 with water impounded to the design level;
(viii) be designed and certified by a professional engineer registered in New Mexico as having been designed and constructed in accordance with 19.10 NMAC. As-built drawings shall be completed promptly after construction and be retained on site or otherwise made available upon request to the Director; and
(ix) if necessary for sediment control, be in place before any other disturbance is made to the watershed for the impoundment.

(b) When no longer required, impoundments shall be graded to achieve positive drainage
(i) the surface estate owner has requested in writing that they be retained;
(ii) they are consistent with the approved reclamation plan; and
(iii) they are appropriate for the post-mining land use or the self-sustaining ecosystem.

Tyrone Response:
There are no impoundments associated with the new unit areas, so the impoundment requirements are not applicable. The Emma Pit sump with a barge pump will be maintained at the bottom of the Emma Pit during operations and throughout the closure/post-closure period, where stormwater runoff and groundwater inflow will be collected and ultimately conveyed to the No. 1A PLS Collection Tank for processing.

(7) ***Minimization of Mass Movement*** *All man-made piles such as waste dumps, topsoil stockpiles and ore piles shall be constructed and maintained to minimize mass movement.*

Tyrone Response:
The EMW Waste stockpile will be composed of blasted overburden rock placed on 30-to-50-foot high lifts through end-dumping at angle of repose that results in benches with overall slopes less than angle of repose with catch benches on each lift. The EMW Waste stockpile will be regraded and covered will be reclaimed in a manner that ensures that the slope stability requirements listed in Section 20.6.7.33.B NMAC and Permit GR010RE are met. Tyrone recently completed a stockpile stability analysis associated with the current reclamation plan for the EMW Waste stockpile and the report will be included in the forthcoming Emma CCP. The results of this analysis indicate that the stockpiles are stable for long-term conditions reflecting the post-closure stockpile configurations and strength conditions.

(8) ***Riparian and Wetland Areas*** *Disturbance to riparian and wetland areas shall be minimized during mining. Adverse effects to riparian and wetland areas shall be mitigated during reclamation unless the mitigation conflicts with the approved post-mining land use.*

Tyrone Response:
No riparian or wetland areas are present within the Emma Expansion Project area. Therefore, there will be no disturbances of riparian or wetland areas in relation to mining and reclamation activities at Emma.

(9) ***Roads*** *Roads shall be constructed and maintained to control erosion.*

Tyrone Response:
By the EOY 2023, the Southern Emma Haul Roads will have been constructed north and west of the Emma Pit within the Emma Expansion area. Conceptual Designs for the Southern Emma Haul Roads are included in **Attachment 5**. The designs include detailed plans for stormwater management and best management practices for erosion control.

(a) *Drainage control structures shall be used as necessary to control runoff and to minimize erosion, sedimentation and flooding. Drainage facilities shall be installed as road construction progresses and shall be capable of safely passing a 10-year, 24 hour precipitation event unless site-specific characteristics indicate a different standard is appropriate and is included in the approved permit. Culverts and drainage pipes shall be constructed and maintained to avoid plugging, collapsing, or erosion.*

Tyrone Response:
Temporary erosion control measures will be provided during construction. The temporary measures are described in **Attachment 2**, Section 4(a) above, but may also include berms, mulch, straw bales, silt fences, and minor corrective regrading.

(b) *Roads to be constructed in or across intermittent or perennial streams require site-specific designs to be submitted with the permit application.*

Tyrone Response:
Not applicable, Oak Grove Wash is an ephemeral stream.

(c) Roads to be made permanent must be approved by the surface owner and be consistent with the approved post-mining land use.

Tyrone Response:
The proposed Southern Emma Haul Roads will be located exclusively on private land controlled by Tyrone. Any haul roads and access roads (or portions thereof) to be closed (if not needed post-closure) will be reclaimed following closure as described in Section 5 of the Emma CCP that will be submitted as part of this permit revision application package in the coming weeks.

(10) ***Subsidence Control*** *Underground and in situ solution mining activities shall be planned and conducted, to the extent technologically and economically feasible, to prevent subsidence which may cause material damage to structures or property not owned by the operator.*

(a) Underground and in situ solution mining activities near any aquifer that serves as a significant source of water supply to a public water system shall be conducted so as to avoid disruption of the aquifer and consequent exchange of ground water between the aquifer and other strata.

(b) Underground and in situ solution mining activities conducted beneath or adjacent to any perennial stream must be performed in a manner so that subsidence is not likely to cause material damage to streams, water bodies and associated structures.

Tyrone Response:
There are no in-situ solution mining activities associated with the Emma Expansion Project. There are small historic mine workings on the existing site of the proposed Emma Pit. If the permit is approved and mining is implemented to the limits shown, a historic shaft that is currently present would be mined out.

(11) ***Explosives*** *Blasting shall be conducted to prevent injury to persons or damage to property not owned by the operator. Fly rock shall be confined to the permit area. The Director may require a detailed blasting plan, pre-blast surveys or specify blast design limits to control possible adverse effects to structures.*

Tyrone Response:
A site-specific blasting plan has been developed for Emma by Tyrone in consultation with Aimone-Martin Associates, LLC (2021) and is included with this application in **Attachment 4**. The site-specific blasting plan provides information on pre-blast surveys, specify blast design limits to control possible adverse effects to structures, security and notification protocols, and other pertinent measures to be conducted to prevent injury to persons or damage to property. Fly rock will be confined to the Emma Expansion permit area.

C: ***Site Stabilization and Surface Configuration*** *The permit area shall be stabilized, to the extent practicable, to minimize future impact to the environment and protect air and water resources. The final surface configuration of the disturbed area shall be suitable for achieving a self-sustaining ecosystem or approved post-mining land use.*

Tyrone Response:
The reclamation plans and associated design criteria detailed in Section 5 of the Emma CCP (forthcoming) will conform to the closure requirements described in DP-1341 and the Copper Mine Rules, and closeout requirements described in MMD Permit GR010RE (MMD, 2004; 2021). Tyrone recently completed a stockpile stability analysis associated with the current reclamation plan for the EMW Waste stockpile and the report will be included as an Appendix to the Emma CCP that will be submitted as part of this permit revision application package in the coming weeks. The results of this analysis indicate that the EMW Waste stockpile is stable for long-term conditions reflecting the post-closure stockpile configuration and strength conditions.

The reclamation will provide for the establishment of a self-sustaining ecosystem consistent with the designated post-mining land uses and life zone of the surrounding area, which for Emma, is wildlife habitat.

(1) Final slopes and drainage configurations must be compatible with a self-sustaining ecosystem or approved post-mining land use.

Tyrone Response:
New disturbances associated with the Emma Expansion Project that area located outside the current Tyrone Mine Permit and Design Limit Boundary that are to be revegetated will be covered with topdressing, and revegetated to meet the reclamation standards set forth in 19.10.5.507 NMAC and will also comply with the new unit standards set forth in 19.10.5.508.E NMAC.

(2) All reconstructed slopes, embankments and roads shall be designed, constructed and maintained to minimize mass movement.

Tyrone Response:
All reconstructed slopes, embankments and roads will be designed, constructed, and maintained to minimize mass movement. Pursuant to Section 9.C of Revision 09-1 of the MMD Permit, Tyrone will submit a Construction Quality Assurance Plan (CQAP) to MMD for approval no less than 180 days prior to any reclamation activities and will implement the final designs and CQA plan only after MMD approval. The final designs will include detailed engineering designs addressing slopes, surface erosion controls and stormwater management structures for MMD approval. The CQAP will be supplemented with a Final Design (formerly known as a Construction Quality Assurance Report) to be submitted to the MMD within 180 days after completion of construction.

(3) Measures must be taken to reduce, to the extent practicable, the formation of acid and other toxic drainage that may otherwise occur following closure to prevent releases that cause federal or state standards to be exceeded.

Tyrone Response:
Surface water runoff and groundwater inflows in the Emma Pt will flow into the Emma Pit sump and will be collected by the pit dewatering system. Details of the Emma Pit water management and treatment plan are provided in the DP-396 Water Management Plan included in Attachment IID-1 of the DP-396 Permit renewal and modification application package being submitted to the NMED concurrent with this application package. Mining operations will be conducted in accordance with the Emma Material Characterization and Handling Plan recently completed by LCG (2021) and included in Attachment IID-2 of the DP-396 Modification application. As part of the Emma Pit water management plan, non-potentially acid generating (NPAG) waste rock mined from the Emma Pit will be placed within the upper bench areas of the pit (Upper North, Upper South and Upper East areas) and within accessible portions of the South Main and graded to promote surface water runoff toward the pit sump during mine operations. Due to the limited accessibility of the Upper East area, this area will be fully reclaimed during operations with the addition of a one-foot thick layer of soil material from the Soil Stockpile placed over the backfill area surfaces to enhance the seedbed at the surface and then the area will be revegetated in accordance with Appendix C of the MMD Permit GR010RE and associated Permit revisions. The remaining backfilled and graded areas of the South Main, Upper North, and Upper South will be fully reclaimed at closure with the addition of a one-foot thick layer of soil material from the Soil Stockpile placed over all pit backfill area surfaces to enhance the seedbed at the surface and then the areas will be revegetated in accordance with Appendix C of the MMD Permit GR010RE and associated Permit revisions. Surface water conveyances will be designed to safely convey stormwater flows associated with a 100-year 24-hour storm event from the reclaimed areas. An operational sump with a barge pump will be maintained at the bottom of the Emma Pit during operations and in the closure/post-closure period, where stormwater runoff and groundwater inflow will be collected and ultimately conveyed to the No. 1A PLS Collection Tank for processing. These measures will help control any potential non-point source surface releases from the new disturbance areas.

(4) Nonpoint source surface releases for acid or other toxic substances shall be contained within the permit area.

Tyrone Response:
The Emma EMW Waste stockpile and Southern Emma Haul Roads will be constructed with NPAG overburden materials and will be non-discharging facilities. Surface water runoff and groundwater inflows in the Emma Pt will flow into the pit sump and will be collected by the pit dewatering system. Details of the Emma Pit water management and treatment plan are provided in the DP-396 Water Management Plan included in Attachment IID-1 of the DP-396 Permit renewal and modification application package being submitted to the NMED concurrent with this application package.

See in our response to Section 19.10.5.508.B.4(a) for a description of the several state and federal permits that Tyrone maintains to protect surface water and ground water and to ensure adherence to water quality standards as mandated by the New Mexico Water Quality Act and the WQCC regulations (NMAC 20.6), Sections 401 and 404 of the Clean Water Act, and the EPA's NPDES MSGP.

D. ***Erosion Control*** *Reclamation of disturbed lands must result in a condition that controls erosion. Revegetated lands must not contribute suspended solids above background levels to intermittent and perennial streams. Acceptable practices to control erosion include but are not limited to the following:*

(1) stabilizing disturbed areas through land shaping, berming, or grading to final contour;
(2) minimizing reconstructed slope lengths and gradients;
(3) diverting runoff;
(4) establishing vegetation;
(5) regulating channel velocity of water;
(6) lining drainage channels with rock, vegetation or other geotechnical materials; and
(7) mulching.

Tyrone Response:
Details of the water management plan for the Emma Expansion area provided in the DP-396 Water Management Plan included in Attachment IID-1 of the DP-396 Permit renewal and modification application package being submitted to the NMED concurrent with this application package. Tyrone will provide the MMD with final detailed plans for stormwater management and best management practices (BMPs) for erosion control, for MMD approval, at least 180 days before proposed reclamation activities are to occur at Emma, and will implement the plans after MMD approval. Tyrone will design, construct and maintain BMPs for erosion control identified by the U.S. Natural Resource Conservation Service or alternative equivalent standards acceptable to MMD.

Vegetation will be established on the reclaimed areas at Emma resulting in increased erosion protection and direct habitat improvement, and reduced percolation of water into the underlying materials relative to current conditions. BMPs will be utilized during construction and operation of the Emma facilities to limit sediment transport. Long-term erosion control measures may include the installation of berms, designed channels, and sediment traps, as necessary. Short-term erosion control measures may include, but not limited to: silt fences, hay bales, water bars, and mulching. Runoff from the reclaimed facilities will be diverted into natural drainages (or to the pit sump for portions of the Emma Pit) and final shaping will stabilize all disturbed areas.

E. ***Revegetation*** *To obtain the release of financial assurance revegetated lands must meet the following standards:*

(1) Revegetation success for a self-sustaining ecosystem shall be determined through comparison of ground cover, productivity and diversity and shall be made on the basis of the following approved reference areas; through the use of technical guidance procedures published by the U. S. Department of Agriculture; other reasonably attainable standards approved by the Director; or a combination. Data collection shall be performed using the same methods and techniques on reference areas and reclaimed areas.

(a) foliar or basal cover and productivity of living perennial plants of the revegetated area shall be established equal to 90 percent of the reference area or equal to the approved revegetation standard to within a 90-percent statistical confidence;
(b) diversity of plant life forms (woody plants, grasses, forbs) shall consider what is reasonable based on the physical environment of the reclaimed area; and
(c) woody plant species shall be established to the approved density with an 80 percent statistical confidence.

Tyrone Response:
Areas proposed for revegetation located outside the existing Tyrone Mine Permit and Design Limit Boundary (new units) associated with the Emma Expansion Project that are to be covered with topdressing, and revegetated will meet the reclamation standards set forth in 19.10.5.507 NMAC and will also comply with the new unit standards set forth in 19.10.5.508.E NMAC. The proportional success guideline for total canopy cover shall be 70 percent of the reference area to within a 90 percent statistical confidence for existing units and 90 percent of the reference area to within a 90 percent statistical confidence for new units. The ground cover of living perennial plants shall be adequate in both the existing and new unit disturbance areas to control erosion. Plant diversity guidelines will comply with Appendix A of Revision 09-1 of the MMD Permit (MMD 2021). These guidelines are based on the assumption that site stability is improved by establishing plants with different ecological amplitudes to buffer seasonal and annual fluctuations in climate. The diversity guidelines for the Tyrone Mine was developed from a functional perspective, whereby site stability and erosion control are primary performance objectives. The proportional success guideline for shrub density will be equal to 80 percent of the measured reference area value with an 80 percent statistical confidence in accordance with 19.10.5.508E NMAC for new units and 60 percent of the measured reference area value with an 80 percent statistical confidence for existing units.

(2) For areas for which the approved post-mining land use is for wildlife habitat or forest land, success of vegetation shall be determined on the basis of tree or shrub stocking (density) and ground cover.

(a) The ground cover of living perennial plants shall be equal to 90 percent of the native ground cover of the reference area or the approved standard to within a 90 percent statistical confidence and shall be adequate to control erosion.
(b) Tree stocking for forest land shall have stocking rates of plant species equal to 90 percent of the approved reference area or other approved standard with an 80 percent statistical confidence and shall be adequate to control erosion.

Tyrone Response:
Shrub density guidelines will comply with Appendix A of Revision 09-1 of the MMD Permit (MMD 2021). The standard for shrub density shall be 60 percent of the shrub density of the reference area to within an 80 percent statistical confidence for existing units and 80 percent of the shrub density of the reference area to within an 80 percent statistical confidence for new units. The proportional success guideline for ground cover will be equal to 90 percent of the measured reference area value with a 90 percent statistical confidence in accordance with 19.10.5.508E NMAC for new units and 70 percent of the reference area to within a 90 percent statistical confidence for existing units. There are no tree stockings proposed.

(c) If wildlife habitat is to be the post-mining land use, the operator shall select and use plant species on reclaimed areas based on the following criteria:

(i) their proven nutritional value for fish and wildlife;
(ii) their uses as cover and security for wildlife;

(iii) their ability to support and enhance fish and wildlife habitat; and

(iv) distribute plant life forms to maximize benefits of edge effect, cover and other benefits for fish and wildlife.

Tyrone Response:

The proposed seed mix for the Emma Expansion area was selected to provide early establishment of ground cover, erosion control, and diversity in growth forms, and is in accordance with the seed mix presented in Appendix A of Revision 09-1 of the MMD Permit (MMD 2021). The species selected for Emma have been successfully used in mine reclamation and range improvement projects in many parts of New Mexico, including both the Tyrone and Little Rock mines. The vegetation will provide forage, seeds, and cover for reptiles, small mammals, and birds. The reptiles, small mammals, and birds common to the mine area will benefit from the increased insect populations that are likely to accompany revegetation of the site. The shrubs, grasses, and forbs selected for use at the Emma will provide nutritious forage and browse for large mammals (e.g., deer). In addition, the seed mix includes a number of valuable forage grasses that are absent or occur at a low frequency outside the permit area, thus, improving the range condition locally.

Successful implementation of the proposed reclamation plan will result in the development of an early-stage grass/shrub community within a larger plant community that is dominated by a mixed-evergreen woodland community. The areas of cliffs and talus associated with the pit walls will provide features that are consistent with the local topography in the canyons. The reclaimed area will provide a locally important increase in community level diversity that will benefit the broad range of wildlife adapted to the area. The pit's topographic relief is expected to present desirable nesting and perching sites for birds and insects.

(3) Revegetation for other post-mining land shall be consistent with the approved post-mining land use. Site-specific standards may include standards for foliar or basal cover, production and diversity and will be included in the approved permit.

Tyrone Response:

Site specific revegetation standards will be in accordance with the standards and guidelines for revegetation success listed in Appendix A of Revision 09-1 of the MMD Permit (MMD 2021) .

ATTACHMENT 2 – FULFILLMENT OF PERMIT REVISION APPLICATION REQUIREMENTS (Section 19.10.5.508 NMAC)

References:

Daniel B. Stephens & Associates, Inc. (DBS&A) 2021a. Sitewide Water Management Plan Tyrone Mine (See DP-396 Modification Application). Prepared for Freeport-McMoRan Tyrone Inc. Tyrone, New Mexico. May 28.

DBS&A. 2021b. Hydrogeologic Report for Proposed Open Pit at Emma Exploration Project (See DP-396 Modification Application). Prepared for Freeport-McMoRan Tyrone Inc., Tyrone, New Mexico. October 22.

Freeport McMoRan Tyrone, Inc. 2010. Spill Prevention Control and Countermeasure Plan. September.

Freeport McMoRan Tyrone, Inc. 2012. Multi-Sector General Storm Water Permit (MSGP)-2008 Stormwater Pollution Prevention Plan Tyrone Inc. September.

Life Cycle Geo, LLC (LCG). 2021. Material Characterization and Handling Plan for Two Non-Discharging Facilities: Emma Project (See DP-396 Modification Application. October 22.

Mining and Minerals Division (MMD). 2004. Permit Revision 01-1 to Permit No. GR010RE Tyrone Mine Existing Mining Operation. Mining and Minerals Division Energy, Minerals and Natural Resources Department. April 12.

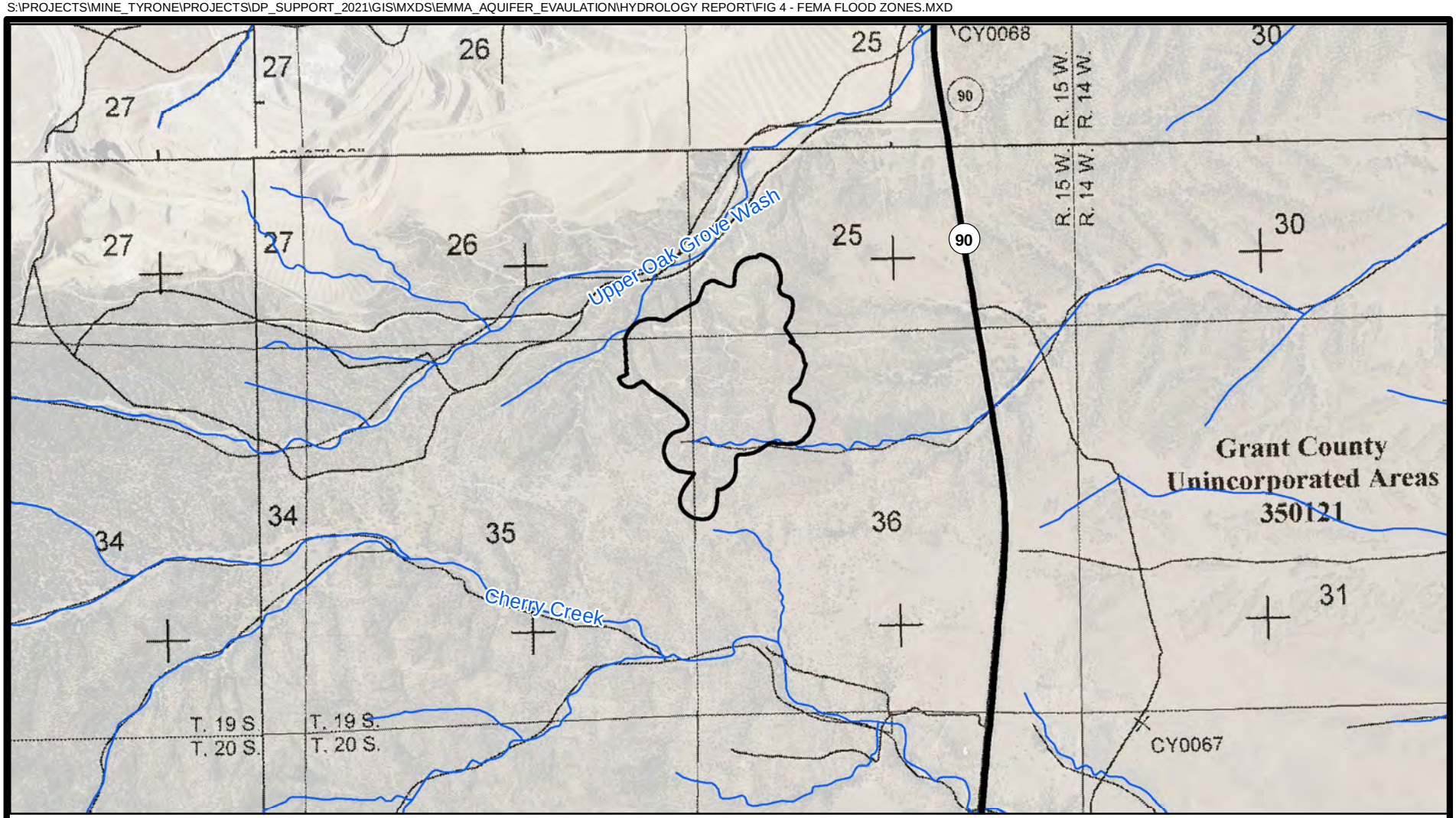
MMD. 2021. Reissued Permit No. GR010RE Permit Revision 09-1: Updated Site Wide Closure/Closeout Plan Tyrone Mine Existing Mining Operation. Mining and Minerals Division Energy, Minerals and Natural Resources Department. March 29.

Telesto. 2021. Northern and Southern Emma Haul Road Preliminary Design. Prepared for Freeport-McMoran Tyrone Inc., Tyrone, New Mexico. October 22.

WestLand Resources, Inc. 2021. Emma Project Wildlife and Habitat Impact Assessment. Prepared for Freeport-McMoRan Tyrone Inc., Tyrone, New Mexico. October 22.

FIGURES

S:\PROJECTS\MINE_TYRONE\PROJECTS\DP_SUPPORT_2021\GIS\MXDS\EMMA_AQUIFER_EVAULATION\HYDROLOGY REPORT\FIG 4 - FEMA FLOOD ZONES.MXD



Explanation

- Proposed Emma pit boundary
- Zone A denotes 100 year flood zone
- Streams

N

0 1000 2000 Feet

Note: No Zone A regions are within map view. Nearest Zone A region is more than 2.7 miles east of Emma.

Source:
1. Aerial imagery (NAIP, 2020)
2. FEMA, Flood Insurance Rate Map, Grant County, New Mexico, Panels 1225, 1250, 1235, 1475 and 1500.
3. Stream file (U.S. Census Bureau, 2019)

FREEPORT-McMoRan

TYRONE MINE

Federal Emergency Management Agency Flood Zones

Figure 1

DBS&A
Daniel B. Stephens & Associates, Inc.
9/13/2021 DB20.1392.00

ATTACHMENT 3

TYRONE MINE EMMA EXPANSION PROJECT
SITE ASSESSMENT SUMMARY
(Enclosed)

Tyrone Mine Emma Expansion Project

Site Assessment Summary

The Emma project is proposed as a new unit to an existing mine under the New Mexico Mining Act Regulations. The applicable regulations as they relate to the site assessment are summarized below.

19.10.5.502 - PERMIT APPLICATION REQUIREMENTS; Site Assessment 19.10.5.502 D (4):

"The site assessment previously submitted pursuant to Section 69-36-5 of the Act shall be considered part of the application. If information in the site assessment requires updates to provide information necessary for evaluation of the permit or if the site-specific conditions at the time of the assessment significantly deviate from conditions at the time of submittal of the permit application, such updated information or deviations must be described in the application."

Section 69-36-5 of the Mining Act:

"The mining operation site assessment for new and existing mining operations shall describe in detail the mining operation's existing permits and regulatory requirements pursuant to the standards for mining operations pursuant to existing state and federal environmental standards and regulations. To the extent that they are applicable, the permit applicant may incorporate documents on file with state agencies. The mining operation site assessment shall include:

(1) identification of a proposed permit area for the mining operation;

(2) a description of the location and quality of surface and ground water at or adjacent to the mining operation and an analysis of the mining operation's impact on that surface and ground water;

(3) a description of the geologic regime beneath and adjacent to the mining operation;

(4) a description of the piles and other accumulations of waste, tailings and other materials and an analysis of their impact on the hydrologic balance, drainages and air quality;

(5) an analysis of the mining operation's impact on local communities

(6) a description of wildlife and wildlife habitat at and surrounding the mining operation and an analysis of the mining operation's impact on that wildlife and wildlife habitat; and

(7) for existing mining operations, a description of the design limits for each unit, including waste units, impoundments and stockpiles and leach piles."

The original site assessment for the Tyrone Mine titled Mining Operations Site Assessment Tyrone Mine was prepared by Dames and Moore dated June 28,1994. That site assessment was supplemented by various studies, applications, and reports associated with Mining Act permit modifications and revisions (including Tyrone Closure/Closeout Plan updates) and Discharge Permit activities over the years. The purpose of this Site Assessment Summary is to provide additional information associated with the Emma project to ensure that the State Agencies and Public have a clear understanding of how these regulations are fulfilled in the Emma permit applications.

Significant portions of the site assessment are provided in Tyrone's application to modify Discharge Permit (DP) 396 which is being submitted concurrently with the Revision Application of GR010RE for Emma.

Site Assessment Components

(1) Proposed Permit Area – See Figure 2 which shows both the Tyrone Permit and the proposed expansion to the Tyrone Permit area for the Emma expansion project. Figure 2 is referenced in Section D-5 of this Emma Project Mining Act Permit Application.

(2) Analysis of location, quality and impacts to surface and groundwater - See Attachment II.C-3 of the Tyrone DP 396 Modification application - DBS&A. 2021. Hydrogeologic report for proposed Emma expansion project, Tyrone Mine. Prepared for Freeport-McMoRan Tyrone Inc., Tyrone, New Mexico. October 22, 2021.

(3) Geologic regime – See Parts IV.A.5, Figure IVC-1 and Attachment IVC-1 of the DP 396 Permit Modification application.

(4) Description of waste stockpiles and their impact on the hydrologic balance, drainages, and air quality:

Figure 3 of this permit application shows all of the proposed mine facilities associated with the Emma project. Tyrone proposes to construct two waste stockpiles – 6HW Waste and EMW Waste from the overburden materials excavated from the Emma open pit.

The proposed EMW Waste stockpile will cover up to approximately 54 acres prior to reclamation, including approximately 6.3 acres of the northern portion of the Emma Pit. Approximately 8 acres of the EMW Waste stockpile will lie within the existing Tyrone Mine Permit Area and Mine/Design Limit, and the remaining 46 acres lies within the proposed expanded Tyrone Permit Area to accommodate the Emma expansion project. The EMW Waste stockpile is bounded by the Emma Pit to the west/southwest, Reclaimed 1C and Reclaimed 7A Waste stockpiles and Oak Grove Wash to the north, and undisturbed land to the east. At the EOY 2026 the top of the stockpile will be at an elevation of up to 6,360 ft amsl. The EMW Waste stockpile will consist primarily of Pre-Cambrian granite and other non-potentially acid generating (NPAG) overburden materials from the Emma Pit. Although the EMW Waste stockpile will be constructed as a non-discharging facility, Tyrone acknowledges that it is subject to a material handling plan to ensure that it will in fact be a non-discharging unit. Tyrone is currently testing the physical and chemical soil suitability characteristics of the waste rock materials that will be placed at the EMW Waste stockpile to confirm that the materials meet suitability criteria for reclamation cover. These results will be presented in the Emma Closure/Closeout Plan that will be submitted to the agencies in the next few weeks as part of the permit application package. The stockpile will be constructed by end dumping in lifts approximately 50 feet high. The outslope of the stockpile will be built at angle of repose, and the top surface will be constructed to the reclamation design slope of approximately 1 percent. The EMW Waste stockpile configuration shown is larger than the anticipated amount of NPAG material expected to be generated. It is shown this way to allow for operational flexibility. Some of the waste rock will be hauled and placed within the Emma pit for water management and closeout purposes (see Emma Closure Closeout Plan) instead of being hauled to the EMW Waste stockpile. At closure a significant portion of the stockpile will be excavated, hauled and placed as reclamation cover material at Tyrone.

The proposed 6HW Waste stockpile will be constructed entirely within the existing Tyrone Mine Permit Area and Mine/Design Limit. The 6HW Waste stockpile will be constructed of the same NPAG materials as described for the EMW Waste stockpile and subject to the same material handling plan. The stockpile

will cover up to approximately 54 acres prior to reclamation. The 6HW Waste stockpile is bounded by the 6B Leach stockpile to the north, Reclaimed 7A Waste stockpile to the south, 7B Leach stockpile to the west, and the Gettysburg Pit to the east. At the EOY 2026 the top of the stockpile will be at an elevation of up to 6,640 ft amsl. The stockpile will be constructed by end dumping in lifts approximately 50 feet high. The outslope of the stockpile will be built at angle of repose, and the top surface will be constructed to the reclamation design slope of approximately 1 percent. The 6HW Waste stockpile configuration shown is larger than the anticipated amount of NPAG material expected to be generated. It is shown this way to allow for operational flexibility. Both the 6HW and the EMW Waste stockpiles will be important sources of reclamation cover material in the future for Tyrone.

Tyrone also plans to salvage suitable soil from the Emma project area disturbance footprint to utilize it for reclamation cover material during closeout activities. It is referred to as the "Soil Stockpile" on Figure 3. The Soil Stockpile will cover approximately 8.3 acres immediately west of the proposed pit area and will be removed at closure for use as cover.

All other waste rock will be hauled to permitted waste rock stockpiles at Tyrone. All leach ore will be hauled to existing permitted leach stockpiles at Tyrone.

A detailed discussion of hydrologic balance as it relates to these facilities and the entire Emma project is presented in DBS&A 2021 (Hydrogeologic report for proposed Emma expansion project, Tyrone Mine). This report is included as Attachment IIC-3 to the DP-396 Permit Modification and Renewal Application.

Tyrone's Title V and NSR air quality permits contain requirements that ensure fugitive dust and other air pollutants do not violate State air quality standards. All mining activities at Emma, including blasting, construction of the waste stockpiles above and more have been included in the rigorous analyses and considerations to issue the recent air quality permit. These air quality limits are designed to protect the most sensitive members of the public, including the very young and the elderly. As shown by compliance with the requirements, limits, and restrictions of Tyrone's air permits, the public has not been exposed to any incidents of air quality limits being exceeded from Tyrone mining operations, and the same will be true for the Emma Expansion Project.

(5) Analysis of the Mining Operation's Impact on Local Communities:

The 1994 Site Assessment focused on economic impacts for this portion of the assessment. Appendix A to this Site Assessment Summary includes an update to the significant economic impact on local communities from both the Chino and Tyrone Mines. Over the last 3 years, Tyrone's production has yielded 22 to 33 % of the overall copper production of the Grant County mines that create these economic impacts. The Emma project is a critical part of Tyrone's 10-year production plan.

The Emma project is subject to rigorous environmental permitting requirements as outlined in this summary assessment. The Emma project will meet all applicable environmental standards, thus ensuring that the environmental impacts and negative community impacts are minimized.

The DP 396 application describes in detail how Tyrone will manage the mining project to ensure that groundwater standards are met and to ensure that local community water supplies are protected.

An application for water diversion from the Emma pit is being prepared. It includes a groundwater study that demonstrates that the minor pumping requirements both during operations and post-closure will not negatively impact neighboring water wells. This application will be submitted to the Office of the State Engineer in the near future.

The hard rock mining rules indicate that the director may require a site-specific blasting plan. Tyrone has proactively provided a site-specific blasting plan for the Emma Project (Attachment 4 to the MMD Permit Revision Application).

(6) Wildlife and wildlife habitat and analysis of the mining operation's impact on that wildlife and wildlife habitat:

The 1994 site assessment provided a detailed assessment of wildlife and their habitat and no endangered or threatened species were found. Tyrone has updated this wildlife and habitat assessment for the Emma Project. The 2021 Emma Project Wildlife and Habitat Impact Assessment report (WestLand Engineering & Environmental Services, Inc. 2021) is included as Appendix B to this site assessment summary.

(7) Design limits for each unit:

The Tyrone design limit for the Mine/Stockpile Unit and the proposed expansion of that design limit is provided on Figure 3 of this application.

APPENDIX A
ECONOMIC IMPACTS ASSESSMENT

FREEPORT-McMoRan

New Mexico Community Investment
BY THE NUMBERS

Freeport-McMoRan has invested more than $5 million through its Grant County Community Investment Fund and other financial contributions since 2012. The fund is managed by community leaders representing various organizations who determine the allocation of funds from the Freeport-McMoRan Foundation to address local priority issues and strengthen communities.

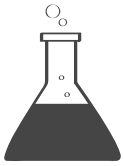
Education and STEM Support

$880,000 to help Silver Consolidated Schools with STEM education and workforce development, including the Makerspace Initiative

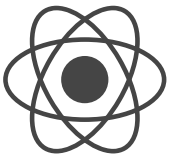
$129,000 to help Western New Mexico University with education and training, including the Capacity Building for Family Engagement in Math Literacy project

$100,000 invested to support Imagination Library and its work to provide free books to children – 3,500 preschoolers have received books to help foster a love of reading

$370,000 invested to support professional development for 142 math teachers through ASSET Stem Education, a national education improvement nonprofit



$100,000 invested to support professional development for 70 science teachers through WestEd's Making Sense of Science program



Partner of the Governor's STEM Challenge since 2019 to encourage participation in the Next Generation Science Standards

Economic Development

$170,000+ invested to support Silver City Main Street Plaza development and economic vitality

$100,000+ to help the Village of Santa Clara with infrastructure improvements and economic development

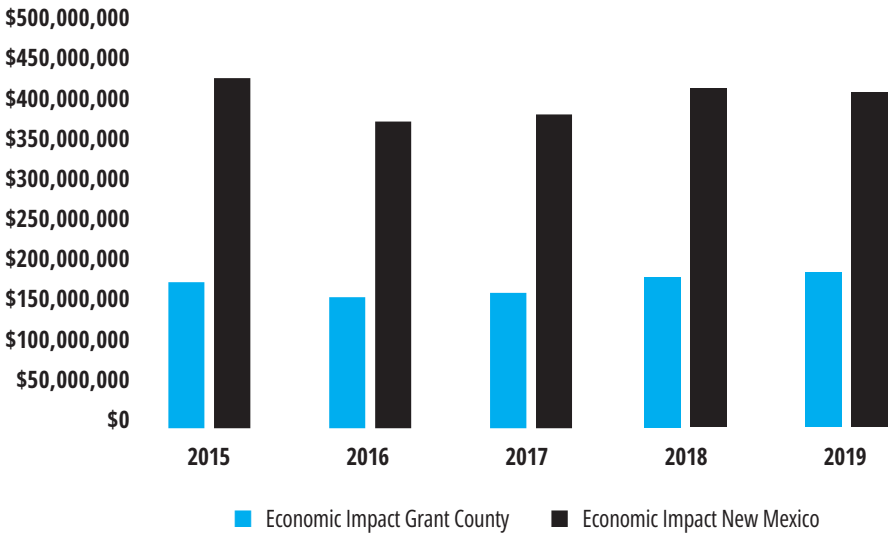
$190,000 invested to support the Community Partnership for Children in their work to build stronger child care centers and expand child care hours to help working families – currently 800 children served

$40,000 for the Historic Waterworks Way Station revitalization project in support of the 5 Points Plan to connect Grant County communities

$2.3 million in additional funds since 2012 made possible through the company's match on employee United Way contributions

460 New Mexico women and more than 33,500 nationwide participating in DreamBuilder – a free, online entrepreneurship training program offered in English and Spanish

Total Economic and Job Impact



4,000+ New Mexico jobs impacted each year since 2012

Source: L. William Seidman Research Institute, Arizona State University

FREEPORT-McMoRan

2020 NEW MEXICO OPERATIONS ECONOMIC IMPACT

Freeport-McMoRan's New Mexico operations generated nearly **$304 million** in economic benefits for New Mexico in 2020, which includes more than **$136 million** for Grant County.

GRANT COUNTY

Compensation	Business Taxes	Vendor Purchases
$95.6 MM	$4.0 MM	$2.7 MM

DIRECT IMPACT $102.3 Million

Spending by Employees	Spending from New Tax Revenues	Spending from Pension Income	Vendor Purchases
$22.7 MM	$5.1 MM	$4.5 MM	$1.6 MM

INDIRECT IMPACT $33.9 Million

$136.2 MILLION TOTAL

NEW MEXICO

Compensation	Business Taxes	Vendor Purchases
$135.9 MM	$8.5MM	$34.5 MM

DIRECT IMPACT $178.9 Million

Spending by Employees	Spending from New Tax Revenues	Spending from Pension Income	Vendor Purchases
$52.4 MM	$40.6 MM	$10.7 MM	$21.1 MM

INDIRECT IMPACT $124.8 Million

$303.7 MILLION TOTAL

ECONOMIC BENEFITS

The New Mexico operations **employed 1,443** – and the ripple effect of wages and taxes plus services we purchase created a total of **3,290 jobs** in the state, generating additional economic benefits.

All economic impact numbers were produced by the L. William Seidman Research Institute, Arizona State University.

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APPENDIX B
EMMA PROJECT WILDLIFE AND HABITAT IMPACT ASSESSMENT

Emma Project Wildlife and Habitat Impact Assessment

Prepared for:

Freeport-McMoRan Tyrone Inc.
PO Box 571 – Tyrone, New Mexico 88065

Prepared by:

WestLand Engineering & Environmental Services, Inc.
1750 S. Woodlands Village Boulevard – Flagstaff, Arizona 86001
+1 928-225-2218

WestLand Project Number: 0269.22

October 22, 2021

WestLand 100% EMPLOYEE OWNED | Engineering & Environmental Services, Inc.

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(follow text)

Attachments

ATTACHMENT A. BIOLOGICAL EVALUATION FOR THE EMMA-OAK GROVE PROJECT

1. INTRODUCTION AND BACKGROUND

Freeport-McMoRan Tyrone Inc. (Tyrone) has proposed the Emma Expansion Project (the Project) on privately held lands south of and adjacent to the existing Tyrone Operations (**Figure 1**). The Project includes the development of a several components typical of an open-pit copper mine including waste rock stockpiles, haul road infrastructure, power and water distribution infrastructure, and stormwater management facilities, in addition to the open pit itself. The Project will require a permit revision to the existing Tyrone Operations under Tyrone Mining Act Permit Number GR010RE. This wildlife and habitat impact assessment is being completed to conform to New Mexico Mining Act (NMMA) and New Mexico Administrative Code (NMAC) requirements for permit modifications at existing mining operations.

Numerous studies of the geographical area surrounding the existing Tyrone Operations have been conducted as part of previous environmental reviews of the mining operations. Many of these studies include portions of the area of the proposed Emma Expansion Project. The information presented in this assessment draws upon and summarizes many of these previous studies and incorporates new data from studies and surveys conducted specifically to support the Project. Information on the actions proposed under the Project are taken from the permit application for GR010RE submitted to the Mining and Minerals Division (MMD), as well as preliminary review of the Emma Expansion Project Closure/Closeout Plan (CCP, to be submitted at a later date) developed by Golder Associates Inc. (Golder; Golder 2021b), and are used to assess potential Project impacts on wildlife and wildlife habitat. In keeping with the NMMA and NMAC requirements for new units at existing mining operations, this assessment includes a description of wildlife and wildlife habitat at and surrounding the proposed Project and an analysis of the impact of the mining operation on that wildlife and wildlife habitat.

2. PROJECT DESCRIPTION

The Emma Expansion Project is located south of and immediately adjacent to the southern portions of the existing Tyrone Operations in Grant County, New Mexico. The footprint of the proposed Project includes approximately 422 acres (the Project Area). The Project would modify the existing Tyrone Mine Permit and Design Limit Boundary to include an additional 336 acres (the Assessment Area; **Figure 2)** for the construction of the Emma Pit, EMW Waste Stockpile, Southern Emma Haul Road, and other supporting infrastructure. Although the Project includes some additional components, such as the 6HW Waste stockpile, these components are located within the previous disturbance footprint of the existing Tyrone Operations and, as such, will have no additional impacts to wildlife or wildlife habitat not previously considered under the current Tyrone Mining Act Permit.

The proposed permit revision for the Project specifically includes the following actions and components:

- Construction, operation, and reclamation of the new Emma Pit
- Construction, operation, and reclamation of the new EMW Waste stockpile
- Construction, operation, and reclamation of the new Southern Emma Haul Roads
- Installation of instrumentation, utilities and access for various operational, monitoring, closure and post-closure uses, including but not limited to, geotechnical instrumentation and monitoring facilities; power distribution; Emma Pit dewatering; communications; and access to facilities and components.

The general configuration of these components and other associated facilities are shown on **Figure 3**. The effects of the construction, operation, and reclamation of these components on wildlife and wildlife habitat within and adjacent to the Project Area is described in the sections below.

3. ENVIRONMENTAL SETTING

The information presented in this assessment draws upon and summarizes many of the studies conducted as part of previous environmental reviews of the existing Tyrone mining operations. Many of these studies, including those conducted for National Environmental Policy Act (NEPA) review by federal land management agencies, include portions of the current Assessment Area. This assessment also incorporates new data from studies and surveys conducted specifically to support the Project, such as the rare plant survey conducted by Geosystems Analysis, Inc. (GSA; GSA 2021) and the Biological Evaluation completed by WestLand Engineering & Environmental Services, Inc. (WestLand; WestLand 2021). Both of these documents are included in **Attachment 1** of this report. The summary of the environmental setting sourced from these documents generally follows the format and nomenclature provided in the CCP (Golder 2021b), with additional supporting information added as appropriate.

3.1. Geography

The Assessment Area includes portions of Sections 25, 26, 35, and 36 of Township 19 South, Range 15 West of the New Mexico Meridian (**Figure 1**). The Project is located in the Burro Mountains, within the Basin and Range province (USGS 2009), approximately 1,000 feet (ft) south of the Continental Divide. The site is located at an elevation ranging from about 6,000 ft to 6,300 ft, and is dissected by a few ephemeral drainages, including Oak Grove Wash, which trend generally southwest to northeast across the Assessment Area.

3.2. Climate

Temperature data are available from the National Oceanic and Atmospheric Administration (NOAA) Cooperative Station in Silver City, NM (WRCC 2020). Climatic conditions are characterized by warm summers (87.5° F average temperature in July, the hottest month), mild winters (50.8° F average temperature in January, the coldest month) and low precipitation. The average annual precipitation in Silver City is approximately 16 inches (WRCC 2020), falling primarily as rain during the monsoon season from July through October. Snow may fall between November and March.

3.3. Soils

General data for soils within the Assessment Area were obtained from the Natural Resources Conservation Service (NRCS) digital soil survey data (NRCS 2020). As reported in the CCP (Golder 2021b), Daniel B. Stephens and Associates, Inc. (DBS&A) conducted site-specific soil surveys at Tyrone in 1997 (DBS&A 1997) and found soils generally in keeping with the NRSC designations. GSA included a summary characterization of the soils within the Assessment Area as part of the rare plant survey (GSA 2021) conducted for the Assessment Area. Golder (2021a) recently completed a detailed soil survey that verified the soil conditions described below.

As reported by NRCS and summarized by GSA (2021), soils within the Assessment Area are predominantly rock outcrop associations (84% of the total area), including: Santana-Rock outcrop complex, 15 to 35% slopes (34.2% of the site); Santa Fe-Rock outcrop complex, 20 to 45% slopes (33.9% of the site); Gaddes-Santa Fe outcrop complex, 15 to 45% slopes (12.2% of the site); and Santana-Rock outcrop complex, 1 to 25% slopes (3.2% of the site). These soil types comprise alluvial fans, hillslopes, terraces, mountain slopes and ridges and all are derived of mixed alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. Soils described for the Assessment Area align with observed field conditions and the mapped terrain, which is a variable mix of steep hillslopes, terraces and ridges with most slopes ranging 15 to 45%, and few slopes less than 15%.

The remaining soils are loam types (16% of the site by area), including: Lonti gravelly loam, 15 to 35% slopes (9.7% of the site), Lonti gravelly clay loam, 0 to 8% slopes (2.6% of the site); Manzano loam, 1 to 3 % slopes (3.9% of the site). Manzano loam comprises drainageways, intermittent streams, and valley floors, and is found in the bottom tiers of Oak Grove Creek. The loams in this type are derived from mixed alluvium and/or residuum from weathered sandstone and shale. Lonti loam types comprise pediments and hillslopes, and like the outcrop types described above, are derived from alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. These soil types are present on the eastern edge of the Assessment Area, as slopes begin to level out and grade into the adjacent desert grassland.

3.4. Vegetation Communities

Several paradigms exist for the description and classification of vegetation communities, and previous environmental evaluations of the Assessment Area have utilized different paradigms. The 1994 Mining Operations Site Assessment (Dames & Moore 1994) for the Tyrone Mine described the vegetation in the northern end of the current Assessment Area using classifications mapped by Brown and Lowe (1977) and data from a draft Biological Assessment prepared by Dames & Moore (1996). Based on these data, the Dames & Moore described vegetation between the existing Tyrone Operations and Oak Grove Creek within the current Assessment Area as being an ecotone of Pinon-Juniper Woodland and Chaparral (Dames & Moore 1994).

GSA (2021) described the vegetation communities in the Assessment Area using both Environmental Protection Agency (EPA) Eco-Regions delineations (EPA 2021) and vegetation communities as defined by Brown (1994). The EPA Eco-Regions delineations identify the Assessment Area as falling within a band of Madrean Lower Montane Woodlands that serves as a transition zone between the Chihuahuan Desert and Montane Coniferous Forest Eco-Regions (USEPA 2021). Similarly, Brown (1994), characterizes the site as Madrean Evergreen Woodland, dominated by alligator juniper (*Juniperus deppeana*), piñon pine (*Pinus edulis*) and oak (*Quercus* spp.), with elements of Interior Chapparal as indicated by a scattering of manzanita (*Arctostaphylos pungens*), sotol (*Dasylirion wheeleri*), and Wright's silktassel (*Garrya wrightii*). Plant species and characteristics observed during the GSA site visit in the Assessment Area support the ecoregion designation. The most common tree species documented include gray oak (*Quercus grisea*), Emory oak (*Q. emoryi*), piñon pine, and alligator juniper. Common understory species included broom snakeweed (*Gutierriezia sarothrae*), mountain mahogany (*Cercocarpus montanus*), Wright's silktassel, Wright's buckwheat (*Eriogonum wrightii*), shrub live oak (*Quercus turbinella*), three-leaf sumac (*Rhus trilobata*), catclaw mimosa (*Mimosa biuncifera*), Carruth's sagebrush (*Artemisia carruthii*), and black grama (*Bouteloua eriopoda*).

In describing the vegetation in the Assessment Area, the CCP (Golder 2021b) cites vegetation designations as described by DBS&A (1997) from surveys conducted for Tyrone in 1997 as part of previous closure/closeout studies. These designations include alluvial grasslands, piedmont scrub savannas, and mountain slope mixed evergreen woodlands (Golder 2021b) that mirror the other descriptions of the Assessment Area vegetation as being a transitional community between desert grasslands and evergreen woodlands. The soil-vegetation associations following these designations for the Assessment Area and other lands surrounding the Tyrone Operations are shown in *Figure 2-8* of the CCP (Golder 2021b).

There are no plants listed or proposed for listing as threatened or endangered under the Endangered Species Act (ESA) that have any potential to occur in the Assessment Area (GSA 2021, WestLand 2021). Survey of the Assessment Area by GSA did not identify any plant species designated as rare by the New Mexico Rare Plant Technical Council (NMRPTC), which includes plants identified as endangered by the

State of New Mexico. The GSA survey report is included as *Appendix C* of **Attachment 1**. GSA (2021) developed a list of the 114 plant species encountered during survey of the Assessment Area and their relative abundance. This list is presented in **Table 1** below.

Table 1. Observed Plant Species and Their Relative Abundance in the Assessment Area (*Table 2* from GSA 2021).

Scientific Name	Common Name	Relative Abundance
Relative Abundance: A=Abundant; C=Common; U=Uncommon; S=Sparse		
Trees		
Juglans major	Arizona walnut	S
Juniperus deppeana	alligator juniper	C
Pinus edulis	piñon pine	C
Prunus serotina	chokecherry	S
Quercus emoryi	Emory oak	C
Quercus grisea	gray oak	A
Shrubs		
Agave parryi	Parry's agave	S
Ageratina herbacea	fragrant snakeroot	U
Arctostaphylos pungens	manzanita	U
Atriplex canescens	fourwing saltbush	U
Baccharis pteronioides	yerba de pasmo	C
Brickellia californica	California brickellbush	C
Coryphantha vivipara	Arizona spiny star	S
Cylindropuntia spinosior	cane cholla	U
Dasylerion wheeleri	sotol	U
Ericameria laricifolia	turpentine bush	S
Ericameria nauseosa	rubber rabbitbrush	C
Cercocarpus montanus	Mountain mahogany	C
Fallugia paradoxa	Apache plume	C
Eriogonum wrightii	Wright's buckwheat	C
Garrya wrightii	Wright's silktassel	C
Gutierriezia sarothrae	broom snakeweed	A
Isocoma tennuisecta	burroweed	U
Lonicera albiflora	western white honeysuckle	S
Lycium pallidum	pale wolfberry	S
Mimosa biuncifera	catclaw mimosa	A
Nolina microcarpa	beargrass	U
Opuntia chlorotica	pancake pricklypear	U
Quercus turbinella	shrub live oak	C
Rhus trilobata	three-leaf sumac	C
Yucca bacata	banana yucca	U
Yucca elata	soaptree yucca	U
Forbs		
Acmispon (syn.= *Lotus*) *wrightii*	Wright's deervetch	U

Scientific Name	Common Name	Relative Abundance
Ambrosia acanthicarpa	flat-spine burr-ragweed	U
Argemone pleiacantha	Southwestern pricklypoppy	U
Artemisia carruthii	Carruth's sagebrush	A
Artemisia dracunculus	tarragon	U
Artemisia ludoviciana	silver sagewort	U
Astragalus mollossimus	woolly locoweed	U
Bahia absinthifolia	hairyseed bahia	S
Baileya multiradiata	desert marigold	S
Cirsium neomexicanum	New Mexico thistle	U
Comandra umbellata	bastard toadflax	S
Croton texensis	doveweed	S
Cryptantha cinerea	James' cryptantha	S
Cucurbita foetidissima	buffalo gourd	S
Dalea sp.	prairie clover	S
Datura wrightii	sacred datura	S
Dieteria asteroides	fall tansy-aster	C
Dyssodia papposa	fetid marigold	U
Bouchera sp.	rockcress	U
Brickellia eupatorioides	false boneset	U
Brickellia floribunda	Chihuahuan brickellbush	U
Brickellia lemmonii	Lemmon's brickellbush	U
Chaetopappa ericoides	rose heath	U
Erigeron neomexicanus	New Mexico fleabane	S
Eriogonum alatum	winged buckwheat	S
Eriogonum jamesii	James' buckwheat	U
Eriogonum polycladon	sorrel buckwheat	S
Euphorbia albomarginata	whitemargin spurge	S
Euphorbia revoluta	threadstem spurge	S
Euphorbia serpillifolia	thyme-leaf sandmat	S
Evolvulus sericeus	silver dwarf morningglory	S
Glandularia bipinnatifida	Dakota mock vervain	U
Grindelia arizonica	Arizona gumweed	U
Heliomerus longifolia	longleaf false goldeneye	U
Heterotheca subaxillaris	camphorweed	U
Hymenopappus filifolius	fineleaf hymenopappus	U
Hymenothrix wrightii	Wright's thimblehead	U
Hymenoxys richardsonii	pingue	U
Lactuca serriola	prickly lettuce	U
Lappula occidentalis	flatspine stickseed	U
Lepidium sp.	pepperweed	S
Machaeranthera tanacetifolia	tanseyleaf tansyaster	U
Marrubium vulgare	horehound	S

Scientific Name	Common Name	Relative Abundance
Mentzelia multiflora	Adonis blazingstar	S
Mentzelia pumila	dwarf mentzelia	S
Noccaea fendleri	alpine pennycress	U
Packera neomexicana	New Mexico groundsel	U
Pectis angustifolia	lemonscent	S
Pectis filipes	five-bract chinchweed	S
Penellia micrantha	mountain cross	S
Penstemon barbatus	beardlip penstemon	S
Penstemon linarioides	toadflax beardtongue	S
Physaria sp.	bladderpod	S
Plantago patagonica	woolly plantain	S
Salsola tragus	Russian thistle	U
Senecio flaccidus	threadleaf groundsel	S
Solanum elaeagnifolium	silverleaf nightshade	S
Sonchus asper	spiny-leaf sow-thistle	S
Sphaeralcea digitata	juniper globemallow	S
Sphaeralcea fendleri	Fendler's globemallow	S
Sphaeralcea laxa	caliche globemallow	S
Stephanomeria pauciflora	brownplume wirelettuce	S
Verbascum thapsus	common mullein	U
Verbesina encelioides	golden crownbeard	S
Xanthisma gracile	grass-leaf sleepy daisy	U
Xanthisma spinulosum	lacy sleepy daisy	S
Zinnia grandiflora	Rocky Mountain zinnia	U
Graminoids		
Aristida purpurea	purple threeawn	C
Bothriochloa barbinodis	cane bluestem	U
Bouteloua curtipendula	sideoats grama	C
Bouteloua eriopoda	black grama	A
Bouteloua gracilis	blue grama	C
Bouteloua hirsuta	hairy grama	U
Carex sp.	sedge	S
Festuca arizonica	Arizona fescue	U
Muhlenbergia emersleyi	bullgrass	C
Muhlenbergia longiligula	long-tongue muhly	U
Muhlenbergia torreyi	ring muhly	S
Piptochaetium fimbriatum	piñon ricegrass	S
Schizachyrium scoparium	little bluestem	S
Scleropgoon brevifolius	burro grass	S
Sporobolus cryptandrus	sand dropseed	C
Relative Abundance: A=Abundant; C=Common; U=Uncommon; S=Sparse		

3.5. Special or Unique Habitat Features

There are no known natural special or unique habitat features within the Assessment Area, including intermittent or perennial streams, wetlands, springs, or other aquatic sites. There is one manmade unique habitat feature within the Assessment Area: a historic mining shaft. This shaft measures approximately 20 ft tall by 15 ft wide by 10 ft deep and has some potential to serve as roosting habitat for bat species.

WestLand biologists visited the Assessment Area on June 2, 2021, to assess the suitability of this abandoned mine feature as bat habitat. During the assessment, WestLand did not find any evidence of current use by bats, but the feature may be suitable as a temporary roost for some bat species. The shaft is located to the southeast of the proposed Emma Pit and is not located within the footprint of any mine operations as currently proposed in the CCP (Golder 2021b). As the shaft is a historic mine feature, the shaft location may be protected under state or federal cultural resource laws regarding public distribution of cultural resource information. The location of the shaft is included as Isolated Manifestation (IM) 6 on *Figure 4* of the Class III cultural resources inventory (Chamorro 2021) for the Assessment Area, previously provided to the Mining and Minerals Division (MMD).

3.6. Land Use

The land comprising the Assessment Area, all privately held, has historically been and is currently used for livestock grazing, mining, timber and fuel wood harvesting, recreation, and wildlife habitat, with grazing as the predominant use. Current surrounding land uses include private residences, grazing, mining, and recreation (Golder 2021b).

4. WILDLIFE SPECIES

4.1. Anticipated and Observed Species

Information on anticipated and observed wildlife species is based on previous surveys undertaken at the Tyrone Operations in general and studies conducted specifically to support the Project. Wildlife species in the vicinity of the Tyrone Operation are representative of those biotic communities found in southwestern New Mexico and described in Section 3.4 above. Wildlife anticipated to occur in the vicinity of the Assessment Area includes large and small mammals, diverse species of birds (both on a seasonal and residential basis), reptiles, and amphibians. There are no perennial streams or rivers, wetlands, or springs located within the Assessment Area and, as such, no organisms requiring the sustained presence of water, including fish, have any potential to occur within the Assessment Area. A complete list of the observed species is presented in **Table 2**.

4.1.1. Birds

Surveys conducted to support previous assessments of the Tyrone Mine documented the presence of more than 60 bird species in the vicinity of the Tyrone Mine (DBS&A 1997; Metric Corporation 1993, 1996; Dames & Moore 1994). These avian species included Gambel's quail (*Callipepla gambelii*), acorn woodpecker (*Melanerpes formicivorus*), bridled titmouse (*Baeolophus wollweberi*), juniper titmouse (*Baeolophus ridgwayi*), spotted towhee (*Pipilo maculatus*), and Steller's jay (*Cyanocitta stelleri*). In general, birds likely to be in the vicinity of the Assessment Area are representative of most North American orders of birds with the exception of marine and aquatic species (Dames & Moore 1994). Larger birds may include several species of hawks and owls that may forage in habitats surrounding the Assessment Area.

4.1.2. Mammals

Mammals identified in the project record that have been observed in the Assessment Area or vicinity include smaller species such as chipmunk (*Eutamias* spp.), Townsend's big-eared bat (*Corynorhinus townsendii*), white-throated woodrat (*Neotoma albigula*), rock squirrel (*Otospermophilus variegatus grammurus*), and desert cottontail (*Sylvilagus audubonii*). Larger species that have been reported or observed include coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), mountain lion (*Felis concolor*), black bear (*Ursus americanus*), black-tailed jack rabbit (*Lepus californicus*), javelina (*Pecari tajacu*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus couesi*).

4.1.3. Reptiles and Amphibians

The herpetofauna of the Assessment Area vicinity may include small species of lizards, small to medium-sized snakes, and toads (Dames & Morre 1994). As water sources are extremely limited within the Assessment Area, there is little to no potential for amphibians to occur. Surveys of seeps, springs, ponds, tanks, and other surface water features conducted in 2010 to support environmental review for the Tyrone Mine did encounter bullfrogs (*Rana catesbeiana*) and crevice spiny lizard (*Sceloporus poinsettii*) in the vicinity of the Assessment Area (Tierra EC 2010).

Table 2. Species Observed in the Vicinity of the Assessment Area

Scientific Name	Common Name
Mammals	
Canis latrans	coyote
Corynorhinus townsendii	Townsend's big-eared bat
Eutamias spp.	chipmunk
Geomys sp.	pocket gopher
Lepus californicus	black-tailed jackrabbit
Neotamias dorsalis	cliff chipmunk
Neotoma albigula	white-throated woodrat
Odocoileus hemionus	mule deer
Odocoileus virginianus couesi	Coues' white-tailed deer
Otospermophilus variegatus grammurus	rock squirrel
Pecari tajacu	javelina
Puma concolor	mountain lion
Sylvilagus audubonii	desert cottontail rabbit
Urocyon cinereoargenteus	common gray fox
Ursus americanus	black bear
Birds	
Accipiter cooperii	Cooper's hawk
Antrostomus vociferus	Eastern whip-poor-will
Aphelocoma woodhouseii	Woodhouse's scrub jay
Archilochus alexandri	black-chinned hummingbird
Baeolophus ridgwayi	juniper titmouse
Baeolophus wollweberi	bridled titmouse
Bubo virginianus	great horned owl
Buteo jamaicensis	red-tailed hawk
Callipepla gambelii	Gambel's quail
Cardellina pusilla	Wilson's warbler
Cathartes aura	turkey vulture
Catherpes mexicanus	canyon wren
Chondestes grammacus	lark sparrow
Chordeiles acutipennis	lesser nighthawk
Chordeiles minor	common nighthawk
Contopus pertinax	greater pewee
Corvus corax	common raven
Cyanocitta stelleri	Steller's jay
Dryobates scalaris	ladder-backed woodpecker
Empidonax sp.	Hammond's or dusky flycatcher
Falco sparverius	American kestrel
Geococcyx californianus	greater roadrunner
Geothlypis tolmiei	Macgillivray's warbler
Haemorhous mexicanus	house finch

Scientific Name	Common Name
Icterus cucullatus	hooded oriole
Junco hyemalis	dark-eyed junco
Lanius ludovicianus	loggerhead shrike
Megascops kennicottii	Western screech-owl
Melanerpes formicivorus	acorn woodpecker
Melozone fusca	canyon towhee
Mimus polyglottos	Northern mockingbird
Molothrus ater	brown-headed cowbird
Myiarchus cinerascens	ash-throated flycatcher
Parkesia noveboracensis	Northern waterthrush
Patagioenas fasciata	band-tailed pigeon
Phalaenoptilus nuttalli	common poorwill
Pheucticus melanocephalus	black-headed grosbeak
Pipilo maculatus	spotted towhee
Polioptila caerulea	blue-gray gnatcatcher
Psaltriparus minimus	bushtit
Regulus calendula	ruby-crowned kinglet
Salpinctes obsoletus	rock wren
Setophaga coronata	yellow-rumped warbler
Setophaga nigrescens	black-throated gray warbler
Setophaga occidentalis	hermit warbler
Setophaga townsendi	Townsend's warbler
Sialia mexicana	Western bluebird
Sitta carolinensis	white-breasted nuthatch
Sitta pygmaea	pygmy nuthatch
Sphyrapicus nuchalis	red-naped sapsucker
Spinus psaltria	lesser goldfinch
Spizella atrogularis	black-chinned sparrow
Spizella passerina	chipping sparrow
Thryomanes bewickii	Bewick's wren
Toxostoma crissale	crissal thrasher
Troglodytes aedon	house wren
Tyto alba	barn owl
Vireo huttoni	Hutton's vireo
Vireo solitarius	blue-headed vireo
Vireo vicinior	gray vireo
Zenaida macroura	mourning dove
Reptiles and Amphibians	
Rana catesbeiana	bullfrog
Sceloporus poinsettii	crevice spiny lizard

4.2. Threatened and Endangered Species

There are only three animal species listed or proposed for listing as threatened or endangered under the ESA that have any potential to occur in the Assessment Area: the western Distinct Population Segment (DPS) of yellow-billed cuckoo (*Coccyzus americanus*), the Mexican spotted owl (*Strix occidentalis lucida*), and the Mexican wolf (*Canis lupus baileyi*) (WestLand 2021). All are considered unlikely to occur in the Assessment Area. No designated or proposed critical habitat for these species occurs within or in the vicinity of the Assessment Area.

WestLand also reviewed the potential for New Mexico state species listed as either threatened or endangered by the New Mexico Department of Game and Fish (NMDGF) to occur within the Assessment Area (WestLand 2021). For the purposes of that review, the Biota Information System of New Mexico (BISON-M) online review tool was used to generate a list of species listed as either threatened or endangered by the NMDGF within Grant County, and WestLand biologists evaluated the potential for those species to occur within the Assessment Area. Of the 39 state-listed species, none are considered present, four are possible, 13 are considered unlikely, and 22 are not expected to occur in the Assessment Area. One of the species considered to possibily occur, only the gray vireo (*Vireo vicinor*), was previously noted in the vicinity of the Assessment Area by Dames & Moore (1994). The potential for occurrence of these NMDGF-listed species is summarized below.

Possible:

- American peregrine falcon (*Falco peregrinus anatum*)
- Yellow-eyed junco (*Junco phaeonotus*)
- Spotted bat (*Euderma maculatum*)
- Gray vireo (*Vireo vicinor*)

Unlikely:

- Abert's towhee (*Melozone aberti*)
- Bald eagle (*Haliaeetus leucocephalus*)
- Broad-billed hummingbird (*Cynanthus latirostris*)
- Common black hawk (*Buteogallus anthracinus*)
- Common ground dove (*Columbina passerine*)
- Costa's hummingbird (*Calypte costae*)
- Elegant trogon (*Trogon elegans*)
- Gila woodpecker (*Melanerpes uropygialis*)
- Lucifer hummingbird (*Calothorax lucifer*)
- White-eared hummingbird (*Hylocharis leucotis*)
- Varied bunting (*Passerina versicolor*)
- Exp. population; Mexican gray wolf (*Canis lupus baileyi*)

- Gila monster (*Heloderma suspectum*)

None:

- Lowland leopard frog (*Lithobates yavapaiensis*)
- Baird's sparrow (*Centronyx bairdii*)
- Bell's vireo (*Vireo bellii*)
- Buff-collared nightjar (*Antrostomus ridgwayi*)
- Brown pelican (*Anaxyrus microscaphus*)
- Neotropic cormorant (*Phalacrocorax brasilianus*)
- Northern aplomado falcon (*Falco femoralis septentrionalis*)
- Northern beardless tyrannulet (*Camptostoma imberbe*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Thick-billed kingbird (*Tyrannus crassirostris*)
- Chihuahua chub (*Gila nigrescens*)
- Gila chub (*Gila intermedia*)
- Gila topminnow (*Poeciliopsis occidentalis occidentalis*)
- Gila trout (*Oncorhynchus gilae*)
- Loach minnow (*Rhinichthys cobitis*)
- Roundtail chub (*Gila robusta*)
- Spikedace (*Meda fulgida*)
- Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)
- Narrow-headed gartersnake (*Thamnophis rufipunctatus*)
- Northern Mexican gartersnake (*Thamnophis eques megalops*)
- Gila springsnail (*Pyrgulopsis gilae*)
- New Mexico springsnail (*Pyrgulopsis thermalis*)

5. ANTICIPATED IMPACTS

Information on the construction, operation, and reclamation actions proposed under the Project are taken from the CCP (Golder 2021b). The general configuration of these components is shown on **Figure 3**. The effects of the construction, operation, and reclamation of these components on wildlife and wildlife habitat within and adjacent to the Assessment Area is described in the sections below. The evaluation of potential impacts to terrestrial wildlife and habitat as a result of development of the Project can be classified as short-term and long-term, direct and indirect. Short-term impacts are associated with habitat removal and disturbance as well as mining-related activities. Short-term impacts would cease following mine closure and completion of successful reclamation according to the CCP. Direct impacts include wildlife mortality, habitat loss and alteration, habitat fragmentation, and displacement. Indirect impacts include increased noise, light, and human presence. Long-term impacts include changes to, or loss of, habitats and the wildlife populations

that depend on those habitats that continue beyond completion of successful reclamation and may become permanent.

Construction and operation of the Emma Pit, EMW Waste Stockpile, Southern Emma Haul Road, and other supporting infrastructure will result in long-term and short-term habitat loss and alteration, and also would result in direct losses of individual wildlife species. It is anticipated that the larger species displaced from the disturbance areas to surrounding habitats during construction and operation would return following reclamation. The disturbed areas of Project components in the Assessment Area will be reclaimed to achieve the post-mining land uses discussed in the CCP. As described above, the one manmade unique habitat feature within the Assessment Area, the historic mining shaft, is located to the southeast of the proposed Emma Pit and is not within the footprint of any mine operations as currently proposed in the CCP (Golder 2021b).

5.1. Construction and Operations

Direct impacts to all wildlife and habitat as a result of surface disturbance during construction and operations activities within the Assessment Area include the temporary and permanent loss or alteration of habitat within the footprint of construction. The loss of some native vegetation would be long-term, most likely more than 20 years after final reclamation of disturbed areas. Herbaceous species and grasses may become established within 3 to 5 years. In most locations, suitable habitat adjacent to construction and operations disturbance areas would be available until grasses, shrubs, and woody vegetation is reestablished. The predominant vegetation communities that would be affected by construction and operations disturbance is the mountain slope mixed evergreen woodlands shown in *Figure 2-8* of the CCP (Golder 2021b). They would be replaced by native grasses and herbaceous plants during initial reclamation, which would attract species that utilize grasslands and herbaceous feed and cover.

Terrestrial wildlife habitat would be affected by increased habitat fragmentation caused by the installation of the new haul roads, open pit, and stockpiles. The construction of these features will dissect the landscape and may alter wildlife movements within the Assessment Area, such as travel routes for game species. The locations of theses proposed components, however, represent a small incremental increase to the existing area of Tyrone Operations and will not represent significant new disturbance to the area.

Direct impacts to some less mobile or burrowing species (e.g., small mammals, nesting birds, and reptiles) include habitat disruption caused by human disturbance that may result in nest or burrow abandonment, loss of eggs or young, and/or direct mortality of as a result of crushing from vehicles and construction equipment. If surface-disturbing activities occur near nesting or breeding sites during the breeding season, these impacts could result in nest or territory abandonment and possibly the loss of eggs or young, resulting in the loss of productivity for that breeding season. The degree of these impacts depends on a number of variables including the location of the nesting or breeding site, the species' relative sensitivity to

disturbance, and the breeding cycle. Potential impacts to nesting birds that may be present will be lessened through conducting active nest surveys for any soil or vegetation disturbance that occurs during the breeding season, generally September 1 though March 31.

Direct impacts to more mobile species (e.g., medium-sized mammals, big game, adult birds) include the increased potential wildlife mortalities resulting from vehicle collisions due to increased traffic and displacement as a result of surface disturbance activities. Direct impacts to many wildlife species from the operation and maintenance activities associated with the Project will include the incremental long-term habitat loss or alteration of potential breeding or foraging habitats until native vegetation has become reestablished and mortalities resulting from vehicle and facility collisions. The habitats adjacent to the proposed Project disturbance areas may support some displaced animals, depending on current carrying capacity. Due to the lack of surface water sources for wildlife in the Assessment Area, any non-stormwater impoundments proposed for the project may entice wildlife to use them as new watering sources, which could be detrimental. As detailed in the CCP, livestock and wildlife that may be present in the Assessment Area during operations will be excluded from the non-stormwater impoundments through the installation of measures including but not limited to fencing and/or bird balls. New activities within the Assessment Area will occur in proximity to existing portions of the Tyrone Operations and, therefore, some species may already be deterred from the Assessment Area due to human activity, which may minimize potential Project impact.

Indirect impacts to wildlife species would result from the increase in habitat disruption from human presence, including increased vehicle traffic, noise, and artificial lighting during construction, operations, and maintenance activities in the Assessment Area. The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. Larger species would likely decrease their use of areas surrounding surface disturbance activities. Indirect impacts also would include the temporary displacement of small game from the construction areas as a result of increased noise and human activities.

After initial avoidance of human activity and noise, certain wildlife species acclimate to the activity and reoccupy areas formerly avoided. The extent of displacement would be located adjacent to actively used areas along the haul roads, pit, and stockpile areas; and in areas where construction activities would continue incrementally throughout the life of the mine within the Assessment Area. Wildlife are commonly observed around the adjacent Tyrone Operations. Undisturbed land is available beyond the Assessment Area, including large expanses of wildlife habitat of the same or similar type as that within the Assessment Area. The loss of the habitat within the Assessment Area during operations is not anticipated to produce significant impacts on wildlife following reclamation activities.

Artificial light at night introduced to areas currently without lighting could temporarily adversely impact wildlife behaviors including mating, foraging, sleeping, and migratory behaviors. The Assessment Area is located in an area with existing light sources from adjacent mine areas.

5.2. Reclamation

Impacts to wildlife during reclamation activities are anticipated to be similar to, but of a much lesser extent than, those during construction and operating activities. A relative increase in noise levels and human presence during reclamation as compared to the operational period may again cause avoidance of the Assessment Area by wildlife that had become accustomed to operational activities. Post-mining, reclamation and revegetation of the disturbed areas would restore wildlife habitat, in accordance with the CCP (Golder 2021b). Reclamation and revegetation will restore some habitat productivity and connectivity. As described above, the loss of some native vegetation would be long-term, most likely more than 20 years after final reclamation of disturbed areas. Herbaceous species and grasses may become established within 3 to 5 years. In most locations, suitable habitat adjacent to the Assessment Area is available while grasses, shrubs, and woody vegetation are reestablished.

As described in the CCP, the primary performance objectives for closure and closeout of the Tyrone Mine include re-establishment of a self-sustaining ecosystem, stabilization of the reclaimed areas, and the control of process and storm water. Drainage and erosion control for the reclaimed features will be achieved with storm water conveyance channels, stable outslopes, suitable cover material, and revegetation. The reclamation will provide for the establishment of a self-sustaining ecosystem consistent with the designated post-mining land use (PMLU) of wildlife habitat (Golder 2021b). Revegetation will include seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with MMD Permit GR010RE and applicable permit revisions (Golder 2021b). This seed mix was selected to provide a long-term sustainable ground cover, erosion control, and diversity in growth forms and the selected species have been successfully used in mine reclamation and range improvement projects in many parts of New Mexico, including the Tyrone Mine (Golder 2021b).

The proposed wildlife habitat PMLU area for the Project is shown on *Figure 7-1* of the CCP (Golder 2021b). Successful implementation of the proposed reclamation plan will result in the development of an early-stage grass/shrub community within a larger plant community that is dominated by a mixed-evergreen woodland community (Golder 2021b). The vegetation will provide forage, seeds, and cover for reptiles, small mammals, and birds, which will benefit from the increased insect populations that are likely to accompany revegetation of the site. The shrubs, grasses, and forbs selected for use in the Assessment Area will also provide forage and browse for large mammals. Currently, only those areas within the deepest central portion of the pit, an approximate 65 acres, and the pit walls are not anticipated to be reclaimed to their current pre-mining wildlife use. The areas of cliffs and talus associated with the pit walls, however, will

provide features that are consistent with the steeper local topography surrounding Tyrone Operations and may present desirable nesting and perching sites for birds, as well as insects such as bees and wasps.

As described in the CCP, a final construction quality assurance (CQA) plan for reclamation and closure will be prepared for approval by the State of New Mexico and will provide a detailed description of the work proposed to be performed to close the site (Golder 2021b). The reclaimed areas will be monitored in accordance with the MMD Permit after the initial establishment of vegetation on the reclaimed lands. Tyrone will conduct vegetation monitoring of both volunteer revegetation and re-seeded areas in accordance with MMD permit conditions. Wildlife monitoring will occur according to the post-closure wildlife monitoring plan approved by MMD and NMDGF in 2005 (Golder 2021b). Monitoring and maintenance activities will follow primary reclamation and will continue for approximately thirty years as described in the CCP (Golder 2021b).

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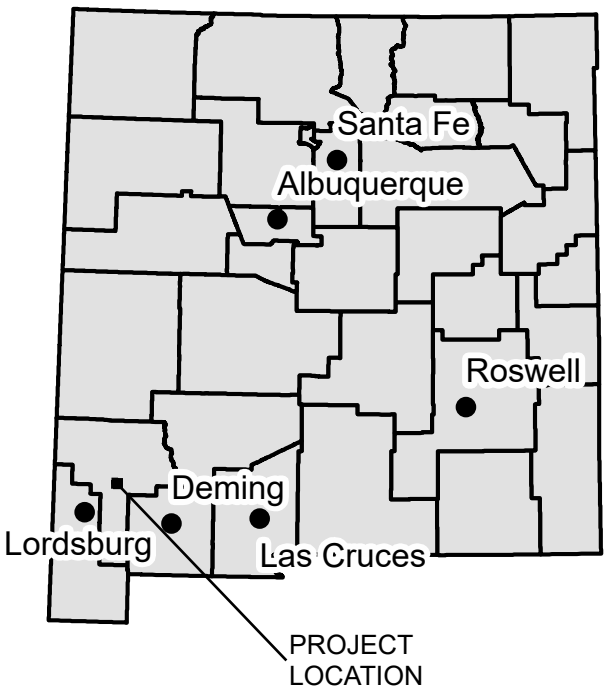
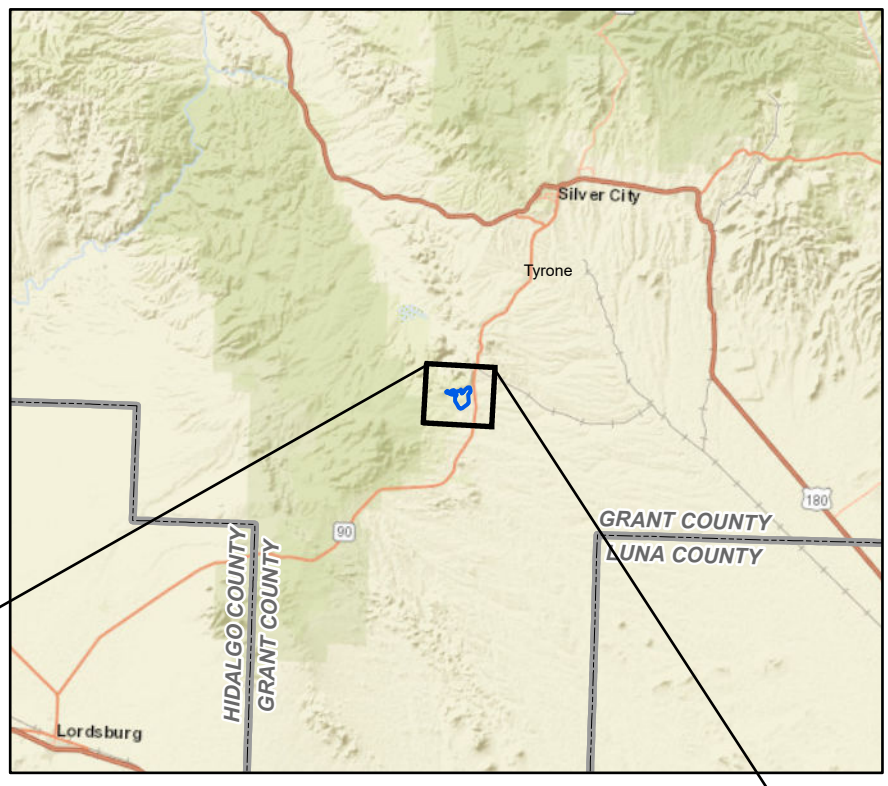
FIGURES

NEW MEXICO



PROJECT VICINITY



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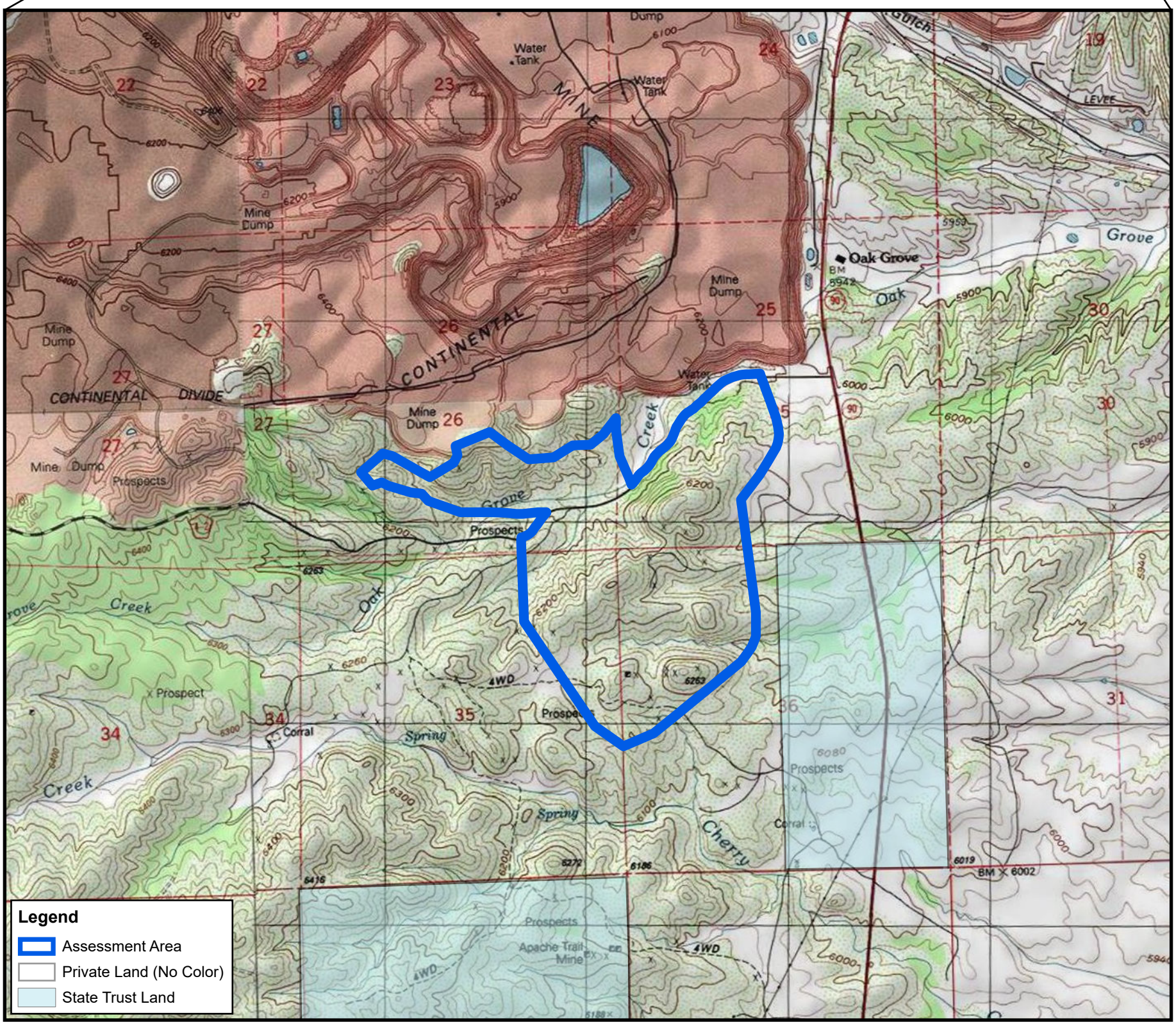

T19S, R15W, Portions of Sections 25, 26, 35 and 36,
Grant County, New Mexico
Tyrone and White Signal USGS 7.5' Quadrangles
Image Source: ArcGIS Online USA Topo and World Street Map

FREEPORT-MCMORAN TYRONE INC.

Emma Project Wildlife and Habitat Impact Assessment

VICINITY MAP

Figure 1

WestLand Resources

N

0 1,000 2,000 Feet

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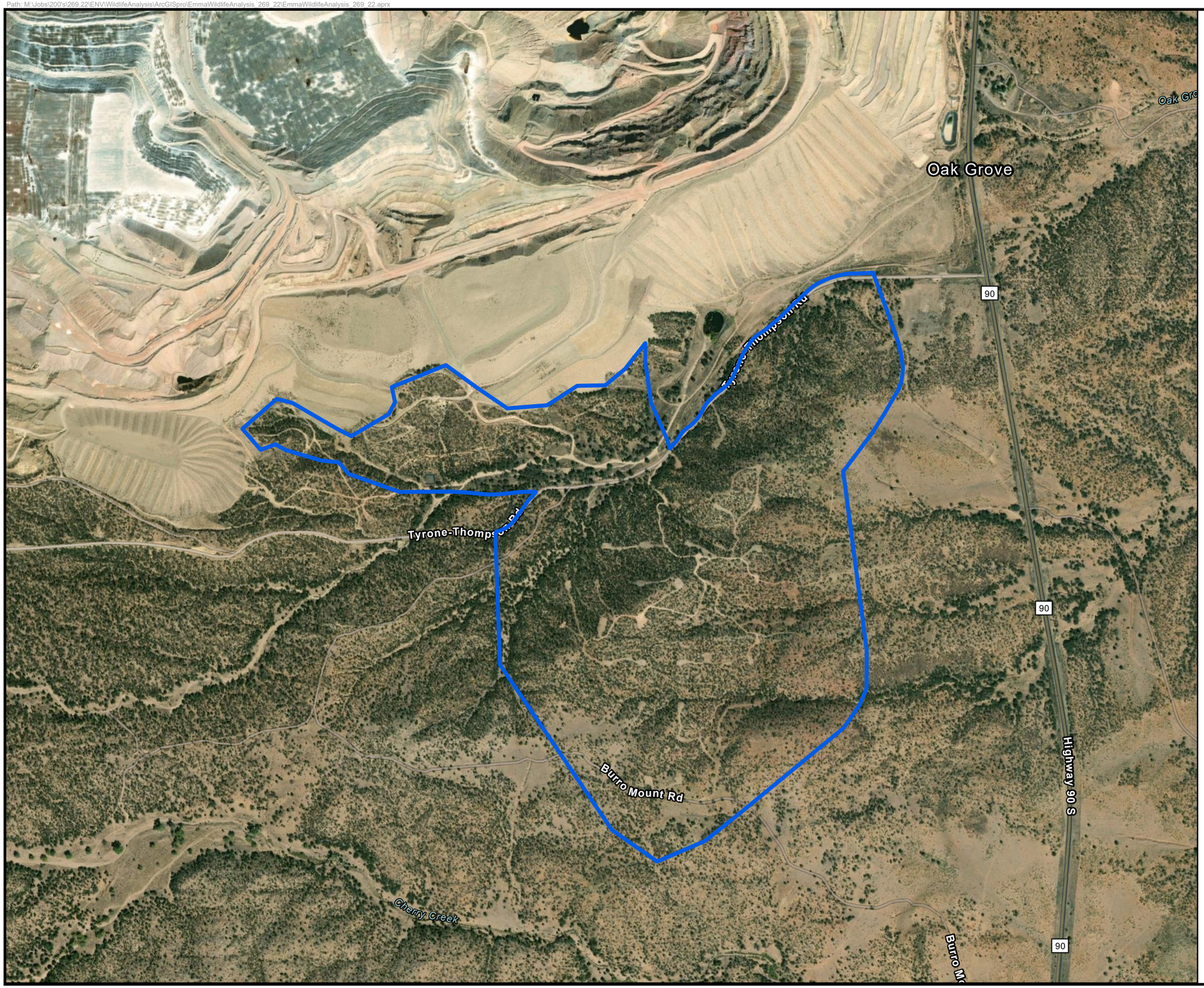
Date: 10/22/2021 User: towens



T19S, R15W, Portions of Sections 25, 26, 35, and 36,
Grant County, New Mexico,
Data Source: Tyrone Mine
Image Source: Maxar 10/21/2020

Legend

Assessment Area

N

0 500 1,000
Feet

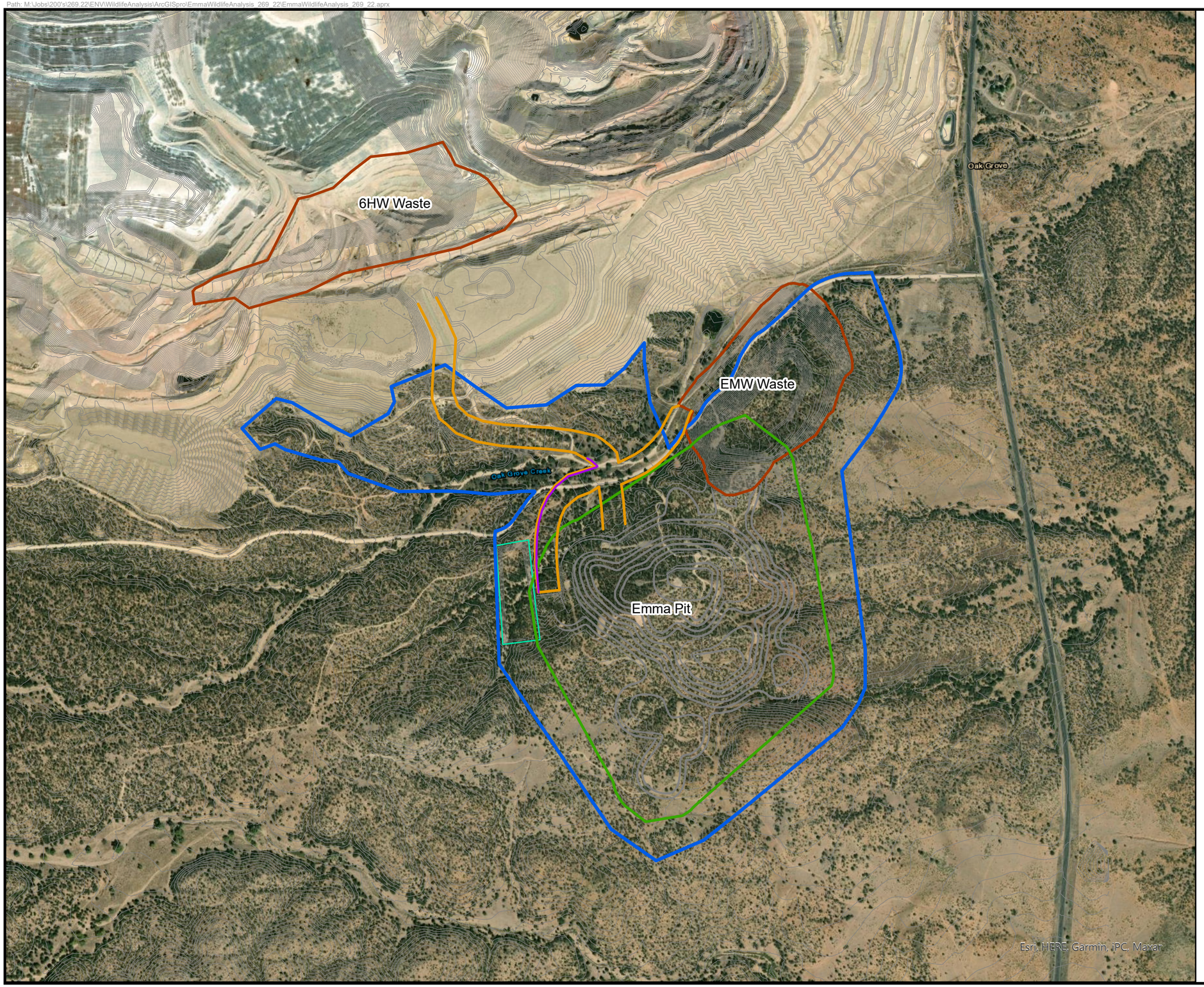
WestLand Resources

FREEPORT-MCMORAN TYRONE INC.

Emma Project Wildlife and
Habitat Impact Assessment

AERIAL OVERVIEW

Figure 2



T19S, R15W, Portions of Sections 25, 26, 35, and 36,
Grant County, New Mexico,
Image Source: Maxar 10/21/2020

Legend

- 10' Contour
- Haul Road
- Utility Corridor
- Assessment Area
- Open Pit
- Topsoil Stockpile
- Waste Stockpile

N

0 500 1,000 Feet

WestLand Resources

FREEPORT-MCMORAN TYRONE INC.

Emma Project Wildlife and
Habitat Impact Assessment

EMMA PROJECT COMPONENTS

Figure 3

ATTACHMENT A

BIOLOGICAL EVALUATION FOR THE EMMA-OAK GROVE PROJECT

BIOLOGICAL EVALUATION
FOR THE EMMA-OAK GROVE PROJECT
Freeport-McMoRan Tyrone Inc.

Prepared for:

Freeport-McMoRan Tyrone Inc.
Hwy 90 South, Tyrone, NM 88065

Project Number 269.19

October 22, 2021 (rev)

WestLand Resources

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(follow text)

APPENDICES

1. INTRODUCTION

Freeport-McMoRan Tyrone Inc. (Tyrone) retained WestLand Resources, Inc. (WestLand) to prepare a Biological Evaluation (BE) for the Emma-Oak Grove Project Site in Grant County, NM (**Figure 1**). The Emma-Oak Grove Site is proposed for Tyrone Mine expansion (Project), totaling an area of about 421 acres of private property (Project Area; **Figure 2**). GeoSystems Analysis, Inc. (GSA) conducted a rare plant survey under sub-contract with WestLand in the Project Area to identify any rare plant species present.

This BE provides a screening analysis to determine the potential to occur of special-status species, designated or proposed critical habitat in the Project Area, and analyzes effects of the Project to such species and/or their habitats. For the purposes of this report, special-status species include:

1) Species listed, or proposed or candidate for listing, under the Endangered Species Act (ESA) by the U.S. Fish and Wildlife Service (USFWS) that have the potential to occur within the Project Area as identified by the USFWS Information, Planning and Consultation (IPaC) tool (**Appendix A**);
2) Species protected under the Bald and Golden Eagle Protection Act (BGEPA); and
3) Species designated as state threatened or endangered by the New Mexico Department of Game and Fish (NMDGF) as identified by the Biota Information System of New Mexico (BISON-M) for Grant County (**Appendix B**).

The following sections describe the Project Area location and environmental setting (**Section 2**), the methods (**Section 3**), potential to occur of special-status species screening results (**Section 4**), and list the references cited (**Section 5**). List of species occurrences for Grant County provided in the BISON-M query are included in **Appendix B** and the results of field surveys conducted for rare plants in the Project Area in October 2020 in **Appendix C**.

2. PROJECT AREA

The Project Area is a proposed area for expansion for the existing Tyrone Mine in Grant County, New Mexico (latitude: 32° 36'50.56" N/longitude: 108° 21'13.89" W), approximately 17 miles southeast of the Gila River and adjacent to the Burro Mountain Region of the Gila National Forest. The Project Area lies within portions of Section 25, 26, 35, and 36 of Township 19 South, Range 15 West of the New Mexico Meridian (**Figures 1** and **2**). The northernmost extent of the Project Area lies just 1,000 feet (ft) south of the Continental Divide. The Project Area is intersected by Oak Grove Wash, an ephemeral wash that likely flows only in direct response to precipitation.

2.1. PHYSIOGRAPHIC

The Project is located in the Burro Mountains, within the Basin and Range province (USGS 2009), within a couple of thousand feet of the Continental Divide. The site is located at an elevation ranging from about 5,600 ft to 6,300 ft.

2.2. CLIMACTIC

Temperature data are available from the National Oceanic and Atmospheric Administration (NOAA) Cooperative Station in Silver City, NM (WRCC 2020). Climatic conditions are characterized by warm summers (87.5° F average temperature in July, the hottest month), mild winters (50.8° F average temperature in January, the coldest month), and low precipitation. The average annual precipitation in Silver City is approximately 16 inches (WRCC 2020), falling primarily as rain during the monsoon season from July through October. Snow may fall between November and March.

2.3. SURFACE WATER

The Project Area is located within the Upper Gila-Mangas Subbasin (Hydrologic Unit Code (HUC8) 15040002) and is intersected by Oak Grove Wash (**Figure 2**). The National Wetland Inventory (NWI) has characterized Oak Grove Wash as an intermittent riverine feature (USFWS 2021d). However, based on aerial imagery, vegetation characteristics and depth to groundwater, this drainage is better characterized as ephemeral, only flowing in direct response to precipitation. The NWI surface water mapping suffers from a lack of ground-truthing of water features, such that ephemeral and intermittent features are seldom distinguished.

2.4. SOIL

GSA conducted a rare plant survey and characterized the soils within the Project Area (**Appendix A**). Soils within the project site are predominantly rock outcrop associations (84% of the total area), including: Santana-Rock outcrop complex, 15 to 35% slopes (34.2% of the site); Santa Fe-Rock outcrop complex, 20 to 45% slopes (33.9% of the site); Gaddes-Santa Fe outcrop complex, 15 to 45% slopes (12.2% of the site); and Santana-Rock outcrop complex, 1 to 25% slopes (3.2% of the site). These soil types comprise alluvial fans, hillslopes, terraces, mountain slopes and ridges and all are derived of mixed alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. Soils described for the site align with observed field conditions and the mapped terrain, which is a variable mix of steep hillslopes, terraces and ridges with most slopes ranging 15 to 45%, and few slopes less than 15%.

The remaining soils are loam types (16% of the site by area), including: Lonti gravelly loam, 15 to 35% slopes (9.7% of the site), Lonti gravelly clay loam, 0 to 8% slopes (2.6% of the site); Manzano loam, 1 to 3 % slopes (3.9% of the site). Manzano loam comprises drainageways, intermittent streams and valley floors, and is found in the bottom tiers of Oak Grove Wash. The loams in this type are derived from

mixed alluvium and/or residuum from weathered sandstone and shale. Lonti loam types comprise pediments and hillslopes, and like the outcrop types described above, are derived from alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. These soil types are present on the eastern edge of the Project Area, as slopes begin to level out and grade into the adjacent desert grassland.

2.5. VEGETATION

According to Environmental Protection Agency Eco-Regions delineations, the Project Area falls within a band of Madrean Lower Montane Woodlands that serves as a transition zone between the Chihuahuan Desert and Montane Coniferous Forest Eco-Regions (USEPA 2021). Similarly, Brown (1994), characterizes the site as Madrean Evergreen Woodland, dominated by alligator juniper (*Juniperus deppeana*), piñon pine (*Pinus edulis*) and oak (*Quercus* spp.), with elements of Interior Chapparal as indicated by a scattering of manzanita (*Arctostaphylos pungens*), sotol (*Dasylirion wheeleri*), and Wright's silktassel (*Garrya wrightii*). Plant species and characteristics observed during site visit in the Project Area support the ecoregion designation (**Appendix C**). The most common tree species documented include gray oak (*Quercus grisea*), Emory oak (*Q. emoryi*), piñon pine, and alligator juniper. Common understory species included broom snakeweed (*Gutierriezia sarothrae*), mountain mahogany (*Cercocarpus montanus*), Wright's silktassel, Wright's buckwheat (*Eriogonum wrightii*), shrub live oak (*Quercus turbinella*), three-leaf sumac (*Rhus trilobata*), catclaw mimosa (*Mimosa biuncifera*), Carruth's sagebrush (*Artemisia carruthii*), and black grama (*Bouteloua eriopoda*).

3. METHODS

This section describes what categories of special-status species were identified for analysis, how these species were screened for their potential to occur (including data sources), and the Potential to Occur categories.

3.1. SPECIAL-STATUS SPECIES IDENTIFICATION

A screening analysis was completed to evaluate the potential for special-status species or their critical habitat to occur within the Project Area. As stated in **Section 1**, special-status species in this BE are defined as:

1) Species designated by the USFWS as Endangered, Threatened, Proposed for listing, or Candidate for listing under the ESA as identified by the USFWS IPaC tool (**Appendix A**);
2) Species protected under the BGEPA; and
3) Species listed as state threatened or endangered by NMDGF as identified by BISON-M for Grant County (**Appendix B**).

3.2. SPECIAL-STATUS SPECIES SCREENING

Based on the special-status species list generated from the above sources, a screening analysis was performed to evaluate the potential for these species to occur within the Project Area and to determine the presence or absence of designated or proposed critical habitat within the Project Area. These determinations were based on review of:

- The natural history and known geographical and elevational ranges of the species.
- Results of the Biota Information System of New Mexico (BISON-M) species occurrences for Grant County, included as **Appendix B**.
- Other occurrence records in published or grey literature, including citizen science data (including eBird records).
- Data provided by the USFWS Critical Habitat Portal online mapping tool.
- Rare plant survey data collected by GSA for the Project Area in October 2020 (**Appendix C**).

The criteria used to determine the potential of occurrence of each species included in this screening analysis are defined as follows:

> **Present:** The species has been observed to occur within the Project Area, the Project Area is within the known range and distribution of the species, and habitat characteristics required by the species are present.
>
> **Possible:** There are no known records of the species within the Project Area, but the known, current distribution of the species includes the Project Area and the required habitat characteristics of the species appear to be present in the Project Area. Given the uncertainty associated with species identification and accuracy of the location of observations from eBird and other citizen science databases, observations associated with citizen science databases are evidence that a species is possible within the Project Area.
>
> **Unlikely:** The known, current distribution of the species does not include the Project Area, but the distribution of the species is close enough such that the Project Area may be within the dispersal or foraging distance of the species, and they may show up as transients. The habitat characteristics required by the species may be present in the Project Area.
>
> **None:** The Project Area is outside of the known distribution of the species or the habitat characteristics required by the species are not present.

4. POTENTIAL FOR SPECIAL-STATUS SPECIES TO OCCUR

Of the 57 special-status species evaluated, 35 species have no potential to occur, five are possible, 17 species are unlikely, and no special-status species are known to be present in the Project Area (see

below). The species evaluated include 16 ESA-listed species identified by the USFWS IPaC tool (**Appendix A**), two BGEPA species, and 39 NMDGF-listed species. There is no designated or proposed critical habitat present in the Project Area. No special-status or rare plants were observed during pedestrian surveys of the Project Area (**Appendix C**).

4.1. ESA-LISTED SPECIES

The potential for the sixteen special-status ESA species to occur within the Project Area are summarized below. The basis for determination of each of the ESA-listed species' potential to occur within the Project Area are provided in **Table 1**.

Amphibian:

- None – threatened; Chiricahua leopard frog [CLF] (*Rana chiricahuensis*)

Birds:

- Unlikely – threatened; western Distinct Population Segment (DPS) of yellow-billed cuckoo (*Coccyzus americanus*)
- None – experimental population; northern Aplomado falcon (*Falco femoralis septentrionalis*)
- None – endangered; southwestern willow flycatcher (*Empidonax traillii extimus*)
- Unlikely – threatened; Mexican spotted owl (*Strix occidentalis lucida*)

Fish:

- None – threatened; beautiful shiner (*Cyprinella formosa*)
- None – threatened; Chihuahua chub (*Gila nigrescens*)
- None – endangered; Gila chub (*Gila chub*)
- None – endangered; spikedace (*Meda fulgida*)
- None – endangered; loach minnow (*Tiaroga cobitis*)
- None – threatened; Gila topminnow (incl. Yaqui) (*Poeciliopsis occidentalis*)
- None – threatened; Gila trout (*Oncorhynchus gilae*)

Mammals:

- Unlikely – experimental population; Mexican wolf (*Canis lupus baileyi*)
- None – endangered; Mexican long-nosed bat (*Leptonycteris nivalis*)

Reptiles:

- None – threatened; northern Mexican gartersnake (*Thamnophis eques megalops*)
- None – threatened; narrow-headed gartersnake (*Thamnophis rufipunctatus*),

While gray wolf appeared on the IPaC screening, in addition to the Mexican gray wolf, the gray wolf has been recently delisted and as such does not have protections under the ESA (USFWS 2020a).

4.2. BGEPA-LISTED SPECIES

Results of the screening analysis of the two BGEPA-listed species are summarized below. The basis for determination of each of the BGEPA-listed species' potential to occur within the Project Area are provided in **Table 2**.

- Possible – Golden eagle (*Aquila chrysaetos*)
- Unlikely – Bald eagle (*Haliaeetus leucocephalus*)

4.3. NEW MEXICO STATE-LISTED SPECIES

The BISON-M online review tool was used to generate a list of New Mexico state species listed as either threatened or endangered by the NMDGF within Grant County (**Appendix B**). Of the 39 state-listed species, none were present, four are possible, 13 are considered unlikely, and 22 are not expected to occur in the Project Area. The basis for determination of each of the NMDGF-listed species' potential to occur within the Project Area are provided in **Table 3**.

Amphibian:

- None – Lowland leopard frog (*Lithobates yavapaiensis*)

Birds:

- Unlikely – Abert's towhee (*Melozone aberti*)
- Unlikely – Bald eagle (*Haliaeetus leucocephalus*)
- None – Baird's sparrow (*Centronyx bairdii*)
- None – Bell's vireo (*Vireo bellii*)
- Unlikely – Broad-billed hummingbird (*Cynanthus latirostris*)
- None – Buff-collared nightjar (*Antrostomus ridgwayi*)
- Unlikely – Common black hawk (*Buteogallus anthracinus*)
- Unlikely – Common ground dove (*Columbina passerine*)
- Unlikely – Costa's hummingbird (*Calypte costae*)
- Unlikely – Elegant trogon (*Trogon elegans*)
- Unlikely – Gila woodpecker (*Melanerpes uropygialis*)
- Possible – Gray vireo (*Vireo vicinor*)
- Unlikely – Lucifer hummingbird (*Calothorax lucifer*)
- None – Brown pelican (*Anaxyrus microscaphus*)
- None – Neotropic cormorant (*Phalacrocorax brasilianus*)
- None – Northern aplomado falcon (*Falco femoralis septentrionalis*)
- None – Northern beardless tyrannulet (*Camptostoma imberbe*)
- Possible – American peregrine falcon (*Falco peregrinus anatum*)
- None – Southwestern willow flycatcher (*Empidonax traillii extimus*)
- None – Thick-billed kingbird (*Tyrannus crassirostris*)
- Unlikely – White-eared hummingbird (*Hylocharis leucotis*)
- Unlikely – Varied bunting (*Passerina versicolor*)
- Possible – Yellow-eyed junco (*Junco phaeonotus*)

Fish:

- None – Chihuahua chub (*Gila nigrescens*)
- None – Gila chub (*Gila intermedia*)
- None – Gila topminnow (*Poeciliopsis occidentalis occidentalis*)
- None – Gila trout (*Oncorhynchus gilae*)
- None – Loach minnow (*Rhinichthys cobitis*)
- None – Roundtail chub (*Gila robusta*)
- None – Spikedace (*Meda fulgida*)

Mammals:

- Possible – Spotted bat (*Euderma maculatum*)
- Unlikely – Exp. population; Mexican gray wolf (*Canis lupus baileyi*)
- None – Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)

Reptiles:

- None – Narrow-headed gartersnake (*Thamnophis rufipunctatus*)
- None – Northern Mexican gartersnake (*Thamnophis eques megalops*)
- Unlikely – Gila monster (*Heloderma suspectum*)

Molluscs:

- None – Gila springsnail (*Pyrgulopsis gilae*)
- None – New Mexico springsnail (*Pyrgulopsis thermalis*)

Table 1. ESA-Listed Species evaluated for potential to occur in the Project Area

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
AMPHIBIANS					
Lithobates chiricahuensis Chiricahua leopard frog	Threatened (USFWS 2002a, USFWS 2012b); designated critical habitat (USFWS 2012b).	Breeds in perennial to semi-permanent montane aquatic environments including cattle tanks, creeks, cienegas, pools, rivers, springs, lakes and reservoirs (USFWS 2011). Larvae are obligate on aquatic habitats whereas adults are primarily aquatic but also utilize terrestrial habitats (USFWS 2012b). May disperse from occupied habitat one mile overland, three miles along intermittent drainages, and five miles along permanent water courses, or some combination thereof (USFWS 2012b). Elevation: 3,200–8,890 ft (USFWS 2012b).	Occurs in Arizona and New Mexico, U.S. and Sonora, Chihuahua and Durango, Mexico (USFWS 2012b).	In New Mexico, this species is found in west-central and southwestern New Mexico where suitable habitat can be found (Natural Heritage New Mexico 2021). This species is known to occur in suitable habitat in the Animas, Black Range, Guadalupe, Mogollon, and Peloncillo mountains, coinciding with the Rio Grande and Pecos Basins, Elephant Butte Reservoir, Caballo, Playas Lake, Mimbres, Rio Grande, Tularosa Valley, Lower Colorado River Basin, Upper Little Colorado, Upper Gila, Animas Valley, San Francisco, San Simon, San Bernandino Valley, and Cloverdale watersheds (BISON-M 2017d).	**None**. There is no suitable habitat in the Project Area. Previous surveys adjacent to the Little Rock site, on the east side of the mine and several miles from the Project Area, did not detect this species, nor were there any water features within five-mile radius that could support leopard frogs (BLM 2010). Given that the nearest suitable habitats (Mimbres or Gila River) are beyond the dispersal capabilities of this species (i.e., greater than three miles away), and surface flow in the Project Area is intermittent in Oak Grove Wash, the Project Area would not contribute to CLF dispersal, nor provide year-round suitable habitat for populations or metapopulations of CLF. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
BIRDS					
Coccyzus americanus (western Distinct Population Segment) Yellow-billed cuckoo	Threatened (USFWS 2014a); designated critical habitat (USFWS 2021b).	In Arizona, most commonly found in lowland riparian woodlands where Fremont cottonwood, willow, velvet ash, Arizona walnut, mesquite, and tamarisk are dominant (USFWS 2013c). Also utilizes drier woodlands including mesquite bosques, drainages in desert scrub and desert grassland with a tree component, and Madrean evergreen woodlands in perennial, intermittent or ephemeral drainages (USFWS 2020c). This species typically occurs at elevations less than 6,600 ft (AGFD 2011c). Western yellow-billed cuckoos may migrate along riparian corridors and surrounding upland vegetation (Hughes 2020). Elevation: Typically below 6,600 ft (AGFD 2011c).	This species is a long-distance neotropical migrant (Hughes 2020). At the species level, breeds throughout temperate North America south to Mexico and the Greater Antilles (Hughes 2020). The western DPS breeds west of the Continental Divide and the watershed boundary between the Rio Grande and Pecos River and the Chihuahuan Desert. The USFWS considers the historical breeding range to include southern British Columbia, Canada and in Washington, Idaho, Nevada, Oregon, Utah, western Colorado, southwestern Wyoming, California, Arizona, western New Mexico, and Texas, U.S. Breeding range extends into the Cape Region of Baja California Sur, Sonora, Sinaloa, western Chihuahua and northwestern Durango, Mexico (USFWS 2014a). Winters in South America, east of the Andes and typically south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia and northern Argentina (USFWS 2014a).	Occurs throughout the state where suitable habitat exists and is considered rare to fairly common. Breeding areas include the San Juan, Dry Cimarron, Rio Grande, Pecos, Mora, Canadian, San Francisco, and Gila valleys (BISON-M 2018k, accessed January 2021). This species is most common in the south and along major drainages (eBird 2021).	**Unlikely**. There is no preferred riparian habitat in the Project Area. However, this species uses ephemeral drainages in the southwest, thus the Project Area has some marginally suitable habitat. In addition, there have been citizen scientists detections of YBC in the vicinity of the Project Area (eBird 2021). Given that the habitat in the Project Area is marginal, and constitutes a minor portion of the available habitat for cuckoo in New Mexico, it is unlikely for this species to occur in the Project Area, although it is possible that cuckoo may traverse the site while foraging or migrating. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Falco femoralis septentrionalis Northern aplomado falcon	Endangered (USFWS 1986); no critical habitat; non-essential experimental population (USFWS 2006a).	Within the U.S., this species uses coastal prairies, desert grasslands, oak woodlands and riparian gallery forest (Keddy-Hector, Pyle, and Pattern 2017). This species has historically occurred in relatively flat and open habitats (USFWS 2014c). Builds nests in large trees, cliffs, utility poles, artificial platforms or on the ground when elevated nest sites are not available (Keddy-Hector, Pyle, and Pattern 2017). This species is expected to use similar habitat year-round (Keddy-Hector, Pyle, and Pattern 2017). Elevation: In southwestern US, most common from 3,300–4,900 ft (AGFD 2001c).	This species is mostly non-migratory, although local nomadic movement may occur (Keddy-Hector, Pyle, and Pattern 2017). The *septentrionalis* subspecies occurs in New Mexico and Texas, U.S. and the Mexican states of Chihuahua, northwestern Chiapas, western Campeche, Oaxaca, San Luis Potosi, Tabasco, and Vera Cruz (USFWS 2014c). Before reintroductions in Texas, the last known breeding of this species in the U.S. occurred in New Mexico in 1952. Current populations are primarily in Mexico, with isolated populations in southern Texas and from northern Chihuahua to southern New Mexico.	Occasional in the southern portion of the state; rare and local, mainly in grassland-shrubland areas at lower elevations (BISON-M 2017a).	**None**. The Project Area contains oak woodlands and thus may have marginal suitability for this species. However, this species is considered very rare in New Mexico, the nearest sighting of this species is 40 miles away (and this detection occurred over 20 years ago) (eBird 2021). Moreover, the Project Area constitutes a small percentage of the overall marginal habitat available for this species in New Mexico. Thus, the probability of their use of marginal habitats is very low.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Empidonax traillii extimus Southwestern willow flycatcher	Endangered (USFWS 1995); designated critical habitat (USFWS 2013a).	Breeds in successional stands of dense riparian vegetation composed of trees and shrubs along rivers or lakes (AGFD 2002c, USFWS 2013a). Migrates along riparian habitats, including those with shorter or more sparse vegetation or smaller patches than would be suitable for nesting (USFWS 2013a). This species is a long-distance neotropical migrant and winters in habitats outside of the U.S. (Sedgwick 2020). Elevation: In Arizona, 75–9,180 ft (AGFD 2002c).	This species is a long-distance neotropical migrant (Sedgwick 2020). Breeds in Arizona, California, Colorado, New Mexico, Nevada, Texas and Utah, U.S. Winters in southern Mexico and south to northern South America (Sedgwick 2020, USFWS 2013a).	In New Mexico, populations of this species occur along the Rio Grande and Gila river drainages, with much smaller populations at isolated locales in the San Juan, upper Canadian, Zuni, San Francisco, Mimbres, and Pecos river drainages (NMDGF 2018). Historical breeding records are also known from the Canadian, Chama, San Francisco, San Juan, and Zuni river drainages. Species occurs widely throughout the state during migration. (BISON-M 2018j).	**None**. There is no suitable riparian habitat with dense riparian vegetation in the Project Area, there are no detections of this species in New Mexico by citizen scientists (eBird 2021), and this species is limited to perennial waterways with tracts of riparian vegetation. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Strix occidentalis lucida Mexican spotted owl	Threatened (USFWS 1993a); designated critical habitat (USFWS 2004).	Prefers old-growth mixed conifer or pine-oak forests, or such forests with complex structure. Also uses narrow canyons with cliffs and conifer or riparian woodlands (Gutiérrez, Franklin, and Lahaye 2020). In Arizona, canyon habitats typically contain Madrean evergreen oak or Madrean pine-oak woodlands (Wise-Gervais 2005). In forested areas, nests in large trees. In canyon habitats, will nest in trees, caves or on rocky ledges (USFWS 2012c). Primarily forages for rodents in range of forest or woodland habitats, but diet also includes lagomorphs, bats, birds, reptiles and arthropods (AGFD 2005, Gutiérrez, Franklin, and Lahaye 2020, USFWS 2012c) . Species has large home ranges, with single owls in Arizona utilizing an average of 1,600 acres and pairs an average of 2,000 acres (AGFD 2005). Migration variable within areas and among years (AGFD 2005, Gutiérrez, Franklin, and Lahaye 2020). When winter movements do occur, this species may move locally, primarily to lower elevations and more open sites with pinyon pine-juniper woodlands, open mountain shrub habitat, conifer forests or deciduous riparian trees (AGFD 2005, Gutiérrez, Franklin, and Lahaye 2020). Elevation: 2,720–10,000 ft (AGFD 2005).	This species is primarily non-migratory, although there may be some short distance (12 to 30 miles) or altitudinal movement (Gutiérrez, Franklin, and Lahaye 2020). Occurs patchily in Colorado, Utah, Arizona, New Mexico and western Texas. Range extends from the international border southward along the Sierra Madre Occidental and Oriental to Michoacán (Gutiérrez, Franklin, and Lahaye 2020, USFWS 2012c).	In New Mexico, this species occurs in summer and winter throughout the state, except for in the eastern plains. They are more abundant in the south. Some of the larger populations are found in the Gila National Forest and Sacramento Mountains (Ganey et al. 2014, New Mexico Avian Conservation Partners 2017).	**Unlikely**. The Project Area is within the known distribution of this species and there is marginally suitable habitat in the Project Area. However, given the lack of mature forest habitat and the on-going levels of disturbance, it is unlikely that a spotted owl would remain in this area for an extended period. Despite this, it is possible that this species may forage or pass through the Project Area The closest area of designated critical habitat is 20 miles north near Silver City. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
FISH					
Cyprinella formosa Beautiful shiner	Threatened (USFWS 1984); designated critical habitat (USFWS 1984).	Riffles of small to medium streams with sand, gravel, and rock bottoms (BISON-M 2018b). Elevation: less than 4,500 ft (BISON-M 2018b).	Extirpated from the U.S. in 1968, but still found in much of its historical range in Mexico. Breeding stock were collected from Mexico in 1989 and placed at Dexter National Fish Hatchery in New Mexico. In 1990, several individuals were taken from the hatchery and were reintroduced on San Bernardino National Wildlife Refuge in southeastern Arizona (Cochise County) (USFWS 1994). Historically occurred throughout the Rio Yaqui Basin in USA and Mexico and the Mimbres River in New Mexico, primarily in Cochise County in Arizona, and Grant and Luna Counties in New Mexico (Cobble 1995b).	Historically found in Rio Yaqui drainage and the Mimbres River (USFWS 1994), although it is now considered to be extirpated in New Mexico (NatureServe 2021a, Sublette et al. 1990).	**None**. There is no suitable aquatic habitat in the Project Area and this species is presumed extirpated in New Mexico. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Gila nigrescens Chihuahua chub	Threatened (USFWS 1983); no critical habitat.	This species requires perennial water and prefers habitat with pools and undercut bank habitat (USFWS 1983). In streams, Chihuahua chub are found mainly in lateral-scour pools where flow is against or along undercut banks and pools around channel obstructions such as boulders and root wads (Propst and Stefferud, 1994). Elevation: There are few records from New Mexico, but elevations range between approximately 6900-7,100 ft. Across the range (including Mexico), elevations range between 4,500-7,100 ft (Propst and Stefferud 1994).	Chihuahua chub is native to the Mimbres River drainage in New Mexico and the Guzmán and Laguna Bustillos basins in Chihuahua (Propst 1999).	Historically, Chihuahua chub probably occupied all warmwater reaches in the Mimbres River drainage, but they now are found regularly only in Moreno Spring, in about a 15 km reach of the Mimbres River from the confluence of Allie Canyon downstream to the New Mexico Department of Game and Fish Mimbres Property south of Mimbres (Propst 1999).	**None**. There is no suitable aquatic habitat in the Project Area.
Gila intermedia Gila chub	Endangered (USFWS 2005); designated critical habitat (USFWS 2005). [Note: USFWS (2017) determined that *G. nigra* and *G. intermedia* should be subsumed into *G. robusta* and intends to review the status of Gila chub.]	The species typically occurs in pools of small streams or cienegas. However, this species can also be found in larger streams. It is often found near undercut banks, overhanging vegetation, and various types of cover within the aquatic habitat (USFWS 2015c). Elevation: 2,000–5,500 ft (USFWS 2015c).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. and Sonora, Mexico (USFWS 2015c).	In New Mexico, all historically documented populations have been extirpated except in Turkey Creek, in northwestern Grant County (USFWS 2005).	**None**. There is no suitable aquatic habitat in the Project Area and it is outside the known distribution of this species. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Meda fulgida Spikedace	Endangered (USFWS 2012a); designated critical habitat (USFWS 2012a).	Inhabits shallow riffles with sand, gravel, and rubble substrates of moderate to large perennial streams (USFWS 2012a). Elevation: 1,620–4,500 ft (AGFD 2013c).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. (USFWS 2012a).	In New Mexico, this species is found in the mainstem Gila River, as well as in the lower end of the West, Middle, and East forks of the Gila River, and Mangas Creek within Hidalgo, Grant, and Catron counties (BISON-M 2017k).	**None**. There is no suitable aquatic habitat in the Project Area. There is no designated critical habitat in the Project Area.
Rhinichthys* [=*Tiaroga*] *cobitis Loach minnow	Endangered (USFWS 2012a); designated critical habitat (USFWS 2012a).	Typically inhabits swift, small to large perennial streams where it uses interstitial spaces or lee areas of primarily cobble substrates for resting and spawning (USFWS 2012a). However, slow, silty streams are occasionally used (Minckley and Marsh 2009, , p. 174). Adults are often found in areas with coarse, filamentous algae (Minckley and Marsh 2009, p. 174, USFWS 2012a). Elevation: Below 8,000 ft (USFWS 2012a).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. (USFWS 2012a).	In New Mexico, the species is found in the Gila River and its tributaries including the West, Middle, and East forks of the Gila River (Paroz and Propst 2007); the San Francisco and Tularosa Rivers and their tributaries in Catron County (Propst et al. 2009); Blue River and its tributaries, including Dry Blue, Campbell Blue, Pace, and Frieborn Creeks (Catron County) and Dry Blue Creek. and Blue Rivers and some of their tributaries (Carter 2008, Clarkson et al. 2008, USFWS 2012a).	**None**. There is no suitable aquatic habitat in the Project Area. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Poeciliopsis occidentalis Gila topminnow (including Yaqui)	Endangered (USFWS 1967); no critical habitat.	Occurs in springs, cienegas, permanent and intermittent streams and the margins of large rivers. Prefers warm, shallow and slow-moving water but can occur in lentic habitats or lotic habitats with moderate current. Additionally, favors areas with algal mats or debris along stream margins (USFWS 1998b). Elevation: Historical records from 1,320–7,510 ft, with most records occurring below 5,000 ft (AGFD 2001a).	Occurs in the Gila, Concepción and Yaqui river basins of Arizona and New Mexico, U.S. and Sonora, Mexico (Cobble 1995a, USFWS 1998b).	In New Mexico, this species has historically been found in the Gila River at Frisco Hot Springs (Sheffer et al. 1997) and San Francisco River drainage, although this species may be extirpated in New Mexico (Paroz et al. 2006). In 1989, the Gila topminnow was stocked in a pond on the NMDGF Red Rock Wildlife Management Area (NMDGF 1996); however, the effort was unsuccessful.	**None**. There is no suitable aquatic habitat in the Project Area.
Oncorhynchus gilae Gila trout	Threatened (USFWS 1967, USFWS 2006b); no critical habitat.	Inhabits perennial montane streams in coniferous and mixed woodland, montane coniferous forest, and subalpine forests (USFWS 2003). These streams area characterized by high flow variability but with low turbidity and high dissolved oxygen. Spawns in areas with flow over substrates of coarse sand or gravel. Juveniles likely use areas with slow current such as stream margins, side channels or shallow bars. Subadults favor riffle habitats whereas adults prefer pool habitats (USFWS 2003). Elevation: 5,400–9,200 ft (USFWS 2003).	Arizona and New Mexico, U.S. (USFWS 2003).	In New Mexico, this species historically occurred in the headwater streams of the Gila and San Francisco rivers. As of 2001, there were documented populations in Grant, Catron, and Sierra counties, New Mexico (USFWS 2002b). Three streams within Grant County were known to contain populations of the Gila trout (McKnight Creek, Sheep Corral Canyon, and Black Canyon). Gila trout were introduced into McKnight Creek (USFWS 1993b).	**None**. There is no suitable aquatic habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
MAMMALS					
Canis lupus baileyi Mexican gray wolf	Endangered (USFWS 1975, USFWS 2015a); non-essential experimental population (USFWS 1998a, USFWS 2015a); non-essential experimental population remanded but remains in place until a new rule is finalized (Ctr. for Biological Diversity v. Jewell 2018).	Occurs in sparsely to densely forested mountainous terrain or adjacent grasslands where prey is abundant. Prey species include cervids, peccaries, lagomorphs and rodents (USFWS 2015a). Elevation: 3,000–12,000 ft (AGFD 2001b).	The *baileyi* subspecies occurs in Arizona and New Mexico, U.S. and Sonora, Mexico (USFWS 2015a).	This species has been translocated into the Gila National Forest in New Mexico. The non-essential experimental population boundaries are south of I-40 and is divided into management zones. Zone 1: Initial releases and translocations can occur into Apache-Sitgreaves National Forests, and the Tonto Basin Ranger District of Tonto National Forest. Zone 2: Areas outside of Zone 1, south of I-40 and east of Hwy 60/89 and 93, I-10 and I-19 allows for natural dispersal and occupancy. Initial releases allowed on private and tribal land with approved management agreements. Translocations and release of pups less than 5-months old allowed on Federal lands. Zone 3: Areas south of I-40 and west of Hwy 60/89 and 93, I-10 and I-19. Within Zone 3 no releases or translocations are allowed but can be occupied by naturally dispersing individuals (USFWS 2015a).	**Unlikely**. While the Project Area occurs within the secondary recovery zone of the Blue Range Recovery Area, and suitable habitat for the wolf exists in areas surrounding the site, no wolves have been documented on this site Currently, there are no packs within 45 miles of the Project Area according to the USFWS Mexican wolf tracking (USFWS 2021c). However, due to the high mobility of this species, it is possible that an occasional wolf could disperse through the area. Given that the size of the Project Area is negligible relative to the available habitat for this species, the sensitivity of gray wolves to disturbance (USFWS 1998a), it is highly unlikely that this species will occur in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Leptonycteris nivalis Mexican long-nosed bat	Endangered (USFWS 1988), no critical habitat.	A colonial cave dweller that usually inhabits deep caverns, but also can be found in mines, culverts, hollow trees, and unoccupied (USFSW 1988). This bat occupies a variety of habitats from high-elevation pine oak woodlands to sparsely vegetated deserts. Foraging habitat includes columnar cacti and succulents such as saguaro cactus and paniculate agaves (century plants) (USFWS 1988). Elevation: 3,700-7,800 ft (USFWS 1988)	The Mexican long-nosed bat has been found in extreme southwestern New Mexico, the Big Bend area of Texas, the Chinati Mountains of Presidio County, Texas and southward to central Mexico (USFWS 1988).	This species has been documented in the "bootheel" mountain ranges of southwestern New Mexico in Hidalgo County. There are known roosts for these species in the Animas Mountains, with another potential population in the Big Hatchet Mountains (Bogan, Cryan, and Weise 2006).	**None.** Although there is a known roost site in the Bootheel mountain ranges of southwestern New Mexico region (Bogan, Cryan, and Weise 2006), the Project Area is outside the reported geographic range for this species. Furthermore, the Project Area does not contain suitable foraging habitat for this species. An internal survey of a decline shaft in the Project vicinity in 2014 by Bat Conservation International (BCI) concluded that this species does not occur (BCI 2014). This species is not expected to occur in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
REPTILES					
Thamnophis eques megalops Northern Mexican gartersnake	Threatened (USFWS 2014b); designated critical habitat (USFWS 2021a).	This species is strongly associated with water due to its primarily aquatic prey base and is heavily dependent on fish species. Occurs near or in ponds, cienegas, lowland river riparian forests and woodlands, and upland stream gallery forests. Avoids steep mountain canyons. Most abundant in densely vegetated habitat. Associated with a variety of biotic communities including Sonoran Desertscrub, Semidesert Grasslands, Interior Chaparral, Madrean Evergreen Woodland and into the lower reaches of Petran Montane Conifer Forest (AGFD 2012, USFWS 2013b). Northern Mexican gartersnakes may be found up to one mile (or more) away from water, using terrestrial habitat for brumation, digestion, or for thermoregulatory needs such as developing young (Jeff Servoss, USFWS pers. comm. to D. Cerasale, April 18, 2016). Elevation: 130–8,497 ft (USFWS 2014b) but is most common below 5,000 ft (AGFD 2012).	Occurs in Arizona and New Mexico, U.S. (USFWS 2014b). Although it is poorly known, the range extends into Mexico and is thought to include Sonora, Chihuahua, Durango, Coahuila, Zacatecas, Guanajuato, Nayarit, Hidalgo, Jalisco, San Luis Potosí, Aguascalientes, Tlaxcala, Puebla, México, Michoacán, Oaxaca, Veracruz, and Querétaro (AGFD 2012).	The status of this species in New Mexico is uncertain, although it is possible that this species may occur in Mule Creek (USFWS 2014d), and there is proposed critical habitat for this species in Gila River and Duck Creek, although portions of these areas are being considered for exclusion (USFWS 2020b); however, it is likely extirpated.	**None**. There is no suitable aquatic habitat in the Project Area and the nearest suitable habitat is well outside of the dispersal capability of this species. There is no designated critical habitat in the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Thamnophis rufipunctatus Narrow-headed gartersnake	Threatened (USFWS 2014b); proposed critical habitat (USFWS 2020b).	This species is strongly associated with pool and riffle habitats in clear, rocky streams habitats in Petran Montane Conifer Forest, Great Basin Conifer Woodland, Interior Chaparral and the Arizona Upland subdivision of Sonoran Desertscrub. Occasionally utilizes lake shoreline habitats (USFWS 2014b). The narrow-headed gartersnake primarily preys on fish species (USFWS 2014b). Bank-line vegetation is an important habitat component and this species favors areas with shrub- and sapling-sized plants for thermoregulation (USFWS 2014b). This species has been documented using site up to 656 ft away from the floodplain for hibernation (USFWS 2014b). This species is typically surface active between March and November with air temperatures of 52° to 89° F (USFWS 2014b). Elevation: 2,300–8,000 ft (USFWS 2014b).	Occurs in Arizona and New Mexico, U.S. (USFWS 2014b).	In New Mexico, this species is confined to the Catron, Grant, and Hidalgo counties where it reaches the easternmost edge of its distribution, where it uses suitable rocky rivers and streams of the San Francisco and Gila River drainages. This species is expected to exist within the San Francisco River drainage at low densities. Individuals have been recently detected in Saliz Creek, Whitewater Creek, Diamond Creek, and Dry Blue Creek near the Arizona border in Catron County (NMDGF 2020).	**None**. There is no suitable aquatic habitat in the Project Area and there is no suitable prey base (fish) for this species. The nearest suitable aquatic habitat is outside of the dispersal capabilities of this species; thus, this species is not expected to occur. There is no critical habitat in the Project Area.

Table 2. BGEPA Listed Species evaluated for potential to occur in the Project Area

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Aquila chrysaetos Golden eagle	Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c).	Range-wide, breeds in a wide variety of open habitats, with nests typically on cliffs, and avoids heavily forested areas (Katzner et al. 2020). In Arizona, prefers pinyon-juniper woodlands and Sonoran desertscrub (Driscoll 2005). Constructs large nests on cliff ledges, rock outcrops, tall trees or, rarely, transmission towers (Driscoll 2005). Golden eagles are known to forage within 4.4 miles of the nest (Tesky 1994), generally in open habitats where prey is available (Katzner et al. 2020). Primarily feeds on small mammals (greater than 80% of prey items) but also consumes birds, reptiles and fish (Katzner et al. 2020). In the western U.S. average territory size ranges from 22 to 55 square miles (AGFD 2002b). Elevation: In Arizona, typically breeds between 1,300–9,000 ft (Driscoll 2005).	This species is a short to medium-distance partial migrant with a Holarctic distribution (Katzner et al. 2020). In North America, primarily breeds in western portion of the continent from Alaska to central Mexico. Northern most populations are typically migratory. Year-round and non-breeding populations occur from central Saskatchewan to British Columbia, Canada and south throughout its range and sparsely in the eastern U.S. (Katzner et al. 2020).	In New Mexico, Golden Eagles breed locally in suitable habitat throughout the state (Katzner et al. 2020, Parmeter, Neville, and Emkalns 2002).	**Possible.** Golden eagles have been detected within 3 miles of the Project Area (eBird 2021, accessed 1/5/2021) and the site contains marginally suitable foraging habitat. There are no cliffs within the Project Area that could serve as suitable nesting habitat, although there are some ponderosa pines are present. Given the nearby sightings of golden eagles and marginally suitable habitat present, it is possible that golden eagles may occur within or in the vicinity of the Project Area.

Species Name	Federal Status	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Haliaeetus leucocephalus Bald eagle	Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c).	Breeding is concentrated in coastal areas, along rivers, lakes or reservoirs. Typically breeds in forested areas with edge habitat within 1.3 miles of aquatic habitats suitable for foraging. Prefers areas of shallow water and shorelines for fishing and hunting wide variety of waterfowl, and small aquatic and terrestrial mammals. Fish are preferred prey, but carrion is used extensively whenever encountered. Nests away from human disturbance in large trees and rarely on cliff ledges or on the ground when trees are absent. Winters primarily in coastal areas or along major river systems with adequate prey availability and large trees for perching (Buehler 2020). Elevation: In Arizona, 460–7,930 ft (AGFD 2011a).	Migratory behavior varies among populations and age groups (Buehler 2020). Breeds south of the tundra throughout Canada and the U.S., excluding Hawaii. Additionally, small breeding populations occur in Baja California, Sonora and Chihuahua, Mexico (Buehler 2020). Winter range appears to be expanding as populations increase in size. Most populations are year-round residents with only the northern most populations in Alaska, U.S. and Canada withdrawing southward or to coastal areas (Fink et al. 2018).	In New Mexico, bald eagles are present casually to occasionally in summer, but they migrate and winter almost statewide, although there is limited breeding in New Mexico (Buehler 2020).	**Unlikely**. The Project Area within the range of this species and there are citizen scientists' sightings of bald eagles within ten miles of the site (eBird 2021, accessed 1/5/2021). However, the Project Area does not contain large bodies of water associated with this species. While it is possible that a bald eagle may fly over the Project Area when foraging, given the absence of preferred habitat, it is unlikely that this species will occur.

Table 3. NMDGF-Listed Species evaluated for potential to occur in the Project Area

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
AMPHIBIANS				
Lithobates yavapaiensis Lowland leopard frog	Occur in a variety of perennial to near perennial waters in desert grasslands to pinyon juniper biotic communities (AGFD 2006). Inhabits large rivers, streams, canals, cienegas, cattle tanks or other aquatic features (Rorabaugh 2008). Can survive in semi-permanent aquatic systems by retreating into deep mud cracks, mammal burrows, or rock fissures, but large pools are required for adult survival and reproductive efforts (Bureau of Reclamation 2016). Elevation: In Arizona, from 480–6,200 ft (AGFD 2006).	Historic range included Arizona, California, Nevada, New Mexico, U.S. and extreme northeastern Baja California, northern Sonora, and possibly northwestern Chihuahua, Mexico (AGFD 2006, Bureau of Reclamation 2016). Current range is restricted to southern Arizona and adjacent portions of Sonora (Bureau of Reclamation 2016).	Is thought to be extremely rare and likely extirpated in the state. A 1995 survey of 72 potential locations in the state, including six historical sites that had not been surveyed in the past 10 years, resulted in no observations. Populations are now believed to be extirpated or occurring in very low numbers (BISON-M 2019c).	**None.** There is no suitable aquatic habitat in the Project Area, and this species is likely extirpated from the state.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
BIRDS				
Melozone aberti Abert's towhee	Occupies riparian areas with cottonwood-willow woodlands, mesquite bosque, marshes and mixed exotic-native vegetation within the lower Sonoran life zone. Prefers a dense understory (Tweit and Finch 1994). Most abundant in low-elevation riparian vegetation with cottonwood, willows and mesquite or dry washes with dense thickets. Additionally, utilizes areas with dense stands of tamarisk, patches of dense shrubs along irrigation ditches or run-off retention ponds in agricultural areas and densely vegetated suburban areas (Corman 2005a). Occurs in the same habitat year-round (Tweit and Finch 1994). In its New Mexico range, this species uses thickets of seepwillow and other riparian habitats. Elevation: In Arizona and neighboring states, generally below 4,300 ft (Corman 2005a).	Non-migratory. The core of their range is in Arizona, but also extends into adjacent portions of southeastern California, southwestern New Mexico, southeastern Nevada, and extreme southwestern Utah, U.S. Additionally, there are populations just south of the international border in Baja California and Sonora, Mexico (Corman 2005a, Tweit and Finch 1994).	Found along portions of the Gila River from the Arizona border to Mogollon Creek in Grant County, and at the San Simon Cienega in Hidalgo County where suitable habitat exists (BISON-M 2018a, Tweit and Finch 2020).	**Unlikely.** There are citizen scientist sightings of this species in nearby Tyrone (eBird 2021). However, the species is rarely detected in the general vicinity and the Project Area does not contain suitable riparian habitat. This species may occur as a vagrant.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Haliaeetus leucocephalus Bald eagle	Breeding is concentrated in coastal areas, along rivers, lakes or reservoirs. Typically breeds in forested areas with edge habitat within 1.3 miles of aquatic habitats suitable for foraging. Prefers areas of shallow water and shorelines for fishing and hunting wide variety of waterfowl, and small aquatic and terrestrial mammals. Fish are preferred prey, but carrion is used extensively whenever encountered. Nests away from human disturbance in large trees and rarely on cliff ledges or on the ground when trees are absent. Winters primarily in coastal areas or along major river systems with adequate prey availability and large trees for perching (Buehler 2020). Elevation: In Arizona, 460–7,930 ft (AGFD 2011a).	Migratory behavior varies among populations and age groups (Buehler 2020). Breeds south of the tundra throughout Canada and the U.S., excluding Hawaii. Additionally, small breeding populations occur in Baja California, Sonora and Chihuahua, Mexico (Buehler 2020). Winter range appears to be expanding as populations increase in size. Most populations are year-round residents with only the northern most populations in Alaska, U.S. and Canada withdrawing southward or to coastal areas (Fink et al. 2018).	Are present casually to occasionally in summer, but they migrate and winter almost statewide, although there is limited breeding in the state (Buehler 2020).	**Unlikely.** The Project Area is within the range of this species and there are citizen scientists' sightings of bald eagles within ten miles of the site (eBird 2021). However, the site does not contain large bodies of water associated with this species. While it is possible that a bald eagle may fly over the site while foraging, given the absence of preferred habitat, it is unlikely that this species will occur.
Centronyx bairdii **[recently changed from *Ammodramus bairdii*]** Baird's sparrow	Utilizes prairie habitats. Winters in areas of dense and expansive grasslands, with only a minor shrub component (Green et al. 2020). In southern New Mexico, this species prefers areas with denser grass cover than surrounding areas (BISON-M 2019a). Elevation: 3,900-6,570 ft (BISON-M 2019a).	Nests in the Dakotas, Montana, and Minnesota, as well as the Canadian provinces of Alberta, Manitoba, and Saskatchewan. Winters primarily in northern Mexico, although some may be found in southern Texas, New Mexico, and Arizona (BISON-M 2019a, Green et al. 2020).	Species migrates in the eastern and extreme southern areas of the state, where it is considered rare to uncommon (BISON-M 2019a, Green et al. 2020).	**None.** The Project Area lack of suitable habitat, this species is considered rare to uncommon in the state, and has only been detected irregularly in southwestern New Mexico (eBird 2021).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Vireo bellii Bell's vireo	Breeds in a wide variety of dense shrubby habitats, often near water, particularly in arid environments, including riparian scrub along drainages, successional riparian vegetation, brushy fields, mesquite brushlands, chaparral and young forests and woodlands (Kus et al. 2020). In New Mexico, they characteristically occurs near riparian habitat and dense shrubland or woodland along lowland stream courses (Kus et al. 2020). In the southeast and southwest parts of the state, most nests occur in willow, seepwillow, or hackberry (Kus et al. 2020) Elevation: In Arizona, breeds 120–5,120 ft (Averill-Murray and Corman 2005).	A neotropical migrant (Kus et al. 2020). Breeds throughout the central and southwestern U.S. including Arizona, Arkansas, California, Colorado, Illinois, Indiana, Kentucky, Louisiana, Michigan, Missouri, Nebraska, Nevada, New Mexico, North Dakota, Ohio, Oklahoma, South Dakota, Texas, Utah, Wisconsin, and Wyoming. Additionally, breeds in northern Mexico in Baja California, Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo Leon, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, and Zacatecas. The wintering range is less well known but includes Baja California Sur and south along the Pacific Slope from Sonora through Oaxaca, El Salvador, Honduras and Nicaragua (Kus et al. 2020). There are scattered winter records throughout the southern U.S. portion of the breeding range and in Florida (Kus et al. 2020).	Considered a common and widespread summer resident in southern parts of the state (Bailey 1928, Hubbard 1978). They are known populations in the lower Gila Box, San Simon Cienega, and Guadalupe Canyon.	**None.** Lack of suitable foraging or nesting habitat within the Project Area, and the Project Area is above the elevation preferred by this species. There are no citizen scientist records of this species from the vicinity of the Project Area (eBird 2021).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Cynanthus latirostris Broad-billed hummingbird	Utilizes a wide variety of habitats across its range including riparian forest, thorn forest, tropical deciduous forest, pine-oak forest and successional or disturbed habitats (Powers and Wethington 2020). In New Mexico, occurs along drainages with riparian habitat (Powers and Wethington 2020). Additionally, uses densely vegetated washes with mesquite, netleaf hackberry, juniper or oaks, parks and residential areas (Corman 2005b). There is no information on habitat use during migration. Winters in habitats outside of the U.S. (Powers and Wethington 1999). Elevation: Range-wide 490–9,840 ft (Powers and Wethington 2020). In Guadeloupe Canyon, New Mexico, breeds at approximately 4,480 ft (Powers and Wethington 2020).	A partial migrant, with the northern most populations withdrawing southward (Powers and Wethington 1999). Breeds in southeastern Arizona, extreme southwestern New Mexico and rarely in southwestern Texas, U.S. Range extends southward into Mexico in eastern Sonora, western Chihuahua, Sinaloa, extreme western Durango, Nayarit, west Zacatecas, Aguascalientes, Jalisco, Guanajuato, Querétaro, Hidalgo, Colima, Michoacán, México D. F., northern Guerrero, northern Puebla, extreme western Vera Cruz, Oaxaca, extreme southwestern Chiapas, San Luis Potosí, extreme western Tamaulipas, and extreme southern Nuevo León (Powers and Wethington 1999). During the winter, most individuals leave the U.S., northern Sonora and Nuevo León (Corman 2005b, Powers and Wethington 1999).	Dependent on riparian habitat in extreme southwest portion of the state in the Peloncillo and Guadeloupe Mountains in Hidalgo County (Powers and Wethington 1999). Have also been vagrant sightings of this species in Hidalgo, Doña Ana, and Sierra counties (BISON-M 2020a).	**Unlikely.** The Project Area does not contain the suitable forested habitat and is outside of the known breeding distribution. However, has been detected in the vicinity of the Project Area, although very rarely (eBird 2021).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Antrostomus [=*Caprimulgus*] *ridgwayi* Buff-collared nightjar	Prefers arid and densely vegetated areas and is often found in ravines, washes or rocky canyons (Bowers and Dunning 1997). Buff-collared nightjars do not build nests and instead lay eggs directly on the ground (Bowers and Dunning 1997). There is no information about habitat use during migration and this species winters in habitats outside of the U.S. (Bowers and Dunning 1997). Elevation: Across range, has been detected from sea-level to 7,870 ft (Bowers and Dunning 2020).	Migratory behavior of this species is poorly understood, but it is a suspected partial migrant with the northern most populations likely migratory (Bowers and Dunning 1997). Breeding range includes southeastern Arizona and extreme southwestern New Mexico, U.S. Breeding range extends southward into Mexico through eastern Sonora, western Chihuahua, Sinaloa, western Durango, south on the Pacific Slope to Oaxaca, northern Guerrero, Morelos, central Chiapas, and central Vera Cruz. Additional breeding populations occur in central Guatemala, west-central Honduras, and possibly central Nicaragua. Winter range is similar to the breeding range except the northern most populations withdraw from the US, north and central Sonora, Chihuahua and Durango (Bowers and Dunning 1997).	Detected in extreme southwestern portion of the state in of Hidalgo and Doña Ana counties (BISON-M 2017c).	**None.** The Project Area is outside of the known distribution of this species and there have been no citizen scientist records of this species in the vicinity (eBird 2021).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Buteogallus anthracinus Common black hawk	Is associated with swamps, marshes, flooded forests, coastal plains, mangroves, and riparian areas with perennial water. In the southwestern U.S. they are an obligate riparian species (Schnell 2020). In Arizona, this species occurs along perennial and intermittent streams with perennial pools in drainages with sycamores, Arizona alder, Fremont cottonwood, Arizona cypress, Arizona walnut, Goodding's willow, velvet ash, velvet mesquite or tamarisk. Hunts for arthropods and small vertebrates including fish, frogs, snakes, and lizards from streamside perches. High branches, rock ledges, sandbars or streamside rocks are used as foraging perches (Schnell 2020). U.S. populations are migratory and winter in Mexico or further south (Schnell 2020). Migratory habitat is insufficiently known, but this species is generally believed to follow riparian corridors (Sadoti 2010). Elevation: In Arizona, 1,800–7,000 ft (Corman and Wise-Gervais 2005).	A partial migrant. Migratory breeding populations in extreme southern Utah and Nevada, Arizona, New Mexico and western Texas in the U.S. and eastern Sonora, western Chihuahua, western Durango, and eastern Nayarit. Resident from Sinaloa and Tamaulipas and south, primarily along the coasts to Ecuador, Columbia, and Venezuela in northern South America. Occasional individuals have been reported overwintering in southern Arizona (Schnell 2020).	Found along the Gila, San Francisco, and Mimbres rivers in the southwest quadrant of the state, as well as along the Rio Hondo in the southeast. It occasionally nests along the Rio Grande as far north as Albuquerque, and in the Canadian River and Upper Pecos drainages. (AGFD 2013a, Corman and Wise-Gervais 2005).	**Unlikely.** While there is no suitable habitat in the Project Area, there have been citizen scientist detections of this species within 10 miles of the Project Area (eBird 2021). As there are ephemeral water features in the Project Area, it is possible that this species may fly over the site while foraging or migrating, although this is very unlikely.
Columbina passerine Common ground dove	Inhabit arid, open woodlands in the early stages of forest development, including pine woods, hammocks, lake shores, forest edges, coastal dunes, mesquite flats, river bottom woodlands, deserts, desert scrublands, oak scrublands, and savannas (Bowman 2020). Also found in human landscapes, especially irrigated farm fields and residential neighborhoods. Elevation: 1,000 to 6,000 ft in New Mexico (BISON-M 2017e).	Ranges from southern California to southern Florida, with populations occurring through Central and South America. Normally resident throughout breeding range, but vagrants north of range not uncommon. May move from interior to coastal areas; comparison of breeding and winter distributions suggest some movement southward from northern portions of range, but most movement into existing breeding areas (Bowman 2020).	Formerly was most regularly found in the southern part of the state at Las Cruces in the Rio Grande drainage and near Carlsbad (BISON-M 2017e).	**Unlikely.** There is potentially suitable habitat in the Project Area but there are no eBird records in the vicinity (eBird 2021).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Calypte costae Costa's hummingbird	Breeds in Sonoran and Mojave desertscrub, coastal scrub, chaparral and tropical deciduous forest (Baltosser and Scott 1996). In Arizona, this hummingbird occurs in upland desertscrub, desert washes and in riparian vegetation associated with springs or intermittent streams (Corman 2005c). During migration, this species uses xeric habitats but also is known to travel along drainages, which may be more mesic than habitats used during breeding (Baltosser and Scott 1996). Arizona populations may travel westward to summer in chaparral and costal scrub of California and Baja California (Baltosser and Scott 1996). Elevation: In Arizona, typically 100–4,700 ft, but occasionally up to 7,800 ft (Corman 2005c).	A partial migrant (Baltosser and Scott 1996). Migratory breeding populations occur in east-central California, southern Nevada, Arizona and extreme southwestern New Mexico and Sonora, Mexico. Resident breeding populations occur in southern California, southwestern Arizona and in Baja California, Baja California Sur and northwestern Sonora, Mexico. Wintering populations occur in southern Sonora, Sinaloa and Nayarit (Baltosser and Scott 1996).	Uncommon and sporadic breeder in the southwest and south-central mountains, and is most commonly found in Guadalupe Canyon and in side canyons along the lower Gila River from Cliff south (BISON-M 2017f).	**Unlikely.** There is marginally suitable habitat of ephemeral washed in the Project Area, and there have been citizen scientist detections of this species within 10 miles of the site (eBird 2021). It is possible that this species may fly over the site while foraging or migrating.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Trogon elegans Elegant trogon	Most common tropical deciduous forest (Williams 2011) but uses a wide variety of habitats including semi-arid pine-oak woodland, xeroriparian areas in thornscrub, thorn forest, pine and pine-oak forests, riparian woodlands, montane rainforest and plantations (Kunzmann, Hall, and Johnson 1998). Habitat use in New Mexico is poorly known, but in Arizona, this species breeds in canyons with large sycamores and Madrean pine-oak woodlands and, less frequently, in lower elevation canyons with sycamores and adjacent slopes with scattered oaks, pinyon pine or juniper (Corman 2005d). There is no information on migration habitat (Kunzmann, Hall, and Johnson 1998, Williams 2011). Elevation: Range not well known in New Mexico. In Arizona, typically 3,400–6,800 ft (AGFD 2014) but have been observed above 7,000 ft (Corman 2005d).	A partial migrant, with only the northern most populations withdrawing southward (Kunzmann, Hall, and Johnson 1998, Williams 2011). Breeds from southeastern Arizona and southwestern New Mexico, U.S. south through Mexico from Sonora and Chihuahua along the Pacific Slope and from Tamaulipas and Nuevo León to southern Oaxaca. Additionally, occurs in southeastern Guatemala, El Salvador, western Honduras, Nicaragua and northwestern Costa Rica (Kunzmann, Hall, and Johnson 1998). During the winter, U.S. and northern Sonora populations withdraw southwards (Williams 2011).	Scattered records in Guadalupe Canyon and is also described as rare in the Peloncillo and Animas mountains (BISON-M 2017g, Kunzmann et al. 2020).	**Unlikely.** The Project Area is outside of the known current distribution of this species, although there is one historical record of this species from 1986 in the Big Burro Mountains (eBird 2021). Given the rarity of this species in the state, it is unlikely this species will occur in the site.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Melanerpes uropygialis Gila woodpecker	Occurs in desert areas with large cacti or trees, dry subtropical forests, riparian woodlands and residential areas (Edwards and Schnell 2000). In Arizona, this species is most common in upland areas of Sonoran Desert with abundant saguaros, paloverde, mesquite, and ironwood. Is present, but less common in low desert areas and washes where there are few to no saguaros. Commonly nests in riparian woodlands with Fremont cottonwood, Goodding's willow, mesquite, or sycamores. Generally tolerant of some types of human activities and utilizes residential and rural areas (Bradley 2005). They utilize similar habitat throughout the year (Edwards and Schnell 2000). Elevation: In Arizona, 150–4,800 ft (Bradley 2005). In New Mexico, 3,000-5,000 ft (BISON-M 2018e).	Non-migratory, although short-distance local movements may occur (Edwards and Schnell 2000). Found in Arizona, California, Nevada and New Mexico, U.S. and the Mexican states of Aguascalientes, Baja California, Baja California Sur, Chihuahua, Durango, Jalisco, Nayarit, Sinaloa, Sonora and Zacatecas (Edwards and Schnell 2000).	Present only in extreme southwest part of the state, in Grant and west Hidalgo counties (Edwards and Schnell 2000). Primarily found in the lower Gila Valley in both Grant and Hidalgo counties, Guadalupe Canyon, San Simon Cienega, drainages of the Animas and Peloncillo Mountains, and Bitter Creek in western Grant County (BISON-M 2018e, Edwards and Schnell 2000).	**Unlikely.** The Project Area is within the known geographic range, and there are eBird records in the vicinity near Silver City (eBird 2021). However, there is no suitable desert habitat in the site.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Vireo vicinior Gray vireo	Preferred breeding habitat includes pinyon pine-juniper woodlands, oak scrub and chaparral in arid mountain ranges and high plains (Barlow, Leckie, and Baril 2020). In Arizona and New Mexico, occurs in chaparral-juniper and dwarf conifer forests, as well as sites with Graves oak (*Quercus gravesii*), mixed piñon, and madrone (*Arbutus* spp.; (Barlow, Leckie, and Baril 2020). Occasionally occurs in chaparral dominated slopes and Madrean evergreen oak woodlands with only scattered pinyon pine or junipers (Corman 2005e). Habitat used during migration is likely similar to the breeding and wintering habitats. In Arizona, wintering habitat includes lowland Sonoran desertscrub and rocky canyons in desert mountains. Elsewhere in the wintering range this species uses Chihuahuan desertscrub and lowland riparian areas with willow and cottonwood near springs or intermittent streams (Barlow, Leckie, and Baril 2020). Elevation: Typically breeds 3,500–6,800 ft (Corman 2005e), winters much lower (Barlow, Leckie, and Baril 2020).	A short-distance migrant (Barlow, Leckie, and Baril 2020). Breeds from central and southern Utah and western Colorado, south to southern Nevada, Arizona, and New Mexico, U.S. Isolated populations also breed in southern California, Baja California, western Texas, U.S. and in Mexico in northwestern Coahuila and possibly north-central Durango. Wintering range is poorly known, but this species has been reported from south-central Arizona, western Sonora, Baja California Sur and western Texas (Barlow, Leckie, and Baril 2020).	Rare summer residents of the Gila National Forest and only in the state during the warmer months. Has been recorded in central and western counties east to Pecos, western San Miguel County, and Gran Quivara National Monument, eastern Socorro County, the Silver City area, the foothills of the Magdalena, Manzanita, and Sandia mountains and in the southeast in the Guadalupe Mountains and in eastern Otero County (BISON-M 2017i).	**Unlikely.** The Project Area is within the known distribution of this species, has potentially suitable woodland habitat, and there are eBird records within the immediate vicinity (eBird 2021). However, this species is rarely detected in New Mexico, and thus it is unlikely to occur in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Calothorax lucifer Lucifer hummingbird	Range-wide, this species primarily occurs in arid habitats including desertscrub, densely vegetated dry washes, lava fields, volcanic hills, rocky slopes but occasionally uses deciduous riparian woodland (Scott 1994). Little is known about habitat use in New Mexico. There is no information on migratory habitat and this species winters outside of the U.S. (Scott 1994). However, individuals have been reported from feeding stations in drainages dominated by sycamores, Madrean evergreen oak woodlands or pine-oak forest during the presumably post-breeding period (Corman 2005f). Elevation: Range-wide 2,625–7,220 ft (Scott 1994).	Migratory behavior is poorly understood, but this species is likely primarily migratory (Scott 1994). There are sparse breeding populations in southeastern Arizona, extreme southwestern New Mexico and the Big Bend region of Texas, U.S. The breeding range extends along the Sierra Madre Occidental and Oriental in northeastern Sonora, Chihuahua, Durango, Coahuila and Nuevo Leon to the Central Plateau and possibly as far south as Puebla (Scott 1994). Winters in central and southwestern Mexico in Jalisco, Guanajuato, Querétaro, Guerrero, Oaxaca, Colima, Michoacán and Morelos (Scott 1994).	A rare breeder and sparse visitor to the mountain ranges in the southwestern portion of the state including Post Office Canyon in the Peloncillo Mountains. Has also been recorded in the Peloncillos at Clanton Canyon and Skeleton Canyon (BISON-M 2018f).	**Unlikely.** While the Project Area may contain some marginally suitable woodland habitat, it is a rare vagrant to New Mexico, and has only been detected in the vicinity of the Project Area twice in the past 35 years, both times in Silver City (eBird 2021). Given the rarity of this species in New Mexico, it is unlikely to occur in the site.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Anaxyrus microscaphus Brown pelican	Primarily warm coastal marine and estuarine environments year-round. Generally rare inland, but regular post-breeding visitor to inland waters in the southwestern U.S. (Shields 2020) Very little is known about the habitat use of this species in New Mexico. Elevation: Unknown for New Mexico.	Pacific coast from southern California south to central Mexico (including Gulf of California), Honduras, Costa Rica, Panama, Galápagos Islands, Colombia, and southern Ecuador. On the Atlantic, this species is found in the Gulf of Mexico, and Caribbean coasts from Maryland south around Florida and west to southern Texas; from southern Veracruz, Mexico, east to northern Honduras. Also found in the Bahamas, Greater and Lesser Antilles, Trinidad and Tobago, Venezuela, and Colombia. Also inland at Lake Okeechobee, Florida and Salton Sea, California (Shields 2020)	Rare post-breeding vagrant to water bodies across the state (BISON-M 2017b).	**None.** There is no suitable inland water habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Phalacrocorax brasilianus Neotropic cormorant	Inhabits a wide variety of wetlands in fresh, brackish, or saltwater. In coastal areas, this species remains close to the shore in sheltered bays, inlets, estuaries, lagoons, rock outcrops, and islands. Inland, occupies broad slow-flowing rivers, mountain streams, lakes, marshes, swamps, and reservoirs. Habitat requirements include water deep enough for diving and elevated perches in trees and shrubs (Telfair II and Morrison 2020) Elevation: across range, found from sea-level to 16,400 ft in the Andes (Telfair II and Morrison 2020).	Breeding resident throughout lowland South America and Aruba. Largely resident in Central America to northwestern Mexico, and north to Gulf Coast of United States from Texas to Louisiana, with inland breeding colonies established in Louisiana, Mississippi Delta, southern Florida, southwestern Arkansas, southeastern and north-central Oklahoma, central Kansas, eastern South Dakota, southern New Mexico, south-central Arizona, and southern, eastern, north-central, and western Texas (Telfair II and Morrison 2020). Nonbreeding range is similar to breeding range (Telfair II and Morrison 2020)	Found throughout the state in areas with suitably large bodies of water (BISON-M 2018g).	**None.** The Project Area does not contain suitable foraging or breeding habitat of large water bodies.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Falco femoralis septentrionalis Northern aplomado falcon	Within the U.S., this species uses coastal prairies, desert grasslands, oak woodlands and riparian gallery forest (Keddy-Hector, Pyle, and Pattern 2017). Historically occurred in relatively flat and open habitats (USFWS 2014c). Builds nests in large trees, cliffs, utility poles, artificial platforms or on the ground when elevated nest sites are not available (Keddy-Hector, Pyle, and Pattern 2017). Is expected to use similar habitat year-round (Keddy-Hector, Pyle, and Pattern 2017). Elevation: In southwestern U.S., most common from 3,300–4,900 ft (AGFD 2001c).	Mostly non-migratory, although local nomadic movement may occur (Keddy-Hector, Pyle, and Pattern 2017). The *septentrionalis* subspecies occurs in New Mexico and Texas, U.S. and the Mexican states of Chihuahua, northwestern Chiapas, western Campeche, Oaxaca, San Luis Potosi, Tabasco, and Vera Cruz (USFWS 2014c). Before reintroductions in Texas, the last known breeding of this species in the U.S. occurred in New Mexico in 1952. Current populations are primarily in Mexico, with isolated populations in southern Texas and from northern Chihuahua to southern New Mexico.	Occasional in the southern portion of the state; rare and local, mainly in grassland-shrubland areas at lower elevations (BISON-M 2017a).	**None**. The Project Area contains oak woodlands and thus may have marginal suitability for this species. However, this species is considered very rare in New Mexico, the nearest sighting of this species is 40 miles away (and this detection occurred over 20 years ago) (eBird 2021). Moreover, the Project Area constitutes a small percentage of the overall marginal habitat available for this species in New Mexico. Thus, the probability of their use of marginal habitats is very low.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Camptostoma imberbe Northern beardless tyrannulet	Occurs in arid to semi-humid brushy areas, thickets and forest edges, commonly along streams and dry washes (Tenney 2000). In New Mexico, irregular and uncommon in lowland riparian woodland and adjacent scrub (Tenney 2000). Also uses mesquite bosque and intermittent foothill drainages or dry washes with mesquite and netleaf hackberry (Corman 2005g). Migration habitat use is poorly known but has been reported in areas with desertscrub. Wintering habitat is similar to breeding habitat and includes lowland riparian woodland and adjacent habitats, chaparral and mesquite (Tenney 2000). Elevation: Poorly known for New Mexico. In Arizona, breeds 1,920–4,600 ft (Corman 2005g).	A partial migrant, with northern-most populations being short-distance migrants (Tenney 2000). Breeds locally in southcentral and southeastern Arizona, extreme southwestern New Mexico and in south Texas along the Rio Grande Valley. Range extends southward from U.S. populations through Mexico to Guatemala, although is absent from western Sonora, northwestern Sinaloa, the north Central Plateau, and the highlands of southeastern Chiapas. Also occurs in El Salvador, Honduras, Nicaragua and Costa Rica (Tenney 2000). Winter range is the same as the breeding range with only a portion of the populations in the northern-most extent of the range withdrawing (Tenney 2000).	Breeds irregularly in Guadalupe Canyon in extreme southwest Hidalgo County. Occasionally may occur in the Animas Mountains and north into southern Grant County (BISON-M 2017j)	**None**. The Project Area is outside of the known geographic range and is an irregular and rare visitor to the state.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Falco peregrinus anatum American peregrine falcon	Breeds in a wide range of open habitats (White et al. 2002). Prefer steep cliffs that overlook woodlands and riparian areas. Habitat selection is mainly driven by the abundance of prey (birds and occasionally bats). They dive from cliffs to ambush prey. Usually forages within 9 miles of the nest site, but foraging distances of 15 miles are common (Luensmann 2010). Can be found in less optimal habitats, such as small, broken cliffs or cliffs in xeric areas, when preferred habitat is not available. Will roost on tall buildings when prey is abundant (AGFD 2002a). In Arizona, this species is most often found in forested regions from pinyon pine-juniper and evergreen oaks to ponderosa pine and mixed conifer, to cold-temperate desertscrub and Sonoran desertscrub (AGFD 2002a, Burger 2005). Migratory and overwintering habitats are diverse and include similar habitats to those used during breeding and areas devoid of cliffs (White et al. 2002). Elevation: In Arizona, 400–9,000 ft (AGFD 2002a).	*F. peregrinus* occurs on every continent expect Antarctica (White et al. 2002). The *anatum* subspecies is a partial migrant and breeds throughout North America south of the tundra, excluding coastal Pacific Northwest, to northern Mexico (White et al. 2002). Winter range includes portions of the breeding range where prey is abundant year-round and extends south through Central America and South America through Chile (AGFD 2002a, White et al. 2002).	They pPass through the state during migration from March-May and there are isolated breeding records throughout the state (White et al. 2002).	**Possible**. While there is no the cliff habitat for nesting on the site, there are recent detections of peregrine falcons from in the vicinity of the Project Area (eBird 2021). It is possible that this species could pass through the site while foraging.
Empidonax traillii extimus Southwestern willow flycatcher	Breeds in successional stands of dense riparian vegetation composed of trees and shrubs along rivers or lakes (AGFD 2002c, USFWS 2013a). Migrates along riparian habitats, including those with shorter or more sparse vegetation or smaller patches than would be suitable for nesting (USFWS 2013a). They are a long-distance neotropical migrant and winters in habitats outside of the U.S. (Sedgwick 2020). Elevation: In Arizona, 75–9,180 ft (AGFD 2002c).	They are a long-distance neotropical migrant (Sedgwick 2020). Breeds in Arizona, California, Colorado, New Mexico, Nevada, Texas and Utah, U.S. Winters in southern Mexico and south to northern South America (Sedgwick 2020, USFWS 2013a).	Populations occur along the Rio Grande and Gila River drainages, with much smaller populations at isolated locales in the San Juan, upper Canadian, Zuni, San Francisco, Mimbres, and Pecos river drainages (NMDGF 2018). Historical breeding records are also known from the Canadian, Chama, San Francisco, San Juan, and Zuni River drainages. Species occurs widely throughout the state during migration (BISON-M 2018j).	**None.** There is no suitable riparian habitat with dense riparian vegetation in the Project Area and there are no eBird detection records are limited to perennial waterways with tracts of riparian vegetation in New Mexico (eBird 2021). There is no designated critical habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Tyrannus crassirostris Thick-billed kingbird	Prefers low elevation gallery forest and edge habitats in tropical deciduous forest. The gallery forest may be surrounded by subtropical thorn scrub, desertscrub or oak woodland (Lowther, Pyle, and Patten 2020). Habitat use in New Mexico is poorly understood, but in Arizona, breeds in broad drainages at the edges of riparian woodland with large sycamores or cottonwoods. Also uses areas with tall cottonwoods around manmade ponds. Frequently forages in adjacent brushy areas (Corman 2005h) including oak-pine woodland or mesquite grassland (AGFD 2010).Winters in habitats outside of the U.S. Migratory habitat is unknown but is expected to be similar to that used for breeding (Lowther, Pyle, and Patten 2020). Elevation: Range-wide, occurs below 6,070 ft (Lowther, Pyle, and Patten 2020).	A partial migrant with only the northernmost populations withdrawing southward (Lowther, Pyle, and Patten 2020). Breeds from southeastern Arizona and extreme southwestern New Mexico, U.S. and south along the Pacific Slope of Mexico from eastern Sonora and western Chihuahua to Guerrero, México D.F., Morelos, southern Puebla, and central Oaxaca. Winters from southeastern Sonora, through the remainder of the breeding range to southwestern Chiapas. Rarely found as far south as Guatemala (Lowther, Pyle, and Patten 2020).	Occurs in Hidalgo County in extreme southwestern New Mexico, including Antelope Wells and the foothills of the Animas Mountains (BISON-M 2017m, Lowther, Pyle, and Patten 2020).	**None.** There is no suitable tropical forest habitat in the Project Area and this species an uncommon visitor to the state.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Hylocharis leucotis White-eared hummingbird	Breeds in pine, pine-oak and mixed conifer forests particularly in edge habitats or clearings (Arizmendi et al. 2015). In Arizona, this species occurs in forested mountain canyons and in shrubby, previously burned or otherwise disturbed areas. These habitats may include broadleaf or coniferous trees such as Arizona sycamore, bigtooth maple, Gambel's or Madrean evergreen oak, pines, Douglas Fir or locust (Corman 2005j). Arizona populations winter in habitats outside of the U.S. (Arizmendi et al. 2015). Elevation: In Arizona, 4,900–8,400 ft (Corman 2005j). In New Mexico, 5,000-7,000 ft (BISON-M 2020b).	Is a partial migrant, with the northern most populations withdrawing southward (Arizmendi et al. 2015). Breeds from southeastern Arizona, U.S. and southward through highlands of Mexico, Guatemala, El Salvador, Honduras and Nicaragua (Arizmendi et al. 2015, Corman 2005j). May also breed in portions of New Mexico and Texas (Arizmendi et al. 2015). During the winter, this species withdraws from the U.S. and Sonora, Chihuahua and Nuevo León, Mexico (Arizmendi et al. 2015).	Verified only as migrants in the state and was found summering in the Animas Mountains in the mid-1970s. Subsequently, it was reported from two sites in the Peloncillo Mountains. In 1993, at least four individuals were at two sites in the Piños Altos Mountains, and individuals were reported from two sites in the Sangre de Cristo Mountains (BISON-M 2020b, eBird 2021).	**Unlikely**. There is some potentially suitable forested habitat in the Project Area, it was detected in the Piños Altos Mountains. However, these detections occurred in the early 1990's (eBird 2021). Given the rarity in the state, it is highly unlikely to occur in the site.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Passerina versicolor Varied bunting	Range-wide, they breed in densely vegetated areas with desertscrub, thornscrub, scrubby woodlands, forest edges, and overgrown clearings (Groschupf and Thompson 2020). Habitat use in New Mexico is poorly described. However, in Arizona, most breeding records are from arid slopes adjacent to drainages with mesquite and netleaf hackberry and from areas with dense Sonoran desertscrub (Corman 2005i). During migration habitat use is similar to that used for breeding (Groschupf and Thompson 2020). They winter in habitats outside of the U.S. (Groschupf and Thompson 2020). Elevation: In Arizona, breeds between 1,350–5,100 ft (Corman 2005i). In New Mexico, 3,000-5,000 ft (BISON-M 2017n).	Is a partial migrant (Groschupf and Thompson 2020). Breeding range includes south-central and southeastern Arizona, southern New Mexico and southern Texas, U.S. The range extends southward to northern Michoacán, Mexico and locally in Guatemala. During the winter, northern populations withdraw southward and this species can be found in Mexico from southern Sonora on the Pacific Slope, Guanajuato in the interior and northern Tamaulipas and eastern Nuevo León on the Atlantic Slope and southward through the breeding range (Groschupf and Thompson 2020). There is some evidence that they may be expanding northward into Arizona and New Mexico (Groschupf and Thompson 2020).	Occurs in southern part of the state near the Carlsbad Caverns in Hidalgo County and the Guadalupe Mountains. Vagrants have also been detected in west-central portions of the state (BISON-M 2017n, Groschupf and Thompson 2020).	**Unlikely.** The Project Area is outside of the known geographic range, the site may contain marginally suitable woodland habitat. However, there are some eBird records in the vicinity (eBird 2021) and there is evidence that the species is expanding its range northward.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Junco phaeonotus Yellow-eyed junco	Utilizes open conifer forest, ponderosa pine forest, pine-oak forests, scrubby or brushy areas, pastures or other fields During the winter, may move to lower elevations sites with oak-pine woodland, oak-woodland or chaparral (Corman 2005k). Elevation: Range-wide, occurs between 3,940–11,480 ft (Sullivan 2018).	Typically non-migratory (Sullivan 2018). The range extends from southeastern Arizona and extreme southwestern New Mexico, U.S. and southward into Mexico. In Mexico, this species in a two-pronged distribution from northeastern Sonora and western Chihuahua, and western Nuevo León and southwestern Tamaulipas, south to central Oaxaca. Also found in Chiapas, and adjacent southwestern Guatemala (Sullivan 2018).	Fairly common in southwestern part of the state in the Animas Mountains of Hidalgo County (Sullivan 2018). There have also been some detections of this species in the Big Hatchet Mountains of Hidalgo County and the Piños Altos Mountains in Grant County (BISON-M 2018l, Sullivan 2018).	**Possible.** The Project Area has suitable forest habitat and there are eBird records in the vicinity (eBird 2021).
FISH				
Gila nigrescens Chihuahua chub	Requires perennial water and prefers habitat with pools and undercut bank habitat (USFWS 1983). In streams, they are found mainly in lateral-scour pools where flow is against or along undercut banks and pools around channel obstructions such as boulders and root wads (Propst and Stefferud, 1994). Elevation: There are few records from New Mexico, but elevations range from approximately 6,900-7,100 ft. Across the range (including Mexico), range from 4,500-7,100 ft (Propst and Stefferud 1994).	Native to the Mimbres River drainage in New Mexico and the Guzmán and Laguna Bustillos basins in Chihuahua, Mexico (Propst 1999).	Historically, occupied all warmwater reaches in the Mimbres River drainage, but they now are found regularly only in Moreno Spring, in about 9 mile reach of the Mimbres River from the confluence of Allie Canyon downstream to the New Mexico Department of Game and Fish Mimbres Property south of Mimbres (Propst 1999).	**None**. There is no suitable aquatic habitat in the Project Area.
Gila intermedia Gila chub	Occurs in pools of small streams or cienegas. However, can also be found in larger streams. It is often found near undercut banks, overhanging vegetation, and various types of cover within the aquatic habitat (USFWS 2015c). Elevation: 2,000–5,500 ft (USFWS 2015c).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. and Sonora, Mexico (USFWS 2015c).	Historically documented populations have been extirpated except in Turkey Creek, in northwestern Grant County (USFWS 2005).	**None**. There is no suitable aquatic habitat in the Project Area. There is no designated critical habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Poeciliopsis occidentalis occidentalis [Note: There are no currently recognized subspecies of P. occidentalis (Integrated Taxonomic Information System 2019, Accessed April 8, 2019)]. Gila topminnow	Occurs in springs, cienegas, permanent and intermittent streams and the margins of large rivers. Prefers warm, shallow, and slow-moving water but can occur in lentic habitats or lotic habitats with moderate current. Additionally, favors areas with algal mats or debris along stream margins (USFWS 1998b). Elevation: Historical records from 1,320–7,510 ft, with most records occurring below 5,000 ft (AGFD 2001a).	In the U.S., occurs in the Gila River Basin of Arizona and New Mexico. In Mexico, occurs in the Rio Sonora, Santa Cruz River and Rio de la Concepción basins in Sonora (USFWS 1998b).	Historically found in the Gila River at Frisco Hot Springs (Sheffer et al. 1997) and San Francisco River drainage, although this species may be extirpated in the state (Paroz et al. 2006). In 1989, the Gila topminnow was stocked in a pond on the NMDGF Red Rock Wildlife Management Area (BISON-M 2018c, NMDGF 2018) however, the effort was unsuccessful.	**None**. There is no suitable aquatic habitat in the Proposed Action Area.
Oncorhynchus gilae Gila trout	Inhabits perennial montane streams in coniferous and mixed woodland, montane coniferous forest, and subalpine forests (USFWS 2003). These streams area characterized by high flow variability but with low turbidity and high dissolved oxygen. Spawns in areas with flow over substrates of coarse sand or gravel. Juveniles likely use areas with slow current such as stream margins, side channels or shallow bars. Subadults favor riffle habitats whereas adults prefer pool habitats (USFWS 2003). Elevation: 5,400–9,200 ft (USFWS 2003).	Found in Arizona and New Mexico, U.S. (USFWS 2003).	Historically occurred in the headwater streams of the Gila and San Francisco rivers. As of 2001, there were documented populations in Grant, Catron, and Sierra counties (BISON-M 2018d, USFWS 2002b). Three streams within Grant County were known to contain populations of the Gila trout (McKnight Creek, Sheep Corral Canyon, and Black Canyon). Gila trout were introduced into McKnight Creek (BISON-M 2018d, USFWS 1993b).	**None**. There is no suitable aquatic habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Rhinichthys* [=*Tiaroga*] *cobitis Loach minnow	Typically inhabits swift, small to large perennial streams where it uses interstitial spaces or lee areas of primarily cobble substrates for resting and spawning (USFWS 2012a). However, slow, silty streams are occasionally used (Minckley and Marsh 2009, p. 174). Adults are often found in areas with coarse, filamentous algae (Minckley and Marsh 2009, p. 174, USFWS 2012a). Elevation: Below 8,000 ft (USFWS 2012a).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. (USFWS 2012a). In Arizona, only found in Aravaipa, Campbell Blue Creeks, and White, San Francisco, and Blue Rivers in Arizona (USFWS 1991).	Found in the Gila River and its tributaries including the West, Middle, and East forks of the Gila River (BISON-M 2019b, Paroz and Propst 2007); the San Francisco and Tularosa Rivers and their tributaries in Catron County (Propst et al. 2009); Blue River and its tributaries, including Dry Blue, Campbell Blue, Pace, and Frieborn Creeks (Catron County) and Dry Blue Creek. and Blue Rivers and some of their tributaries (BISON-M 2019b, Carter 2008, Clarkson et al. 2008, USFWS 2012a).	**None**. There is no suitable aquatic habitat in the Project Area. There is no designated critical habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Gila robusta[1] Roundtail chub	Inhabits cool to warm water streams and rivers (USFWS 2015b). Typically found in largest and deepest pools of middle to large streams and is considered to be less associated with dense cover than other chub species (AGFD 2015, Minckley and Marsh 2009). Young-of-the-year favor slow, shallow water associated with vegetated shorelines (USFWS 2015b). Elevation: 1,210–7,220 ft, most common between 2,000–5,000 ft (AGFD 2015, Minckley and Marsh 2009).	Note: The distribution described below reflects USFWS description of the proposed DPS and not the current understanding of the species complex. Historically from The Bill Williams, Gila, Little Colorado, Salt and Verde river drainages in Arizona and New Mexico. At the full species level: In the U.S.: the Colorado River basin in Arizona, Colorado, New Mexico, Utah and Wyoming (USFWS 2015b). In Mexico: Rio Yaqui and Piaxtla in Sonora (AGFD 2015).	Found in Rio Arriba, San Juan, and New Mexico counties (BISON-M 2019e).	**None**. There is no suitable aquatic habitat for this species in the Project Area.
Meda fulgida Spikedace	Inhabits shallow riffles with sand, gravel, and rubble substrates of moderate to large perennial streams (USFWS 2012a). Elevation: 1,620–4,500 ft (AGFD 2013c).	Endemic to the Gila River Basin in Arizona and New Mexico, U.S. (USFWS 2012a).	Found in the mainstem Gila River, as well as in the lower end of the West, Middle, and East forks of the Gila River, and Mangas Creek within Hidalgo, Grant, and Catron counties (BISON-M 2017k).	**None**. There is no suitable aquatic habitat in the Project Area. There is no designated critical habitat in the Project Area.

[1] Proposed threatened status withdrawn because the it did not meet the definition of a species under the Act (USFWS 2017). USFWS determined that *G. nigra* and *G. intermedia* should be subsumed into *G. robusta*.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
MAMMALS				
Leptonycteris curasoae yerbabuenae [Note: This taxa has been elevated to full species status as L. yerbabuenae (ITIS 2019, accessed December 2, 2019)].[2] Lesser long-nosed bat	Occurs in thornscrub or Sonoran desertscrub and through semi-desert grasslands and into oak woodlands or deciduous forest where columnar cacti and agaves are present (AGFD 2011b, Medellín 2016). Roosts in caves, abandoned mines, vegetation and occasionally old buildings (AGFD 2011b, USFWS 2018b). Forages at night on nectar and pollen of columnar cacti and agaves (AGFD 2011b, USFWS 2018b). In some portions of its range, fruits of cacti are commonly consumed. Additionally, this species readily finds and utilizes hummingbird feeders. Sometimes bypass foraging areas close to roost sites in favor of distant areas and have been documented travelling greater than 40 miles from known roosts. Elevation: Range-wide, reported as high as 8,530 ft but is typically found below 5,905 ft (Medellín 2016).	In the U.S.: southern Arizona and extreme southwestern New Mexico. Outside the U.S.: south from the U.S. border through Mexico (including Baja), Guatemala, El Salvador, and Honduras (NatureServe 2021b, accessed October 21, 2021). Note that USFWS (2018b) indicates that the range outside of the U.S. only extends as far south as southern Mexico.	Southwestern portions of the state in the Animas and Peloncillo mountains of Hidalgo County (Cole and Wilson 2006, Richardson 2007, USFWS 2016).	**None**. The Project Area is outside of the known range, distribution, and lacks suitable roosting and foraging habitat. They were not observed during bat surveys of abandoned mine features in the site. None were observed during surveys of abandoned mine features in the site but they have some potential to forage in the area.

[2] Delisted due to recovery (USFWS 2018a).

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Canis lupus baileyi Mexican gray wolf	Occurs in sparsely to densely forested mountainous terrain or adjacent grasslands where prey is abundant. Prey species include cervids, peccaries, lagomorphs and rodents (USFWS 2015a). Are sensitive to disturbance Elevation: 3,000–12,000 ft (AGFD 2001b). In New Mexico, 4,000-9,000 ft (BISON-M 2021).	The *baileyi* subspecies occurs in Arizona and New Mexico, U.S. and Sonora, Mexico (USFWS 2015a).	They has been translocated into the Gila National Forest (Mexican Wolf Interagency Field Team 2020). The non-essential experimental population boundaries are south of I-40 and is divided into management zones. Zone 1: Initial releases and translocations can occur into Apache-Sitgreaves National Forests, and the Tonto Basin Ranger District of Tonto National Forest. Zone 2: Areas outside of Zone 1, south of I-40 and east of Hwy 60/89 and 93, I-10 and I-19 allows for natural dispersal and occupancy. Initial releases allowed on private and tribal land with approved management agreements. Translocations and release of pups less than 5-months old allowed on Federal lands. Zone 3: Areas south of I-40 and west of Hwy 60/89 and 93, I-10 and I-19. Within Zone 3 no releases or translocations are allowed but can be occupied by naturally dispersing individuals (BISON-M 2021, USFWS 2015a).	**Unlikely**. While the Project Area occurs within the secondary recovery zone of the Blue Range Recovery Area, and suitable habitat for the wolf exists in areas surrounding the site, no wolves have been documented in the Project Area. Currently, there are no packs within 45 miles of the Project Area (USFWS 2021c). However, due to the high mobility of this species, it is possible that an occasional wolf could disperse through the area, although unlikely due to human disturbance in the vicinity.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Euderma maculatum Spotted bat	Occurs in a wide-range of vegetation types including desertscrub, pinyon-juniper woodlands, ponderosa pine forests, mixed conifer forest, canyon bottoms, riparian areas, fields, pastures, and sub-alpine meadows. Roost in cracks and crevices of rock cliffs and in caves. They are generally solitary but may roost or hibernate in small groups. Foraging ranges may be large and up to 25 miles from their roost sites. Primarily consume moths. Are rarely caught in nets, potentially due to rarity, high flight patterns or sensitivity to light and sound. In Arizona, this species is most commonly captured near water or along canyon rims. It is unknown if this species is migratory. In Arizona, they appear active year-round (Luce, Chambers, and Herder 2005). Elevation: In Arizona, 110–8,670 ft (AGFD 2003).	Occurs in British Columbia, Canada and the U.S. states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Washington, and Wyoming. Range extends south from U.S. populations to Durango and Queretaro, Mexico (AGFD 2003, Hammerson 2015).	Documented from Bernalillo, Catron, Cibola, Doña Ana, Eddy, Grant, Lincoln, Los Alamos, Otero, Rio Arriba, Sandoval, San Juan, Santa Fe, Valencia, and Socorro counties. In 2006, this species was observed in Grant County at the following locations: near the Gila River at Lichty Farm, near Buckhorn, Big Burro Mountains, and near Santa Fe at Black Canyon Campground (BISON-M 2017l).	**Possible**. The Project Area contains potentially suitable woodland habitat and is within the known range of this species because they have been observed in the Big Burro Mountains in vicinity of the site. None were observed during surveys of abandoned mine features in the site but they have some potential to forage in the area.
REPTILES				
Thamnophis rufipunctatus Narrow-headed gartersnake	Are strongly associated with pool and riffle habitats in clear, rocky streams habitats in Petran Montane Conifer Forest, Great Basin Conifer Woodland, Interior Chaparral and the Arizona Upland subdivision of Sonoran Desertscrub. Occasionally utilizes lake shoreline habitats (USFWS 2014b). They primarily preys on fish species (USFWS 2014b). Bank-line vegetation is an important habitat component and this species favors areas with shrub- and sapling-sized plants for thermoregulation (USFWS 2014b). Been documented using site up to 656 ft away from the floodplain for hibernation (USFWS 2014b). Typically surface active between March and November with air temperatures of 52° to 89° F (USFWS 2014b). Elevation: 2,300-8,000 ft (USFWS 2014b).	Occurs in Arizona and New Mexico (USFWS 2014b).	Confined to the Catron, Grant, and Hidalgo counties where it reaches the easternmost edge of its distribution, where it uses suitable rocky rivers and streams of the San Francisco and Gila River drainages. Expected to exist within the San Francisco River drainage at low densities. Individuals have been recently detected in Saliz Creek, Whitewater Creek, Diamond Creek, and Dry Blue Creek near the Arizona border in Catron County (NMDGF 2020).	None. There is no suitable aquatic habitat in the Project Area, and as there are no fish species present thus there is no suitable prey base. The nearest suitable aquatic habitat is outside of the dispersal capabilities of this species. There is no proposed critical habitat in the Project Area.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
Thamnophis eques megalops Northern Mexican gartersnake	Strongly associated with water due to its primarily aquatic prey base and is heavily dependent on fish species. Occurs near or in ponds, cienegas, lowland river riparian forests and woodlands, and upland stream gallery forests. Avoids steep mountain canyons. Most abundant in densely vegetated habitat. Associated with a variety of biotic communities including Sonoran Desertscrub, Semidesert Grasslands, Interior Chaparral, Madrean Evergreen Woodland and into the lower reaches of Petran Montane Conifer Forest (AGFD 2012, USFWS 2013b). May be found up to one mile (or more) away from water, using terrestrial habitat for brumation, digestion, or for thermoregulatory needs such as developing young (Jeff Servoss, USFWS pers. comm. to D. Cerasale, April 18, 2016). Elevation: 130-8,497 ft (USFWS 2014b) but is most common below 5,000 ft (AGFD 2012).	Occurs in Arizona and New Mexico, U.S. (USFWS 2014b). Although it is poorly known, the range extends into Mexico and is thought to include Sonora, Chihuahua, Durango, Coahuila, Zacatecas, Guanajuato, Nayarit, Hidalgo, Jalisco, San Luis Potosí, Aguascalientes, Tlaxcala, Puebla, México, Michoacán, Oaxaca, Veracruz, and Querétaro (AGFD 2012).	The status in the state is uncertain, although it is possible that this species may occur in Mule Creek (USFWS 2014d), and there is proposed critical habitat for this species in Gila River and Duck Creek, although portions of these areas are being considered for exclusion (USFWS 2020b); however, it is likely extirpated.	**None.** There is no suitable aquatic habitat in the Project Area and the distance from the nearest suitable habitat is well outside of the dispersal capability of this species. There is no designated critical habitat in the Project Area.
Heloderma suspectum Gila monster	Inhabit desert and mesquite-grassland, but also pine-oak forest, tropical deciduous forest, and thorn forest. It is usually found in rocky foothill regions and avoids open flats. It typically inhabits the lower slopes of mountains and nearby outwash plains, especially in canyons and arroyos where water is at least periodically present (Beck 2009). In some areas, they also frequent irrigated farmlands that adjoin those habitat types. Cover in such areas often includes boulders, rock crevices, downed vegetation, and litter (AGFD 2013b). Elevation: 3,800-6,400 ft (Beck 2009).	Occupies the southern areas of Utah, Nevada, California, and New Mexico. The most southern population lives in the Sonoran desert of Mexico near the towns of Alamos Guayamas and Ortiz (AGFD 2013b, Beck 2009).	Peripheral in the state, reaching the eastern edge of its range in the southwest, where it is known from Hidalgo, Grant, Luna and perhaps Doña Ana counties (BISON-M 2018h). Most common at the Redrock Wildlife Area on the Gila River west of the Big Burro Mountains (BISON-M 2018h).	**Unlikely**. The Project Area contains suitable habitat but is near the eastern limit of its known geographic range.

Species Name	Known Suitable Habitat	Total Range	Distribution in New Mexico	Potential to Occur
MOLLUSCS				
Pyrgulopsis gilae Gila springsnail	Inhabits cool springs and brooks, but a few have also been found in a nearby thermal spring. Occurs in mud, debris, and vegetation. Typical habitat is a rivulet about 3 ft wide and grown up with watercress (*Nasturtium officinale*) (BISON-M 2017h). Elevation: Unknown.	Endemic to New Mexico (BISON-M 2017h).	Limited to a series of thermal springs along the Gila River in Grant County in the East and West Forks. Has also been observed along Beaver Creek, Mimbres District and in the Black Range District (BISON-M 2017h).	**None**. Project Area is outside of the highly restricted geographic range.
Pyrgulopsis thermalis New Mexico springsnail	Inhabits waters as warm as 38°C but is more common where temperatures are 33-35°C. Occupies substrates in areas of steep or even vertical rock, covered with thin sheets of water. Also found in minor spring flows on algal film and crusts of lime-depositing algae. Likely also occurs in dense grasses and sedges bordering the springs (BISON-M 2019d). Elevation: Unknown.	Endemic to New Mexico (BISON-M 2019d).	Restricted to a series of thermal springs along the Gila River in Grant County (BISON-M 2019d).	**None**. Project Area is outside of the highly restricted geographic range.

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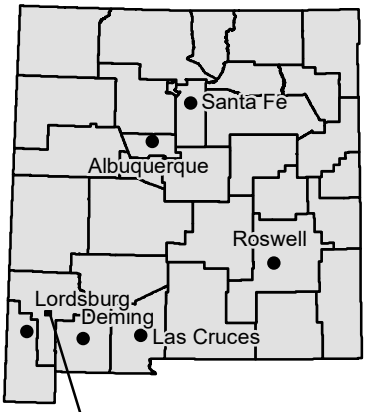
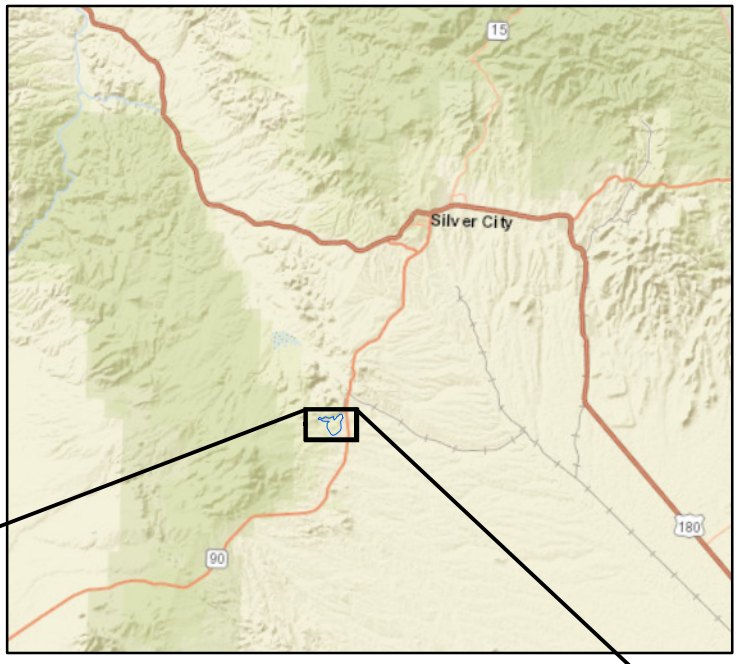
FIGURES

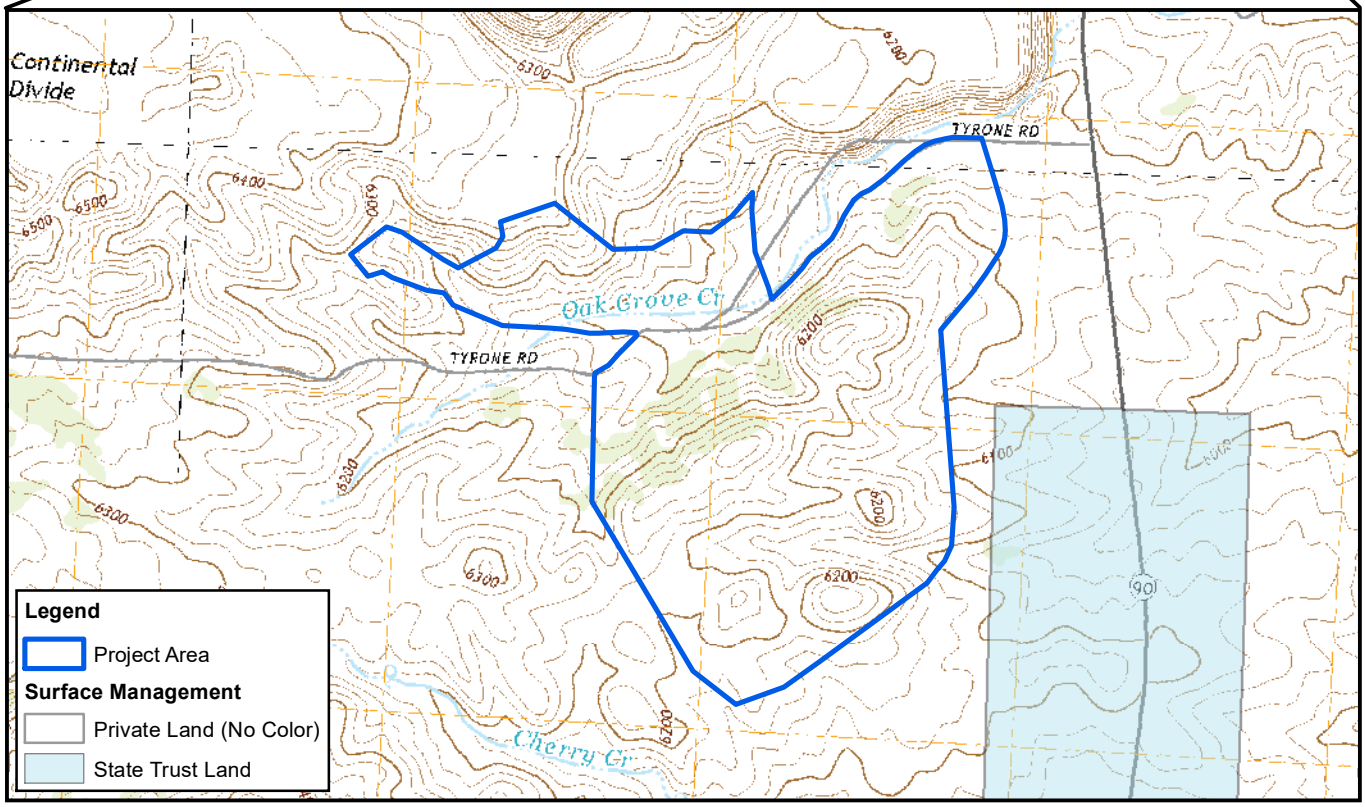
NEW MEXICO



PROJECT VICINITY



Approximate Scale 1 Inch = 10 Miles



T19S, R15W, Portions of Sections 25, 26, 35 and 36,
Grant County, New Mexico
Tyrone and White Signal USGS 7.5' Quadrangles (2020)
Surface Management: BLM 2014,
Image Source: ArcGIS Online, World Street Map

FREEPORT-MCMORAN
TYRONE MINING LLC
Emma Oak Grove
Biological Evaluation

VICINITY MAP
Figure 1

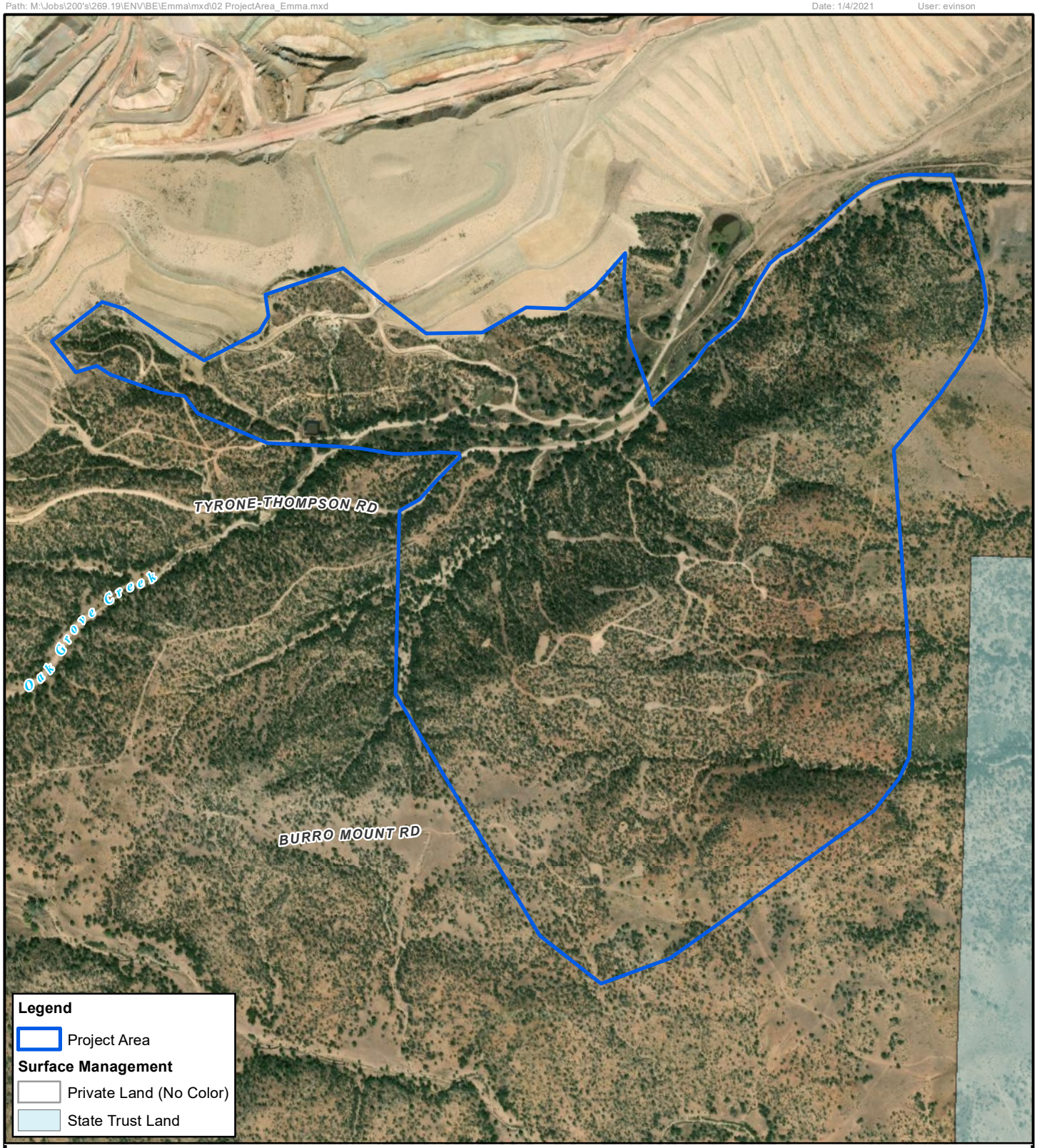
WestLand Resources

N

0 1,000 2,000 Feet

0 300 600 Meters

Path: M:\Jobs\200's\269.19\ENV\BE\Emma\mxd\02 ProjectArea_Emma.mxd Date: 1/4/2021 User: evinson



T19S, R15W, Portions of Sections 25, 26, 35 and 36,
Grant County, New Mexico
Surface Management: BLM 2014,
Image Source: ArcGIS Online, World Imagery 10/25/2019

FREEPORT-MCMORAN
TYRONE MINING LLC
Emma Oak Grove
Biological Evaluation

PROJECT AREA
Figure 2

N

0 500 1,000 Feet

0 150 300 Meters

WestLand Resources

APPENDIX A

IPaC Query Results

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Grant County, New Mexico

Local office

New Mexico Ecological Services Field Office

(505) 346-2525
(505) 346-2542

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

http://www.fws.gov/southwest/es/NewMexico/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Gray Wolf Canis lupus — Proposed Endangered
No critical habitat has been designated for this species.

Mexican Long-nosed Bat Leptonycteris nivalis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8203

Mexican Wolf Canis lupus baileyi — EXPN
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/3916

Birds

NAME	STATUS

Mexican Spotted Owl Strix occidentalis lucida — Threatened
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/8196

Northern Aplomado Falcon Falco femoralis septentrionalis — EXPN
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1923

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/6749

Yellow-billed Cuckoo Coccyzus americanus — Threatened
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/3911

Reptiles

NAME	STATUS

Narrow-headed Gartersnake Thamnophis rufipunctatus — Threatened
Wherever found
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/2204

Northern Mexican Gartersnake Thamnophis eques megalops — Threatened
Wherever found
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/7655

Amphibians

NAME	STATUS

Chiricahua Leopard Frog Rana chiricahuensis — Threatened
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/1516

Fishes

NAME	STATUS

Beautiful Shiner Cyprinella formosa — Threatened
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/7874

Chihuahua Chub Gila nigrescens — Threatened
Wherever found
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/7156

Gila Chub Gila intermedia — Endangered
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/51

Gila Topminnow (incl. Yaqui) Poeciliopsis occidentalis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1116

Gila Trout Oncorhynchus gilae — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/781

Loach Minnow Tiaroga cobitis — Endangered
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/6922

Spikedace Meda fulgida — Endangered
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/6493

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on

this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Grace's Warbler Dendroica graciae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 20 to Jul 20
Red-faced Warbler Cardellina rubrifrons This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 10 to Jul 15
Rufous Hummingbird selasphorus rufus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8002	Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

RIVERINE

R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal,

state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX B

BISON-M Results for Grant County

All Species
Grant

Taxonomic Group	# Species	Taxonomic Group	# Species
Amphibians	15	Birds	325
Coleoptera; beetles	16	Crustaceans	3
Ephemeroptera; mayfiles	39	Fish	32
Hymenoptera; ants, bees, wasps	4	Lepidoptera; moths and butterflies	187
Mammals	97	Misc. Arachnids	4
Molluscs	49	Odonata; dragonflies	67
Orthoptera; grasshoppers & crickets	55	Plecoptera; stoneflies	1
Reptiles	63	Spiders	22
Tricoptera; caddisflies	4		

TOTAL SPECIES: 983

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Black-tailed Jackrabbit	Lepus californicus					View
Desert Cottontail Rabbit	Sylvilagus audubonii					View
Eastern Cottontail Rabbit	Sylvilagus floridanus holzneri					No Photo
Crawford's Desert Shrew	Notiosorex crawfordi					View
Big Free-tailed Bat	Nyctinomops macrotis					No Photo
Brazilian Free-tailed Bat	Tadarida brasiliensis					View
Lesser Long-nosed Bat	Leptonycteris yerbabuenae	T			Y	View
Hoary Bat	Aeorestes cinereus					No Photo
Pallid Bat	Antrozous pallidus					View
Pale Townsend's Big-eared Bat	Corynorhinus townsendii				Y	View
Big Brown Bat	Eptesicus fuscus					No Photo
Spotted Bat	Euderma maculatum	T			Y	View
Allen's Big-eared Bat	Idionycteris phyllotis					View
Silver-haired Bat	Lasionycteris noctivagans					No Photo
Western Red Bat	Lasiurus blossevillii					View
Eastern Red Bat	Lasiurus borealis					No Photo
Southwestern Myotis	Myotis auriculus					No Photo
California Myotis	Myotis californicus					No Photo
Western Small-footed Myotis	Myotis ciliolabrum					View
Long-eared Myotis	Myotis evotis					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Southwestern Little Brown Myotis	Myotis occultus					No Photo
Fringed Myotis	Myotis thysanodes					No Photo
Cave Myotis	Myotis velifer					No Photo
Long-legged Myotis	Myotis volans					View
Yuma Myotis	Myotis yumanensis					View
Evening Bat	Nycticeius humeralis					No Photo
Canyon Bat	Parastrellus hesperus					View
Coyote	Canis latrans					View
Mexican Gray Wolf	Canis lupus baileyi	E	E		Y	View
Common Gray Fox	Urocyon cinereoargenteus					View
Kit Fox	Vulpes macrotis					View
Bobcat	Lynx rufus					View
Mountain Lion	Puma concolor					View
Common Hog-nosed Skunk	Conepatus leuconotus					View
Hooded Skunk	Mephitis macroura					View
Striped Skunk	Mephitis mephitis					View
Western Spotted Skunk	Spilogale gracilis					View
Long-tailed Weasel	Mustela frenata					View
American Badger	Taxidea taxus					View
Ringtail	Bassariscus astutus					View
White-nosed Coati	Nasua narica					View
Common Raccoon	Procyon lotor					View
Black Bear	Ursus americanus					View
Chihuahuan Pronghorn	Antilocapra americana mexicana					No Photo
Rocky Mtn. Bighorn Sheep	Ovis canadensis canadensis					View
Desert Bighorn Sheep (delisted pops)	Ovis canadensis mexicana					View
Elk	Cervus canadensis nelsoni					View
Mule Deer	Odocoileus hemionus					View
Coues' White-tailed Deer	Odocoileus virginianus couesi					View
Collared Peccary	Peccari tajacu sonoriensis; angulatus					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
American Beaver	Castor canadensis					View
Northern Pygmy Mouse	Baiomys taylori					No Photo
Long-tailed Vole	Microtus longicaudus longicaudus; alticola; baileyi; mordax					No Photo
Mogollon Vole	Microtus mogollonensis guadalupensis; mogollonensis					No Photo
White-throated Woodrat	Neotoma albigula					View
Mexican Woodrat	Neotoma mexicana mexicana; inopinata; pinetorum; scopulorum					No Photo
Southern Plains Woodrat	Neotoma micropus canescens					No Photo
Stephen's Woodrat	Neotoma stephensi					No Photo
Chihuahua Grasshopper Mouse	Onychomys arenicola arenicola					No Photo
Northern Grasshopper Mouse	Onychomys leucogaster					No Photo
Southern Grasshopper Mouse	Onychomys torridus					No Photo
Brush Mouse	Peromyscus boylii					No Photo
Cactus Mouse	Peromyscus eremicus anthonyi; eremicus					View
Osgood's Mouse	Peromyscus gratus					No Photo
White-footed Mouse	Peromyscus leucopus					View
Deer Mouse	Peromyscus maniculatus					No Photo
Northern Rock Mouse	Peromyscus nasutus					No Photo
Pinyon Mouse	Peromyscus truei					No Photo
Tawny-bellied Cotton Rat	Sigmodon fulviventer minimus					No Photo
Hispid Cotton Rat	Sigmodon hispidus berlandieri; confinis; texianus					View
Yellow-nosed Cotton Rat	Sigmodon ochrognathus					No Photo
Western Harvest Mouse	Reithrodontomys megalotis megalotis; aztecus					No Photo
Plains Harvest Mouse	Reithrodontomys montanus					No Photo
Common Porcupine	Erethizon dorsatum					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Botta's Pocket Gopher	Thomomys bottae actuosus; alienus; aureus; collis; connectens; cultellus; fulvus; guadalupensis; lachuguilla; mearnsi; morulus; opulentus; paguatae; pectoralis; peramplus; pervagus; planorum; rufidulus; ruidosae; tol					No Photo
Bailey's Pocket Mouse	Chaetodipus baileyi					No Photo
Chihuahuan Pocket Mouse	Chaetodipus eremicus					No Photo
Hispid Pocket Mouse	Chaetodipus hispidus					No Photo
Rock Pocket Mouse	Chaetodipus intermedius intermedius; crititus; phasma; umbrosus					No Photo
Desert Pocket Mouse	Chaetodipus penicillatus					No Photo
Merriam's Kangaroo Rat	Dipodomys merriami					View
Ord's Kangaroo Rat	Dipodomys ordii					No Photo
Banner-tailed Kangaroo Rat	Dipodomys spectabilis baileyi; clarencei; spectabilis					No Photo
Arizona Banner-tailed Kangaroo Rat	Dipodomys spectabilis perblandus; spectabilis					No Photo
Silky Pocket Mouse	Perognathus flavus flavus; hopiensis					No Photo
House Mouse	Mus musculus					View
Harris' Antelope Squirrel	Ammospermophilus harrisii					No Photo
Golden-mantled Ground Squirrel	Callospermophilus lateralis					View
Black-tailed Prairie Dog	Cynomys ludovicianus ludovicianus				Y	View
Rock Squirrel	Otospermophilus variegatus grammurus					View
Abert's Squirrel	Sciurus aberti aberti; chuscensis; ferreus					View
Arizona Gray Squirrel	Sciurus arizonensis arizonensis					View
Gray-collared Chipmunk	Neotamias cinereicollis cinereicollis					No Photo
Cliff Chipmunk	Neotamias dorsalis					View
Red Squirrel	Tamiasciurus fremonti					No Photo
Red Squirrel	Tamiasciurus hudsonicus lychnuchus; mogollonensis					View
Spotted Ground Squirrel	Xerospermophilus spilosoma					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Black-bellied Whistling Duck	Dendrocygna autumnalis					View
Snow Goose	Anser caerulescens					View
Canada Goose	Branta canadensis					View
Wood Duck	Aix sponsa					View
Northern Shoveler Duck	Spatula clypeata					View
Cinnamon Teal Duck	Spatula cyanoptera					View
Blue-winged Teal Duck	Spatula discors					View
American Wigeon Duck	Mareca americana					View
Gadwall Duck	Mareca strepera					View
Mallard Duck	Anas platyrhynchos					View
Mexican Duck	Anas diazi					No Photo
Northern Pintail	Anas acuta					View
Green-winged Teal Duck	Anas crecca					View
Canvasback Duck	Aythya valisineria					View
Ring-necked Duck	Aythya collaris					View
Bufflehead Duck	Bucephala albeola					View
Common Goldeneye Duck	Bucephala clangula					View
Hooded Merganser Duck	Lophodytes cucullatus					View
Common Merganser Duck	Mergus merganser					View
Scaled Quail	Callipepla squamata					View
Gambel's Quail	Callipepla gambelii					View
Montezuma Quail	Cyrtonyx montezumae					View
Wild Turkey	Meleagris gallopavo merriami; intermedia; silvestris					View
Dusky Grouse	Dendragapus obscurus					View
Ring-necked Pheasant	Phasianus colchicus					View
Pied-billed Grebe	Podilymbus podiceps					View
Horned Grebe	Podiceps auritus					No Photo
Eared Grebe	Podiceps nigricollis				Y	View
Western Grebe	Aechmophorus occidentalis					View
Band-tailed Pigeon	Patagioenas fasciata					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Eurasian Collared-Dove	Streptopelia decaocto					View
Inca Dove	Columbina inca					View
Common Ground Dove	Columbina passerina	E			Y	View
White-winged Dove	Zenaida asiatica					View
Mourning Dove	Zenaida macroura					View
Greater Roadrunner	Geococcyx californianus					View
Yellow-billed Cuckoo (western pop)	Coccyzus americanus occidentalis		T		Y	View
Lesser Nighthawk	Chordeiles acutipennis					View
Common Nighthawk	Chordeiles minor				Y	View
Common Poorwill	Phalaenoptilus nuttalli					No Photo
Buff-collared Nightjar	Antrostomus ridgwayi	E				No Photo
Eastern Whip-poor-will	Antrostomus vociferus					No Photo
Mexican Whip-poor-will	Antrostomus arizonae				Y	View
Black Swift	Cypseloides niger				Y	View
Chimney Swift	Chaetura pelagica					No Photo
White-throated Swift	Aeronautes saxatalis					View
Rivoli's Hummingbird	Eugenes fulgens					View
Blue-throated Mountain-gem	Lampornis clemenciae					View
Lucifer Hummingbird	Calothorax lucifer	T			Y	View
Black-chinned Hummingbird	Archilochus alexandri					View
Anna's Hummingbird	Calypte anna					View
Costa's Hummingbird	Calypte costae	T			Y	View
Calliope Hummingbird	Selasphorus calliope					View
Rufous Hummingbird	Selasphorus rufus					View
Allen's Hummingbird	Selasphorus sasin					View
Broad-tailed Hummingbird	Selasphorus platycercus					View
Broad-billed Hummingbird	Cynanthus latirostris	T			Y	View
White-eared Hummingbird	Basilinna leucotis	T				View
Virginia Rail	Rallus limicola					View
Sora	Porzana carolina					View
Common Gallinule	Gallinula galeata					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
American Coot	Fulica americana					View
Sandhill Crane	Antigone canadensis					View
American Avocet	Recurvirostra americana					View
Killdeer	Charadrius vociferus					View
Mountain Plover	Charadrius montanus				Y	View
Long-billed Curlew	Numenius americanus				Y	View
Baird's Sandpiper	Calidris bairdii					View
Western Sandpiper	Calidris mauri					View
Short-billed Dowitcher	Limnodromus griseus					View
Wilson's Snipe	Gallinago delicata					View
Spotted Sandpiper	Actitis macularius					View
Solitary Sandpiper	Tringa solitaria					View
Willet	Tringa semipalmata					View
Greater Yellowlegs	Tringa melanoleuca					View
Wilson's Phalarope	Phalaropus tricolor					View
Red-necked Phalarope	Phalaropus lobatus					No Photo
Mew Gull	Larus canus					No Photo
Neotropic Cormorant	Phalacrocorax brasilianus	T			Y	View
Double-crested Cormorant	Phalacrocorax auritus					View
American White Pelican	Pelecanus erythrorhynchos					View
Brown Pelican	Pelecanus occidentalis	E				View
American Bittern	Botaurus lentiginosus				Y	View
Great Blue Heron	Ardea herodias					View
Great Egret	Ardea alba					View
Snowy Egret	Egretta thula					View
Cattle Egret	Bubulcus ibis					View
Green Heron	Butorides virescens					View
Black-crowned Night-Heron	Nycticorax nycticorax					View
White-faced Ibis	Plegadis chihi					View
Turkey Vulture	Cathartes aura					View
Osprey	Pandion haliaetus					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Golden Eagle	Aquila chrysaetos					View
Northern Harrier	Circus hudsonius					View
Sharp-shinned Hawk	Accipiter striatus					View
Cooper's Hawk	Accipiter cooperii					View
Northern Goshawk	Accipiter gentilis					View
Bald Eagle	Haliaeetus leucocephalus	T			Y	View
Mississippi Kite	Ictinia mississippiensis					View
Common Black Hawk	Buteogallus anthracinus	T			Y	View
Harris's Hawk	Parabuteo unicinctus					View
Gray Hawk	Buteo plagiatus					View
Broad-winged Hawk	Buteo platypterus					View
Swainson's Hawk	Buteo swainsoni					View
Zone-tailed Hawk	Buteo albonotatus					View
Red-tailed Hawk	Buteo jamaicensis					View
Ferruginous Hawk	Buteo regalis					View
Barn Owl	Tyto alba					View
Flammulated Owl	Psiloscops flammeolus				Y	View
Western Screech-Owl	Megascops kennicottii					View
Great Horned Owl	Bubo virginianus					View
Northern Pygmy Owl	Glaucidium gnoma					View
Elf Owl	Micrathene whitneyi				Y	View
Burrowing Owl	Athene cunicularia				Y	View
Mexican Spotted Owl	Strix occidentalis lucida		T	Y	Y	View
Long-eared Owl	Asio otus					View
Short-eared Owl	Asio flammeus					View
Northern Saw-whet Owl	Aegolius acadicus					View
Elegant Trogon	Trogon elegans	E			Y	View
Belted Kingfisher	Megaceryle alcyon					View
Green Kingfisher	Chloroceryle americana					View
Lewis's Woodpecker	Melanerpes lewis				Y	View
Acorn Woodpecker	Melanerpes formicivorus					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Gila Woodpecker	Melanerpes uropygialis	T			Y	View
Williamson's Sapsucker	Sphyrapicus thyroideus				Y	View
Yellow-bellied Sapsucker	Sphyrapicus varius					View
Red-naped Sapsucker	Sphyrapicus nuchalis					View
American Three-toed Woodpecker	Picoides dorsalis					No Photo
Downy Woodpecker	Dryobates pubescens					View
Ladder-backed Woodpecker	Dryobates scalaris					View
Hairy Woodpecker	Dryobates villosus					View
Northern Flicker	Colaptes auratus					View
American Kestrel	Falco sparverius					View
Merlin	Falco columbarius					View
Aplomado Falcon	Falco femoralis	E	E		Y	View
Peregrine Falcon	Falco peregrinus	T			Y	View
Arctic Peregrine Falcon	Falco peregrinus tundrius					No Photo
Prairie Falcon	Falco mexicanus					View
Northern Beardless-Tyrannulet	Camptostoma imberbe	E			Y	View
Dusky-capped Flycatcher	Myiarchus tuberculifer					View
Ash-throated Flycatcher	Myiarchus cinerascens					View
Brown-crested Flycatcher	Myiarchus tyrannulus					View
Cassin's Kingbird	Tyrannus vociferans					View
Thick-billed Kingbird	Tyrannus crassirostris	E			Y	View
Western Kingbird	Tyrannus verticalis					View
Scissor-tailed Flycatcher	Tyrannus forficatus					View
Olive-sided Flycatcher	Contopus cooperi				Y	View
Greater Pewee	Contopus pertinax					View
Western Wood Pewee	Contopus sordidulus					View
Willow Flycatcher	Empidonax traillii brewsteri; adastus					View
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y	Y	View
Hammond's Flycatcher	Empidonax hammondii					View
Gray Flycatcher	Empidonax wrightii					View

All Species
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Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Dusky Flycatcher	Empidonax oberholseri					View
Cordilleran Flycatcher	Empidonax occidentalis					View
Buff-breasted Flycatcher	Empidonax fulvifrons					View
Black Phoebe	Sayornis nigricans					View
Eastern Phoebe	Sayornis phoebe					View
Say's Phoebe	Sayornis saya					View
Vermilion Flycatcher	Pyrocephalus rubinus					View
Loggerhead Shrike	Lanius ludovicianus				Y	View
White-eyed Vireo	Vireo griseus					View
Bell's Vireo	Vireo bellii	T			Y	View
Gray Vireo	Vireo vicinior	T			Y	View
Hutton's Vireo	Vireo huttoni					View
Yellow-throated Vireo	Vireo flavifrons					View
Cassin's Vireo	Vireo cassinii					View
Blue-headed Vireo	Vireo solitarius					View
Plumbeous Vireo	Vireo plumbeus					View
Warbling Vireo	Vireo gilvus					View
Red-eyed Vireo	Vireo olivaceus					View
Pinyon Jay	Gymnorhinus cyanocephalus				Y	View
Steller's Jay	Cyanocitta stelleri					View
Blue Jay	Cyanocitta cristata					View
Woodhouse's Scrub Jay	Aphelocoma woodhouseii					View
Mexican Jay	Aphelocoma woolweberi					View
American Crow	Corvus brachyrhynchos					View
Chihuahuan Raven	Corvus cryptoleucus					View
Common Raven	Corvus corax					View
Bank Swallow	Riparia riparia				Y	View
Tree Swallow	Tachycineta bicolor					View
Violet-green Swallow	Tachycineta thalassina					View
Northern Rough-winged Swallow	Stelgidopteryx serripennis					View
Purple Martin	Progne subis					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Barn Swallow	Hirundo rustica					View
Cliff Swallow	Petrochelidon pyrrhonota					View
Mountain Chickadee	Poecile gambeli					View
Bridled Titmouse	Baeolophus wollweberi					View
Juniper Titmouse	Baeolophus ridgwayi				Y	View
Verdin	Auriparus flaviceps					View
Bushtit	Psaltriparus minimus					View
Red-breasted Nuthatch	Sitta canadensis					View
White-breasted Nuthatch	Sitta carolinensis					View
Pygmy Nuthatch	Sitta pygmaea				Y	View
Brown Creeper	Certhia americana					View
Rock Wren	Salpinctes obsoletus					View
Canyon Wren	Catherpes mexicanus					View
House Wren	Troglodytes aedon					View
Winter Wren	Troglodytes hemialis					No Photo
Marsh Wren	Cistothorus palustris					View
Carolina Wren	Thryothorus ludovicianus					View
Bewick's Wren	Thryomanes bewickii					View
Cactus Wren	Campylorhynchus brunneicapillus					View
Blue-gray Gnatcatcher	Polioptila caerulea					View
Black-tailed Gnatcatcher	Polioptila melanura					View
Ruby-crowned Kinglet	Regulus calendula					View
Eastern Bluebird	Sialia sialis					View
Western Bluebird	Sialia mexicana				Y	View
Mountain Bluebird	Sialia currucoides				Y	View
Townsend's Solitaire	Myadestes townsendi					View
Swainson's Thrush	Catharus ustulatus					View
Hermit Thrush	Catharus guttatus					View
American Robin	Turdus migratorius					View
Gray Catbird	Dumetella carolinensis					View
Curve-billed Thrasher	Toxostoma curvirostre					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Brown Thrasher	Toxostoma rufum					View
Bendire's Thrasher	Toxostoma bendirei				Y	View
Crissal Thrasher	Toxostoma crissale					View
Sage Thrasher	Oreoscoptes montanus					View
Northern Mockingbird	Mimus polyglottos					View
European Starling	Sturnus vulgaris					View
Cedar Waxwing	Bombycilla cedrorum					View
Phainopepla	Phainopepla nitens					View
Olive Warbler	Peucedramus taeniatus					View
House Sparrow	Passer domesticus					View
American Pipit	Anthus rubescens					View
Sprague's Pipit	Anthus spragueii				Y	View
Evening Grosbeak	Coccothraustes vespertinus				Y	View
House Finch	Haemorhous mexicanus					View
Cassin's Finch	Haemorhous cassinii				Y	View
Red Crossbill	Loxia curvirostra					View
Pine Siskin	Spinus pinus					View
Lesser Goldfinch	Spinus psaltria					View
Lawrence's Goldfinch	Spinus lawrencei					View
American Goldfinch	Spinus tristis					View
Chestnut-collared Longspur	Calcarius ornatus				Y	View
Botteri's Sparrow	Peucaea botterii				Y	View
Cassin's Sparrow	Peucaea cassinii				Y	View
Grasshopper Sparrow	Ammodramus savannarum perpallidus					View
Black-throated Sparrow	Amphispiza bilineata					View
Lark Sparrow	Chondestes grammacus					View
Lark Bunting	Calamospiza melanocorys					View
Chipping Sparrow	Spizella passerina					View
Clay-colored Sparrow	Spizella pallida					View
Black-chinned Sparrow	Spizella atrogularis				Y	View

All Species
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Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Brewer's Sparrow	Spizella breweri					View
Worthen's Sparrow	Spizella wortheni					No Photo
Fox Sparrow	Passerella iliaca					View
Dark-eyed Junco	Junco hyemalis					View
Yellow-eyed Junco	Junco phaeonotus	T			Y	View
White-crowned Sparrow	Zonotrichia leucophrys					View
Golden-crowned Sparrow	Zonotrichia atricapilla					View
Harris's Sparrow	Zonotrichia querula					View
White-throated Sparrow	Zonotrichia albicollis					View
Sagebrush Sparrow	Artemisiospiza nevadensis				Y	View
Vesper Sparrow	Pooecetes gramineus				Y	View
Baird's Sparrow	Centronyx bairdii	T			Y	View
Savannah Sparrow	Passerculus sandwichensis nevadensis; anthinus					View
Song Sparrow	Melospiza melodia					View
Lincoln's Sparrow	Melospiza lincolnii					View
Swamp Sparrow	Melospiza georgiana					View
Canyon Towhee	Melozone fusca					View
Abert's Towhee	Melozone aberti	T			Y	View
Rufous-crowned Sparrow	Aimophila ruficeps					View
Green-tailed Towhee	Pipilo chlorurus					View
Spotted Towhee	Pipilo maculatus					View
Yellow-breasted Chat	Icteria virens					View
Yellow-headed Blackbird	Xanthocephalus xanthocephalus					View
Bobolink	Dolichonyx oryzivorus					No Photo
Eastern Meadowlark	Sturnella magna					View
Western Meadowlark	Sturnella neglecta					View
Orchard Oriole	Icterus spurius					View
Hooded Oriole	Icterus cucullatus					View
Bullock's Oriole	Icterus bullockii					View
Baltimore Oriole	Icterus galbula					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Scott's Oriole	Icterus parisorum					View
Red-winged Blackbird	Agelaius phoeniceus					View
Bronzed Cowbird	Molothrus aeneus					View
Brown-headed Cowbird	Molothrus ater					View
Brewer's Blackbird	Euphagus cyanocephalus					View
Common Grackle	Quiscalus quiscula					View
Great-tailed Grackle	Quiscalus mexicanus					View
Ovenbird	Seiurus aurocapilla					No Photo
Northern Waterthrush	Parkesia noveboracensis					View
Black-and-white Warbler	Mniotilta varia					View
Prothonotary Warbler	Protonotaria citrea					No Photo
Tennessee Warbler	Leiothlypis peregrina					No Photo
Orange-crowned Warbler	Leiothlypis celata					View
Lucy's Warbler	Leiothlypis luciae				Y	View
Nashville Warbler	Leiothlypis ruficapilla					View
Virginia's Warbler	Leiothlypis virginiae				Y	View
Macgillivray's Warbler	Geothlypis tolmiei					View
Common Yellowthroat	Geothlypis trichas					View
Hooded Warbler	Setophaga citrina					View
American Redstart	Setophaga ruticilla					View
Northern Parula	Setophaga americana					No Photo
Magnolia Warbler	Setophaga magnolia					View
Bay-breasted Warbler	Setophaga castanea					No Photo
Yellow Warbler	Setophaga petechia					View
Chestnut-sided Warbler	Setophaga pensylvanica					No Photo
Blackpoll Warbler	Setophaga striata					No Photo
Black-throated Blue Warbler	Setophaga caerulescens					View
Palm Warbler	Setophaga palmarum					View
Yellow-rumped Warbler	Setophaga coronata					View
Grace's Warbler	Setophaga graciae				Y	View
Black-throated Gray Warbler	Setophaga nigrescens				Y	View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Townsend's Warbler	Setophaga townsendi					View
Hermit Warbler	Setophaga occidentalis					View
Black-throated Green Warbler	Setophaga virens					View
Wilson's Warbler	Cardellina pusilla					View
Red-faced Warbler	Cardellina rubrifrons				Y	View
Painted Redstart	Myioborus pictus				Y	View
Hepatic Tanager	Piranga flava					View
Summer Tanager	Piranga rubra					View
Western Tanager	Piranga ludoviciana					View
Northern Cardinal	Cardinalis cardinalis					View
Pyrrhuloxia	Cardinalis sinuatus					View
Rose-breasted Grosbeak	Pheucticus ludovicianus					View
Black-headed Grosbeak	Pheucticus melanocephalus					View
Blue Grosbeak	Passerina caerulea					View
Lazuli Bunting	Passerina amoena					View
Indigo Bunting	Passerina cyanea					View
Varied Bunting	Passerina versicolor	T			Y	View
Painted Bunting	Passerina ciris					View
Dickcissel	Spiza americana					View
Ornate Box Turtle	Terrapene ornata					View
Sonoran Mud Turtle	Kinosternon sonoriense sonoriense				Y	View
Spiny Softshell Turtle	Apalone spinifera					View
Eastern Collared Lizard	Crotaphytus collaris					View
Long-nosed Leopard Lizard	Gambelia wislizenii					View
Common Lesser Earless Lizard	Holbrookia maculata maculata; bunkeri; ruthveni					View
Texas Horned Lizard	Phrynosoma cornutum					View
Hernandez's Short-horned Lizard	Phrynosoma hernandesi					View
Round-tailed Horned Lizard	Phrynosoma modestum					View
Twin-spotted Spiny Lizard	Sceloporus bimaculosus					View
Clark's Spiny Lizard	Sceloporus clarkii					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Greater Earless Lizard	Cophosaurus texanus					View
Southwestern Fence Lizard	Sceloporus cowlesi					View
Yarrow's Spiny Lizard	Sceloporus jarrovii					View
Crevice Spiny Lizard	Sceloporus poinsettii					View
Northern Tree Lizard	Urosaurus ornatus					View
Common Side-blotched Lizard	Uta stansburiana					View
Western Banded Gecko	Coleonyx variegatus					View
Chihuahuan Spotted Whiptail	Aspidoscelis exsanguis					View
Plains Striped Whiptail	Aspidoscelis inornata llanuras					View
Marbled Whiptail	Aspidoscelis marmorata					View
New Mexico Whiptail	Aspidoscelis neomexicana					View
Sonoran Spotted Whiptail	Aspidoscelis sonorae					View
Desert Grassland Whiptail	Aspidoscelis uniparens					No Photo
Plateau Striped Whiptail	Aspidoscelis velox					View
Many-lined Skink	Plestiodon multivirgatus					View
Great Plains Skink	Plestiodon obsoletus					View
Madrean Alligator Lizard	Elgaria kingii					View
Reticulate Gila Monster	Heloderma suspectum suspectum	E			Y	View
Texas Blind Snake	Rena dissecta					View
Western Blind Snake	Rena humilis					View
Glossy Snake	Arizona elegans					View
Coachwhip	Coluber flagellum					View
Desert Striped Whipsnake	Coluber taeniatus					View
Ringneck Snake	Diadophis punctatus					View
Western Hooknose Snake	Gyalopion canum					View
Mexican Hog-nosed Snake	Heterodon kennerlyi					No Photo
Chihuahuan Nightsnake	Hypsiglena jani					View
Milk Snake	Lampropeltis gentilis					View
Pyro Mountain Kingsnake	Lampropeltis pyromelana					View
Desert Kingsnake	Lampropeltis splendida					View
Smooth Greensnake	Opheodrys vernalis					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Gophersnake	Pituophis catenifer					View
Texas Long-nosed Snake	Rhinocheilus lecontei					View
Mountain Patchnose Snake	Salvadora grahamiae					View
Big Bend Patchnose Snake	Salvadora hexalepis deserticola					View
Ground Snake	Sonora semiannulata					View
Plains Black-headed Snake	Tantilla nigriceps					View
Smith's Black-headed Snake	Tantilla hobartsmithi					View
Black-necked Gartersnake	Thamnophis cyrtopsis					View
Wandering Gartersnake	Thamnophis elegans					View
Mexican Gartersnake	Thamnophis eques	E	T		Y	View
Marcy's Checkered Gartersnake	Thamnophis marcianus					View
Narrow-headed Gartersnake	Thamnophis rufipunctatus	T	T		Y	View
Sonoran Lyresnake	Trimorphodon lambda					View
Texas Lyresnake	Trimorphodon vilkinsonii					No Photo
Western Coral Snake	Micruroides euryxanthus					View
Western Diamond-backed Rattlesnake	Crotalus atrox					View
Arizona Black Rattlesnake	Crotalus cerberus				Y	View
Banded Rock Rattlesnake	Crotalus lepidus klauberi				Y	View
Western Black-tailed Rattlesnake	Crotalus molossus					View
Eastern Black-tailed Rattlesnake	Crotalus ornatus					No Photo
Prairie Rattlesnake	Crotalus viridis					View
Tiger Salamander	Ambystoma mavortium mavortium; nebulosum					View
Plains Spadefoot	Spea bombifrons					View
New Mexico Spadefoot	Spea multiplicata					View
Great Plains Toad	Anaxyrus cognatus					View
Western Green Toad	Anaxyrus debilis					View
Arizona Toad	Anaxyrus microscaphus				Y	View
Red-spotted Toad	Anaxyrus punctatus					View
Woodhouse's Toad	Anaxyrus woodhousii					View
Canyon Treefrog	Hyla arenicolor					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Arizona Treefrog	Hyla wrightorum				Y	View
Boreal Chorus Frog	Pseudacris maculata				Y	View
Bullfrog	Lithobates catesbeianus					View
Chiricahua Leopard Frog	Lithobates chiricahuensis		T	Y	Y	View
Lowland Leopard Frog	Lithobates yavapaiensis	E			Y	View
Couch's Spadefoot	Scaphiopus couchii					View
Longfin Dace	Agosia chrysogaster					No Photo
Grass Carp	Ctenopharyngodon idella					No Photo
Red Shiner	Cyprinella lutrensis					View
Common Carp	Cyprinus carpio					View
Gila Chub	Gila intermedia	E	E	Y	Y	View
Headwater Chub	Gila nigra				Y	No Photo
Chihuahua Chub	Gila nigrescens	E	T		Y	No Photo
Roundtail Chub (lower Colorado River populations)	Gila robusta	E			Y	View
Spikedace	Meda fulgida	E	E	Y	Y	No Photo
Fathead Minnow	Pimephales promelas					View
Loach Minnow	Rhinichthys cobitis	E	E	Y	Y	No Photo
Speckled Dace (Gila pop.)	Rhinichthys osculus					No Photo
Speckled Dace (Non-Gila pop.)	Rhinichthys osculus					No Photo
Desert Sucker	Catostomus clarkii				Y	No Photo
Sonora Sucker	Catostomus insignis				Y	View
Rio Grande Sucker	Catostomus plebeius				Y	View
Black Bullhead	Ameiurus melas					View
Yellow Bullhead	Ameiurus natalis					View
Channel Catfish	Ictalurus punctatus					View
Flathead Catfish	Pylodictis olivaris					View
Gila Trout	Oncorhynchus gilae	T	T		Y	View
Rainbow Trout	Oncorhynchus mykiss					View
Kokanee Salmon	Oncorhynchus nerka					View
Brown Trout	Salmo trutta					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Western mosquitofish	Gambusia affinis					No Photo
Gila Topminnow	Poeciliopsis occidentalis occidentalis	T	E		Y	View
Green Sunfish	Lepomis cyanellus					View
Bluegill	Lepomis macrochirus					View
Longear Sunfish	Lepomis megalotis					View
Smallmouth Bass	Micropterus dolomieui					View
Largemouth Bass	Micropterus salmoides					View
White Crappie	Pomoxis annularis					View
Decollate Snail	Rumina decollata					View
Forest Disc Snail	Discus whitneyi					No Photo
Mexican Coil Snail	Helicodiscus eigenmani					No Photo
Smooth Coil Snail	Helicodiscus singleyanus					No Photo
Bearded Mountainsnail	Oreohelix barbata					No Photo
Pinos Altos Mountainsnail	Oreohelix confragosa					No Photo
Black Range Mountainsnail	Oreohelix metcalfei concentrica					No Photo
Black Range Mountainsnail	Oreohelix metcalfei radiata					No Photo
Socorro Mountainsnail	Oreohelix neomexicana					No Photo
Subalpine Mountainsnail	Oreohelix subrudis					No Photo
Morgan Creek Mountainsnail	Oreohelix swopei					No Photo
Metcalf Holospira Snail	Holospira metcalfi				Y	No Photo
Blunt Ambersnail	Oxyloma retusum					No Photo
Whitewashed Rabdotus Snail	Rabdotus durangoanus					No Photo
Sluice Snaggletooth Snail	Gastrocopta ashmuni					No Photo
Crested Snaggletooth Snail	Gastrocopta cristata					No Photo
Slim Snaggletooth Snail	Gastrocopta pellucida					No Photo
Montane Snaggletooth Snail	Gastrocopta pilsbryana					No Photo
Sonoran Snaggletooth Snail	Gastrocopta prototypus					No Photo
Cross Snaggletooth Snail	Gastrocopta quadridens					No Photo
White-lipped Dagger Snail	Pupoides albilabris					No Photo
Rocky Mtn. Column Snail	Pupilla blandi					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Vertigo Snail	Vertigo arizonensis					No Photo
Vertigo Snail	Vertigo concinnula					No Photo
Glossy Pillar Snail	Cionella lubrica					No Photo
Silky Vallonia Snail	Vallonia cyclophorella					No Photo
Multirib Vallonia Snail	Vallonia gracilicosta					No Photo
Thin-lipped Vallonia Snail	Vallonia perspectiva					No Photo
Lovely Vallonia Snail	Vallonia pulchella					No Photo
False Marsh Slug	Deroceras heterura				Y	No Photo
Yellow Gardenslug Snail	Limax flavus					No Photo
Western Glass Snail	Vitrina pellucida					No Photo
Carved Glyph Snail	Glyphyalina indentata					No Photo
Minute Gem Snail	Hawaiia minuscula					No Photo
Median Striate Snail	Striatura meridionalis					No Photo
Quick Gloss Snail	Zonitoides arboreus					No Photo
Brown Hive Snail	Euconulus fulvus					No Photo
Brown Gardensnail	Helix aspersa					View
Silver Creek Woodlandsnail	Ashmunella binneyi				Y	No Photo
Black Range Woodlandsnail	Ashmunella cockerelli argenticola					No Photo
Black Range Woodlandsnail	Ashmunella cockerelli cockerelli					No Photo
Black Range Woodlandsnail	Ashmunella cockerelli perobtusa					No Photo
Iron Creek Woodlandsnail	Ashmunella mendax					No Photo
Mogollon Woodlandsnail	Ashmunella mogollonensis					No Photo
Spruce Snail	Microphysula ingersolli					No Photo
Southwestern Fringed-snail	Thysanophora hornii					No Photo
Pewter Physa Snail	Physa acuta					No Photo
Gila Springsnail	Pyrgulopsis gilae	T			Y	No Photo
New Mexico Hot Springsnail	Pyrgulopsis thermalis	T			Y	No Photo
Beavertail Fairy Shrimp	Thamnocephalus platyurus				Y	View
Tiger Beetle	Cicindela debilis					No Photo
Tiger Beetle	Cicindela hemorrhagica					No Photo
Tiger Beetle	Cicindela hornii					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Tiger Beetle	Cicindela lemniscata					No Photo
Tiger Beetle	Cicindela marutha					No Photo
Tiger Beetle	Cicindela nigrocoerula					No Photo
Tiger Beetle	Cicindela obsoleta obsoleta; santaclarae					No Photo
Tiger Beetle	Cicindela ocelleta					No Photo
Tiger Beetle	Cicindela oregona					No Photo
Tiger Beetle	Cicindela pulchra					No Photo
Tiger Beetle	Cicindela punctulata					No Photo
Tiger Beetle	Cicindela sedecimpunctata					No Photo
Tiger Beetle	Cicindela sperata					No Photo
Tiger Beetle	Cicindela tenuisignata					No Photo
Tiger Beetle	Tetracha carolina					No Photo
Beetle	Calitys scabra					No Photo
Andrenid Bee	Andrena mimbresensis					No Photo
Andrenid Bee	Andrena neffi					No Photo
Andrenid Bee	Arena vogleri					No Photo
American Bumble Bee	Bombus pensylvanicus					No Photo
Moth	Syssphinx hubbardi					No Photo
Moth	Automeris cecrops					No Photo
Moth	Coloradia doris					No Photo
Moth	Coloradia luski					View
Pandora Moth	Coloradia pandora					View
Moth	Hemileuca tricolor					No Photo
Polyphemus Moth	Antheraea polyphemus					View
Columbia Silkmoth	Hyalophora columbia					View
Moth	Manduca florestan					No Photo
Five Spotted Hawk Moth	Manduca quinquemaculata					View
Moth	Pachysphinx occidentalis					View
Small-eyed Sphinx Moth	Paonias myops					No Photo
Moth	Sagenosoma elsa					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
One-eyed Sphinx Moth	Smerinthus cerisyi					View
Moth	Sphinx asella					No Photo
Great Ash Moth	Sphinx chersis					View
Moth	Sphinx dollii					View
Moth	Sphinx istar					No Photo
Moth	Sphinx separata					No Photo
Alope Sphinx Moth	Erinnyis alope					No Photo
Achemon Sphinx Moth	Eumorpha achemon					No Photo
Snowberry Clearwing Moth	Hemaris diffinis					No Photo
White-lined Sphinx Moth	Hyles lineata					View
Juanita Sphinx Moth	Proserpinus juanita					No Photo
Dull Firetip Skipper	Pyrrhopyge araxes					No Photo
Carolina Sphinx Moth	Mandura sexta					No Photo
Golden-Banded Skipper	Autochton cellus					No Photo
Common Streaky Skipper	Celotes nessus					No Photo
Caicus Skipper	Cogia caicus					No Photo
Arizona Silver-Spotted Skipper	Epargyreus clarus huachuca					No Photo
Afranius Duskywing Skipper	Erynnis afranius					No Photo
Sleepy Duskywing Skipper	Erynnis brizo					View
Funereal Duskywing Skipper	Erynnis funeralis					View
Dreamy Duskywing Skipper	Erynnis icelus					View
Meridian Duskywing Skipper	Erynnis meridianus					No Photo
Pacuvius Duskywing Skipper	Erynnis pacuvius					No Photo
Persius Duskywing Skipper	Erynnis persius					No Photo
Rocky Mtn Duskywing Skipper	Erynnis telemachus					View
Mournful Duskywing Skipper	Erynnis tristis					No Photo
Saltbush Sootywing Skipper	Hesperopsis alpheus					No Photo
Common Sootywing Skipper	Pholisora catullus					View
White Checkered Skipper	Pyrgus albescens					View
Common Checkered Skipper	Pyrgus communis					View
Golden-headed Scallopwing Skipper	Staphylus ceos					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Arizona Powdered Skipper	Systasea zampa					No Photo
Mexican Cloudwing Skipper	Thorybes mexicanus					No Photo
Northern Cloudywing Skipper	Thorybes pylades					View
Short-Tailed Skipper	Zestusa dorus					No Photo
Russet Skipperling Skipper	Piruna pirus					View
Four-potted Skipperling Skipper	Piruna polingii					No Photo
Bronze Roadside Skipper	Amblyscirtes aenus					No Photo
Cassus Roadside Skipper	Amblyscirtes cassus					No Photo
Dotted Roadside Skipper	Amblyscirtes eos					No Photo
Large Roadside Skipper	Amblyscirtes exoteria					No Photo
Slaty Roadside Skipper	Amblyscirtes nereus					No Photo
Oslar's Roadside Skipper	Amblyscirtes oslari					No Photo
Orange-headed Roadside Skipper	Amblyscirtes phylace					No Photo
Simius Roadside Skipper	Amblyscirtes simius					No Photo
Texas Roadside Skipper	Amblyscirtes texanae					No Photo
Tropical Least Skipper	Ancyloxypha arene					No Photo
Sachem Skipper	Atalopedes campestris					View
Deva Skipper	Atrytonopsis deva					No Photo
Moon-marked Skipper	Atrytonopsis lunus					No Photo
White-barred Skipper	Atrytonopsis pittacus					No Photo
Python Skipper	Atrytonopsis python					No Photo
Viereck's Skipper	Atrytonopsis vierecki					No Photo
Orange Skipperling Skipper	Copaeodes aurantiacus					View
Kiowa Dun Skipper	Euphyes vestris					View
Susan's Skipper	Hesperia comma susanae					No Photo
Pahaska Skipper	Hesperia pahaska pahaska					No Photo
Lasus Skipper	Hesperia uncas lasus					No Photo
Uncas Skipper	Hesperia uncas uncas					No Photo
Green Skipper	Hesperia viridis					View
Apache Skipper	Hesperia woodgatei					No Photo
Fiery Skipper	Hylephila phlyeus					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Edwards' Skipperling Skipper	Oarisma edwardsii					No Photo
Garita Skipperling Skipper	Oarisma garita					View
Snow's Skipper	Paratrytone snowi					No Photo
Taxiles Skipper	Poanes taxiles					View
Morrison's Skipper	Stinga morrisoni					No Photo
Arizona Giant Skipper	Agathymus aryxna					No Photo
Orange Giant Skipper	Agathymus neumoegeni neumoegeni					No Photo
Navajo Yucca Borer Skipper	Megathymus coloradensis navajo					No Photo
Rhesus Skipper	Yvretta rhesus					No Photo
Pipevine Swallowtail Butterfly	Battus philenor					View
Carus Skipper	Yvretta carus					No Photo
Baird's Swallowtail Butterfly	Papilio bairdii					No Photo
Black Swallowtail Butterfly	Papilio polyxenes asterius					View
Giant Swallowtail Butterfly	Heraclides cresphontes					View
Pima Orangetip Butterfly	Anthocharis pima					No Photo
Ingham's Orangetip Butterfly	Anthocharis sara					View
Arizona Tiger Swallowtail Butterfly	Pterourus rutulus arizonensis					No Photo
Two-Tailed Swallowtail Butterfly	Pterourus multicaudatus					View
Southern Marble Butterfly	Euchloe hyantis					No Photo
Pine White Butterfly	Neophasia menapia					View
Cabbage White Butterfly	Pieris rapae					View
Checkered White Butterfly	Pontia protodice					View
Spring White Butterfly	Pontia sisymbrii elivata					No Photo
Apache Sulphur Butterfly	Colias alexandra apache					No Photo
Orange Sulphur Butterfly	Colias eurytheme					View
Western Common Sulphur Butterfly	Colias philodice					View
Mexican Yellow Butterfly	Eurema mexicanum					No Photo
Sleepy Orange Butterfly	Eurema nicippe					View
Tailed Orange Butterfly	Eurema proterpia					No Photo
Dainty Sulphur Butterfly	Nathalis iole					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Cloudless Sulphur Butterfly	Phoebis sennae					View
Southern Dogface Butterfly	Zerene cesonia					View
Colorado Hairstreak Butterfly	Hypaurotis crysalus					View
Great Purple Hairstreak Butterfly	Atlides halesus					View
Apama Hairstreak Butterfly	Callophrys affinis apama					No Photo
Arizona Hairstreak Butterfly	Erora quaderna					No Photo
Annette's Elfin Butterfly	Incisalia augustinus annetteae					No Photo
Western Pine Elfin Butterfly	Incisalia eryphon					No Photo
Juniper Hairstreak Butterfly	Mitoura siva					View
Thicket Hairstreak Butterfly	Mitoura spinetorum					No Photo
Oslar's Hairstreak Butterfly	Phaeostrymon alcestis oslari					No Photo
Frank's Common Hairstreak Butterfly	Strymon melinus					View
Xami Hairstreak Butterfly	Xamia xami					No Photo
Arizona Blue Butterfly	Celastrina ladon cinerea					No Photo
Spring Azure Butterfly	Celastrina ladon gozora					View
Square-spotted Blue Butterfly	Euphilotes battoides centralis					View
Rita Blue Butterfly	Euphilotes rita rita					View
Western Tailed Blue Butterfly	Everes amyntula					View
Eastern Tailed Blue Butterfly	Everes comyntas					View
Arizona Silvery Blue Butterfly	Glaucopsyche lygdamus arizonensis					No Photo
Ceraunus Blue Butterfly	Hemiargus ceraunus					No Photo
Reakirt's Blue Butterfly	Hemiargus isola					View
Marine Blue Butterfly	Leptotes marina					View
Melissa Blue Butterfly	Lycaeides melissa					View
Texas Blue Butterfly	Plebejus acmon					View
Buchholz's Blue Butterfly	Plebejus icarioides buchholzi					No Photo
Lycea Blue Butterfly	Plebejus icarioides lycea					View
Mexican Metalmark Butterfly	Apodemia mormo mejicana					No Photo
Nais Metalmark Butterfly	Apodemia nais					No Photo
Leda Hairstreak Butterfly	Ministrymon leda					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Palmer's Metalmark Butterfly	Apodemia palmerii					No Photo
Ilavia Hairstreak Butterfly	Fixsenia ilavia					No Photo
Western Pygmy Blue Butterfly	Brephidum exile					View
Fatal Metalmark Butterfly	Calephelis nemesis					View
Southern Snout Butterfly	Libytheana bachmanii					No Photo
Milbert's Tortoise Shell Butterfly	Aglais milberti					View
Buckeye Butterfly	Junonia coenia					View
Dark Buckeye Butterfly	Junonia nigrosuffusa					View
Mourning Cloak Butterfly	Nymphalis antiopa					View
California Tortoise Shell Butterfly	Nymphalis californica					View
Hoary Comma Butterfly	Polygonia gracilis					View
Question Mark Butterfly	Polygonia interrogationis					View
Satyr Anglewing Butterfly	Polygonia satyrus					No Photo
West Coast Lady Butterfly	Vanessa annabella					View
Red Admiral Butterfly	Vanessa atalanta					View
Painted Lady Butterfly	Vanessa cardui					View
American Lady Butterfly	Vanessa virginiensis					View
Variegated Fritillary Butterfly	Euptoieta claudia					View
Nausicaa Fritillary Butterfly	Speyeria hesperis nausicaa					No Photo
Mtn Silverspot Butterfly	Speyeria nokomis nitocris					No Photo
Crocale Patch Butterfly	Chlosyne lacinia					View
Dymas Checkerspot Butterfly	Dymasia dymas					No Photo
Mylitta Crescent Butterfly	Phyciodes mylitta					View
Painted Crescent Butterfly	Phyciodes pictus					View
Camillus Crescent Butterfly	Phyciodes pulchella					View
Pearl Crescent Butterfly	Phyciodes tharos Type A					View
Vesta Crescent Butterfly	Phyciodes vesta					View
Montane Penstemon Checkerspot Butterfly	Poladryas minuta arachne					No Photo
Perse Checkerspot Butterfly	Texola elada perse					No Photo
Fulvia Checkerspot Butterfly	Thessalia fulvia					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Thekla Checkerspot Butterfly	Thessalia theona thekla					No Photo
Arizona Sister Butterfly	Adelpha bredowii					View
Hackberry Butterfly	Asterocampa celtis montis					No Photo
Texan Emperor Butterfly	Asterocampa clyton					No Photo
Chermock's Satyr Butterfly	Cercyonis meadii mexicana					No Photo
Common Wood-Nymph Butterfly	Cercyonis pegala					View
Canyonland Satyr Butterfly	Cyllopsis pertepida dorothea					No Photo
Arizona Blackamoor Butterfly	Gyrocheilus patrobas					No Photo
Arizona Red Satyr Butterfly	Megisto rubricata cheneyorum					No Photo
Striated Queen Butterfly	Danaus gilippus					View
Monarch Butterfly	Danaus plexippus					View
Gulf Fritillary Butterfly	Agraulis vanillae					View
Notodontid Moth	Eyparpax rosea					No Photo
Notodontid Moth	Oligocentria ddelicata					No Photo
Tiger Moth	Alexicles aaspersa					No Photo
SW Pearly Checkerspot Butterfly	Charidryas acastus sabina					No Photo
Texan Crescent Butterfly	Anthanassa texana					View
Hermosa Checkerspot Butterfly	Occidryas anicia hermosa					No Photo
Arizona Admiral Butterfly	Limenitis arthemis					View
Obsolete Viceroy Butterfly	Limenitis archippus obsoleta					No Photo
Narrow-banded Admiral Butterfly	Limenitis weidemeyerii angustifasica					No Photo
Arizona Viceroy	Limenitis archippus obsoleta					No Photo
Great Spreadwing	Archilestes grandis					View
Plateau Spreadwing	Lestes alacer					View
American Rubyspot	Hetaerina americana					View
Canyon Rubyspot	Hetaerina vulnerata					View
Violet Dancer	Argia fumipennis					View
Lavender Dancer	Argia hinei					No Photo
Sooty Dancer	Argia lugens					View
Powdered Dancer	Argia moesta					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Apache Dancer	Argia munda					No Photo
Aztec Dancer	Argia nahuana					View
Amethyst Dancer	Argia pallens					View
Springwater Dancer	Argia plana					View
Blue-ringed Dancer	Argia sedula					View
Tezpi Dancer	Argia tezpi					No Photo
Tonto Dancer	Argia tonto					No Photo
Dusky Dancer	Argia translata					No Photo
Vivid Dancer	Argia vivida					View
Northern Bluet	Enallagma annexum					View
Double-striped Bluet	Enallagma basidens					No Photo
Boreal Bluet	Enallagma boreale					No Photo
Tule Bluet	Enallagma carunculatum					View
Familiar Bluet	Enallagma civile					View
Arroyo Bluet	Enallagma praevarum					No Photo
Painted Damsel	Hesperagrion heterodoxum					View
Desert Forktail	Ischnura barberi					No Photo
Pacific Forktail	Ischnura cervula					View
Plains Forktail	Ischnura damula					View
Mexican Forktail	Ischnura demorsa					View
Black-fronted Forktail	Ischnura denticollis					No Photo
Desert Firetail	Telebasis salva					View
Persephone's Darner	Aeshna persephone					No Photo
Common Green Darner	Anax junius					View
Giant Darner	Anax walsinghami					No Photo
Riffle Darner	Oplonaeschna armata					No Photo
Arroyo Darner	Rhionaeschna dugesi					No Photo
Blue-eyed Darner	Rhionaeschna multicolor					View
White-belted Ringtail	Erpetogomphus compositus					View
Dashed Ringtail	Erpetogomphus heterodon					View
Serpent Ringtail	Erpetogomphus lampropeltis					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Columbia Clubtail	Gomphurus lynnae					No Photo
Arizona Snaketail	Ophiogomphus aarizonicus					No Photo
Five-striped Leaftail	Phyllogomphoides albrighti					No Photo
Gray Sanddragon	Progomphus borealis					View
Russet-tipped Clubtail	Stylurus plagiatus					No Photo
Apache Spiketail	Cordulegaster diadema					No Photo
Pale-faced Clubskimmer	Brechmorhoga mendax					View
Checkered Setwing	Dythemis fugax					View
Western Pondhawk	Erythemis collocata					No Photo
Great Pondhawk	Erythemis vesiculosa					No Photo
Plateau Dragonlet	Erythrodiplax basifusca					View
Widow skimmer	Libellula luctuosa					View
Hoary Skimmer	Libellula nodisticta					No Photo
Flame Skimmer	Libellula saturata					View
Roseate Skimmer	Orthemis ferruginea					View
Blue Dasher	Pachydiplax longipennis					View
Red Rock Skimmer	Paltothemis lineatipes					No Photo
Wandering Glider	Pantala flavescens					View
Spot-winged Glider	Pantala hymenaea					View
Mexican Amberwing	Perithemis intensa					View
Eastern Amberwing	Perithemis tenera					View
Common Whitetail	Plathemis lydia					View
Desert Whitetail	Plathemis subornata					View
Filigree Skimmer	Pseudoleon superbus					No Photo
Variegated meadowhawk	Sympetrum corruptum					View
Cardinal Meadowhawk	Sympetrum illotum					No Photo
Black Saddlebags	Tramea lacerata					View
Red Saddlebags	Tramea onusta					View
Lubber Grasshopper	Brachystola magna					View
Chihuahua Toad Hopper Grasshopper	Phrynotettix tsivavensis					No Photo
Horse Lubber Grasshopper	Taeniopoda eques					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Green Fool Grasshopper	Acrolophitus hirtipes					No Photo
White Whiskers Grasshopper	Ageneotettix deorum					No Photo
Striped Slant-Faced Grasshopper	Amphitornus coloradus					No Photo
Elliott Grasshopper	Aulocara elliotti					No Photo
White Cross Grasshopper	Aulocara femoratum					No Photo
Cream Grasshopper	Cibolacris parviceps					No Photo
Spotted Wing Grasshopper	Cordillacris occipitalis					No Photo
Velvet-Striped Grasshopper	Eritettix simplex					No Photo
Rufous Grasshopper	Heliaula rufa					No Photo
Pecos Clicker Grasshopper	Ligurotettix planum					No Photo
Obscure Grasshopper	Opeia obscura					No Photo
Wyoming Toothpick Grasshopper	Paropomala wyomingensis					No Photo
Brown Spotted Range Grasshopper	Psoloessa delicatula					No Photo
Grasshopper	Psoloessa texana					No Photo
Slant-Faced Grasshopper	Syrbula montezuma					No Photo
Speckled Rangeland Grasshopper	Arphia conspera					No Photo
Red-Winged Grasshopper	Arphia pseudonietana					No Photo
Ridged Grasshopper	Conozoa carinata					No Photo
Grasshopper	Derotmema laticinctum					No Photo
Carolina Grasshopper	Dissosteira carolina					No Photo
Three-Banded Range Grasshopper	Hadrotettix trifasciatus					No Photo
Arroyo Grasshopper	Heliastus benjamini					No Photo
Grasshopper	Hippopedon capito					No Photo
Blue-Winged Grasshopper	Leprus intermedius					No Photo
Mottled Sand Grasshopper	Spharagemon collare					No Photo
Finned Grasshopper	Trachyrhachys aspera					No Photo
Crowned Grasshopper	Trachyrhachys coronata					No Photo
Blue-Winged Grasshopper	Trimerotropis cyaneipennis					No Photo
Black-Winged Grasshopper	Trimerotropis melanoptera					No Photo
Grasshopper	Trimerotropis modesta					No Photo
Pallid-Winged Grasshopper	Trimerotropis pallidipennis					View

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Barren Land Grasshopper	Trimerotropis pristrinaria					No Photo
Great Crested Grasshopper	Tropidolophus formosus					No Photo
Red Shanks Grasshopper	Xanthippus corallipes					No Photo
Green Bird Grasshopper	Schistocerca alutacea shoshone					No Photo
Fuzzy Olive-Green Grasshopper	Campylacantha olivacea					No Photo
Painted Grasshopper	Dactylotum bicolor					No Photo
Green Streak Grasshopper	Hesperotettix viridis					No Photo
Arid Land's Spur-Throat Grasshopper	Melanoplus aridis					No Photo
Two-Striped Grasshopper	Melanoplus bivittatus					No Photo
Differential Grasshopper	Melanoplus differentialis					No Photo
Red-Legged Grasshopper	Melanoplus femurrubrum					No Photo
Yellow Spur-Throat Grasshopper	Melanoplus flavidus					No Photo
Grasshopper	Melanoplus franciscanus					No Photo
Gladston's Spur-Throat Grasshopper	Melanoplus gladstoni					No Photo
Grasshopper	Melanoplus lakinus					No Photo
Flabellate Grasshopper	Melanoplus occidentalis					No Photo
Packard's Grasshopper	Melanoplus packardi					No Photo
Lesser Migratory Grasshopper	Melanoplus sanguinipes					No Photo
Large-Headed Grasshopper	Phoetaliotes nebrascensis					No Photo
Huachuca Grasshopper	Conalcea huachucana					No Photo
Platte Range Grasshopper	Mestobregna plattei					No Photo
Stonefly	Taenionema jacobii					No Photo
A Caddisfly	Hydroptila arctia					No Photo
A Caddisfly	Hydroptila denza					No Photo
A Caddisfly	Ochrotrichia stylata					No Photo
A Caddisfly	Zumatrichia notosa					No Photo
Mayfly	Ameletus doddsianus					No Photo
Mayfly	Acentrella insignificans					No Photo
Mayfly	Baetis celestis					No Photo
Mayfly	Baetis magnus					No Photo
Mayfly	Baetis notos					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Mayfly	Baetis tricaudatus					No Photo
Mayfly	Baetodes deficiens					No Photo
Mayfly	Baetodes edmundsi					No Photo
Mayfly	Callibaetis pictus					No Photo
Mayfly	Camelobaetidius musseri					No Photo
Mayfly	Camelobaetidius warreni					No Photo
Mayfly	Cloeodes macrolamellus					No Photo
Mayfly	Fallceon quilleri					No Photo
Mayfly	Epeorus margarita					No Photo
Mayfly	Heptagenia solitaria					No Photo
Mayfly	Leucrocuta petersi					No Photo
Mayfly	Nixe criddlei					No Photo
Mayfly	Nixe simplicioides					No Photo
Mayfly	Rhithrogena plana					No Photo
Mayfly	Rhithrogena robusta					No Photo
Mayfly	Rhithrogena undulata					No Photo
Mayfly	Isonychia intermedia					No Photo
Mayfly	Choroterpes inornata					No Photo
Mayfly	Neochoroterpes kossi					No Photo
Mayfly	Paraleptophlebia debilis					No Photo
Mayfly	Thraulodes brunneus					No Photo
Mayfly	Thraulodes gonzalesi					No Photo
Mayfly	Thraulodes speciosus					No Photo
Mayfly	Traverella albertana					No Photo
Mayfly	Lachlania dencyannae					No Photo
Mayfly	Siphlonurus occidentalis					No Photo
Mayfly	Caenis bajaensis					No Photo
Mayfly	Ephemerella altana					No Photo
Mayfly	Ephemerella inermis					No Photo
Mayfly	Serratella micheneri					No Photo
Mayfly	Leptohyphes apache					No Photo

All Species
Grant

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Mayfly	Tricorythodes condylus					No Photo
Mayfly	Tricorythodes dimorphus					No Photo
Mayfly	Tricorythodes explicatus					No Photo
Tarantula	Aphonopelma marxi					View
Spider	Oecobius putus					No Photo
Spider	Physocyclus enaulus					No Photo
Spider	Psilochorus imitatus					No Photo
Comb-Footed Spider	Theridion neomexicanum					No Photo
Spider	Eperigone eschatilogica					No Photo
Spider	Eridantes sp.					No Photo
Spider	Islandiana mimbres					No Photo
Spider	Meioneta sp. 4					No Photo
Spider	Spirembolus pallidus					No Photo
Spider	Tennesseellum formicun					No Photo
Spider	Cochlembolus sp.					No Photo
Spider	Erigone sp. 1					No Photo
Spider	Allocosa mokiensis					No Photo
Spider	Allocosa morelosiana					No Photo
Spider	Alopecosa kochi					No Photo
Burrowing Wolf Spider	Geolycosa raphealana					No Photo
Spider	Hesperocosa unica					No Photo
Spider	Hogna coloradensis					No Photo
Thin-legged Wolf Spider	Pardosa sternalis					No Photo
Spider	Varacosa gosiuta					No Photo
Vinegaroon	Mastigoproctus giganteus					View
Pseudoscorpion	Hysterochelifer proprius					No Photo
Pseudoscorpion	Levichelifer fulvopalpus					No Photo
Pseudoscorpion	Lustrochernes grossus					No Photo
Pirate Spider	Mimetus hesperus					No Photo
Scud	Hyalella azteca					No Photo
Northern Crayfish	Orconectes virilis					View

APPENDIX C

Emma-Oak Grove Rare Plant Survey

Emma-Oak Grove Rare Plant Survey

GeoSystems Analysis, Inc.
Innovative Solutions

Prepared for:
WestLand Resources

Prepared by:
GeoSystems Analysis
Albuquerque, NM
www.gsanalysis.com

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INTRODUCTION

GeoSystems Analysis, Inc. (GSA) conducted a rare plant survey on and around Freeport McMoRan Tyrone Inc. (Tyrone) property in Grant County, NM. The survey was conducted within the Emma-Oak Grove Site (or "site" in this report) proposed for Tyrone Mine expansion with a total area of approximately 421-acres. Tyrone Mine lies approximately 12 miles southwest of Silver City, New Mexico (NM); a map showing the location of the site is provided as Figure 1. The northernmost extent of Emma-Oak Grove lies just 1,000 feet south of the Continental Divide and is bisected by Oak Grove Creek, an intermittent wash that likely flows during summer monsoonal storm events. Fieldwork was completed during early October 2020 and no rare plant species were encountered.

According to Environmental Protection Agency Eco-Regions delineations, the survey location falls within a band of Madrean Lower Montane Woodlands that serves as a transition zone between the Chihuahuan Desert and Montane Coniferous Forest Eco-Regions. Similarly, Brown (1994), characterizes the site as Madrean Evergreen Woodland, dominated by alligator juniper (*Juniperus deppeana*), piñon pine (*Pinus edulis*) and oak (*Quercus spp.*), with elements of Interior Chapparal as indicated by a scattering of manzanita (*Arctostaphylos pungens*), sotol (*Dasylirion wheeleri*), and Wright's silktassel (*Garrya wrightii*).

Elevations within the site range from approximately 6,000 to 6,300 feet. Per the Natural Resources Conservation Service (NRCS) digital soil survey data (SSURGO), soils within the project site are predominantly rock outcrop associations (84% of the total area), including: Santana-Rock outcrop complex, 15 to 35% slopes (34.2% of the site); Santa Fe-Rock outcrop complex, 20 to 45% slopes (33.9% of the site); Gaddes-Santa Fe outcrop complex, 15 to 45% slopes (12.2% of the site); and Santana-Rock outcrop complex, 1 to 25% slopes (3.2% of the site). These soil types comprise alluvial fans, hillslopes, terraces, mountain slopes and ridges and all are derived of mixed alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. Soils described for the site align with observed field conditions and the mapped terrain, which is a variable mix of steep hillslopes, terraces and ridges with most slopes ranging 15 to 45%, and few slopes less than 15%.

Also per the NRCS, remaining soils are loam types (16% of the site by area), including: Lonti gravelly loam, 15 to 35% slopes (9.7% of the site), Lonti gravelly clay loam, 0 to 8% slopes (2.6% of the site); Manzano loam, 1 to 3 % slopes (3.9% of the site). Manzano loam comprises drainageways, intermittent streams and valley floors, and is found in the bottom tiers of Oak Grove Creek. The loams in this type are derived from mixed alluvium and/or residuum from weathered sandstone and shale. Lonti loam types comprise pediments and hillslopes, and like the outcrop types described above, are derived from alluvium and/or colluvium derived from igneous, metamorphic, and sedimentary rock. These soil types are present on the eastern edge of the Emma site, as slopes begin to level out and grade into the adjacent desert grassland.

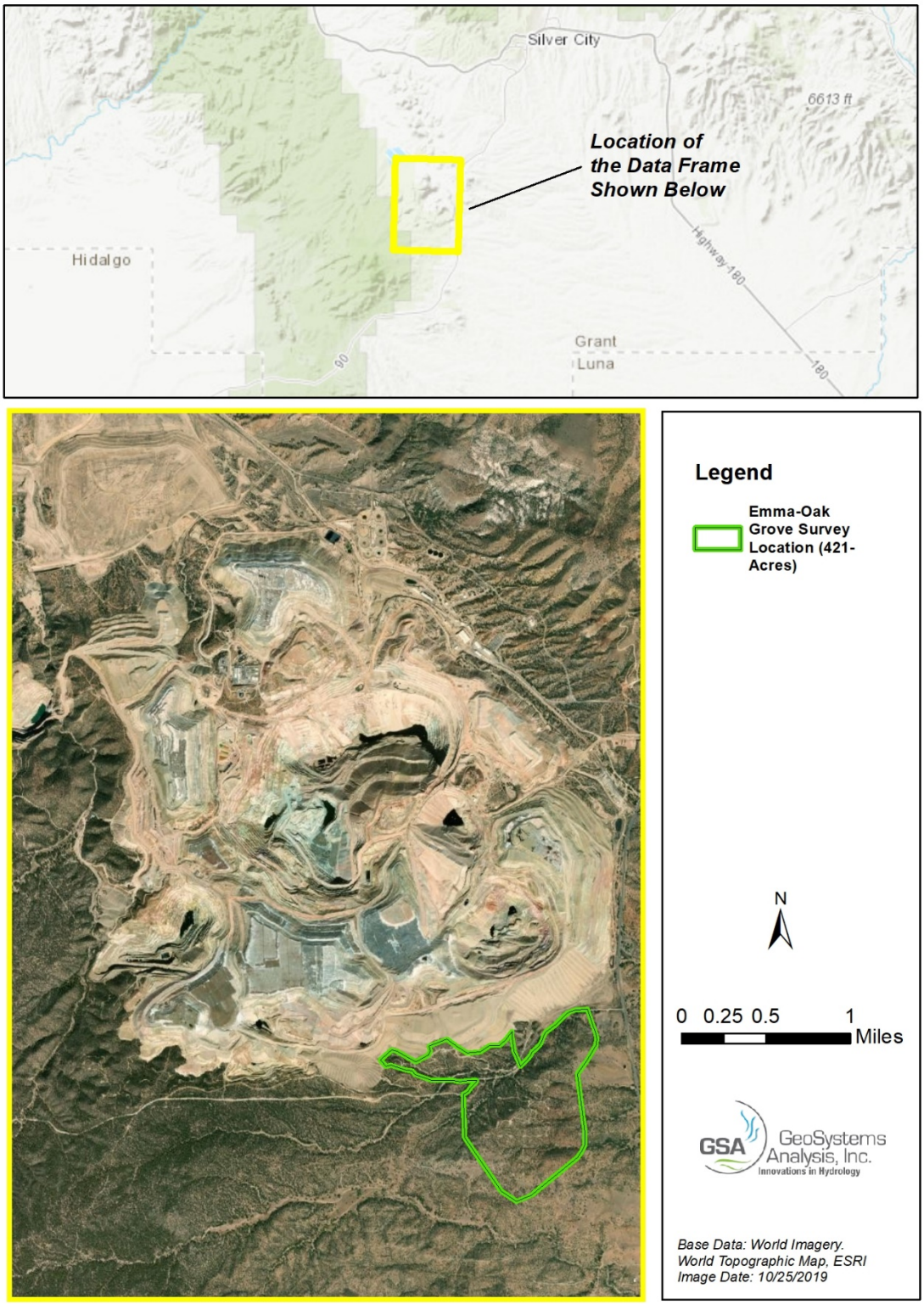


FIGURE 1. PROJECT AREA MAP

METHODS

The Emma-Oak Grove site was surveyed on October 7, 8 and 9, 2020. The survey was completed within a predetermined boundary provided to GeoSystems Analysis. Prior to fieldwork, evenly spaced transect lines were plotted across the site in ArcGIS Desktop to serve as a transect orientation guide during the field survey. The electronic map was exported into a position enabled .pdf file, so the field botanists could plot their location in relation to the evenly spaced transects while onsite. As previously noted, the pre-plotted transects were only meant to serve as an "orientation guide" with recognition that the actual survey intensity would be adjusted during implementation based on the distribution of suitable habitat, surveyor safety, and assurance that the survey needed to be completed within the time allocated. Due to rugged, uneven, and often steep terrain, slippage concerns, and subsequent reductions in survey efficiency, it was not possible to traverse the site along each of the pace transects. Survey transects were traversed in a roughly east-west orientation, with a spacing ranging from 30- to 100-meters depending on habitat potential and navigability. Transect spacing increased slightly more at Oak Grove (to approximately 100-m apart), due to much steeper terrain. A representative photo of most survey transects was taken and Global Positioning System (GPS) tracks were logged to confirm and document sufficient survey coverage.

Species lists developed and managed by the New Mexico Rare Plant Technical Council (https://nmrareplants.unm.edu/) provide a well-organized, expertly vetted, and regularly updated list of "rare" species known to occur within a particular county in NM. The NMRPTC lists taxa that are either narrowly endemic to a specific geographic feature (e.g., mountain range; geologic outcrop) or subset area of a phytogeographic region (e.g., southern Rocky Mountains, northern Chihuahuan desert); NMRPTC listed species can be locally abundant within a narrow range or more widespread but numerically rare. NMRPTC designates a species as "rare" when a particular epithet meets the following criteria (per NMRPTC; https://nmrareplants.unm.edu/about):

- *Species lists developed and managed by the New Mexico Rare Plant Technical Council (https://nmrareplants.unm.edu/) provide a well-organized, expertly vetted, and regularly updated list of "rare" species known to occur within a particular county in NM. More specifically, NMRPTC designates a species as "rare" when a particular epithet meets the following criteria: Critically Imperiled Species are those ranked G1 globally and/or S1 statewide by Natural Heritage New Mexico and NatureServe.*
- *Imperiled Species are those ranked G2 globally and/or S2 statewide by Natural Heritage New Mexico and NatureServe.*
- *Vulnerable Species are those ranked G3 globally, and/or S3 statewide by Natural Heritage New Mexico and NatureServe.*
- *Threatened or Endangered Species are those that are federally listed and protected under the U.S. Endangered Species Act (ESA) by the U.S. Fish and Wildlife Service.*
- *State Endangered Plants are those listed as Endangered by the State of New Mexico and are protected under state law.*
- *Navajo Nation Endangered Species are those listed by the Navajo Nation as threatened, endangered or candidates for listing and are protected by the Navajo Nation Endangered Species Act.*
- *Sensitive Species or Species of Concern are not necessarily included on the above lists, but may be included on lists of Sensitive Species by the U.S. Fish & Wildlife Service, the Division, the Navajo Nation, the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), and other tribes and pueblos. Only the BLM and the USFS provide some protective measures for sensitive species and species of concern, including policies and guidelines.*
- *Endemic Species are those whose entire distribution is restricted to a relatively small geographic region. These species occur nowhere else in the world and are often, but not necessarily, vulnerable to extinction.*

- *Rare Species typically have small numbers of individuals worldwide, narrow geographic ranges, and/or few localized populations, making them more vulnerable to extinction than common species. These include all plants reviewed and listed by the New Mexico Rare Plant Technical Council.*

According to NMRPTC, there are a total of 22 rare plant species known to occur in Grant County. The species have varying sensitivity status as indicated on Table 1. As indicated in the Results section of this report, no rare plant species were detected during the survey. If a rare plant species would have been suspected or confirmed, the observation location would have been marked as a point or area with the GPS, depending on the number of individual plants within the population. Additionally, phenology, vigor, soil type, landform, slope, and aspect would have also been recorded as supplemental site attributes associated with the observed rare plant species. However, as presented in the results section of this report, no rare plant species were encountered during the survey. As transects were traversed, a list of all species encountered was logged, and general abundance noted in a field book. Thus, presence of noxious and/or other invasive, non-native plant species was also ancillary recorded and noted (if observed), along with a comprehensive plant species list for all plant species observed during the survey. If an unknown species was encountered that appeared to be in the same genus as a rare plant, the plant was collected and identified to species to determine the specific epithet.

The primary field data collection elements included:

- Logged GPS tracks of coarse survey grid
- Digital photographs – representative photos of transect grids
- List of species encountered during the survey
- Location of rare plant species, if encountered:
  - Population details, number, extent, vigor, phenology
  - Assessment of potentially suitable habitat for rare species
  - Observer name
  - Notes of threats and/or disturbance
  - Aspect, elevation and landform
  - Soil type and associated plants
  - Representative digital photographs of each found population

TABLE 1. RARE PLANT SPECIES KNOWN TO OCCUR IN GRANT COUNTY, NM (NMRPTC) NOTE: R = RARE ACCORDING TO NMRPTC "RARITY CRITERIA", S1 AND G1 = CRITICALLY IMPERILED, S2 AND G2 = IMPERILED, S3 AND G3 = VULNERABLE, T = INTRASPECIFIC TAXA, ? = QUESTIONABLE TAXONOMY, SNR = STATE RANK NOT YET ASSESSED, SH = POSSIBLY EXTIRPATED (HISTORICAL)

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank
Agastache cana	R						S3	G3
Agastache mearnsii	D						S2	G3
Asclepias uncialis	D			SEN				G3G4T2T3
Brickellia chenopodina	R						SNR	GHQ

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank
Carex amplifolia							S1	G4
Crataegus wootoniana	R			SEN			S2	G2
Cymopterus davidsonii	R						S2	G2
Cypripedium parviflorum var. pubescens	D		E	SEN		GP 4	S2?	G5T5
Desmodium metcalfei	R			SEN			S1	G3?
Draba mogollonica	R						S3	G3
Euphorbia rayturneri	R						S1	G1
Grindelia arizonica var. neomexicana	R						SNR	G4T3?
Grindelia decumbens var. subincisa							S3?	G4T3?
Peniocereus greggii	R		E		SEN		S3	G3G4T3
Penstemon linarioides ssp. maguirei	R			SEN			SH	G5T1
Peritoma multicaulis	R		E				SH	G2G3
Phemeranthus humilis	R			SEN			S2	G2
Puccinellia parishii	R		E	SEN	SEN	GP 4	S1	G2G3
Scrophularia macrantha	R			SEN	SEN		S2	G2
Silene thurberi	R						S3?	G4
Silene wrightii	R						S2	G2
Stellaria porsildii	R			SEN			S1	G1

RESULTS

No rare plant species were encountered during the survey; however, potential suitable habitat was present for six species, habitats for these species are listed below and specific areas with potential habitat within the site are shown on Figure 2.

1. Mogollon whitlowgrass (*Draba mogollonica*) grows in cool, moist northern slopes of mountains, ravines and canyons on volcanic rocks and soil in montane forests at elevations ranging from 5,000 to 9,000 ft. (NMRPTC 1999).
2. Grayish-white giant hyssop (*Agastache cana*) grows in crevices and bases of granite cliffs and in canyons with small-leaved oaks in the upper edge of desert and lower edge of piñon-juniper at 4,600 to 5,900-ft. (NMRPTC 1999).
3. Davidson's cliff carrot (*Cymopterus davidsonii*) grows in cool, rocky places in piñon-juniper woodland and lower montane coniferous forest at 6,500 to 8,000 ft. (NMRPTC 1999). Note that elevations at this site rise to approximately 6,300 ft.
4. Mimbres figwort (*Scrophularia macrantha*) grows in steep and rocky, usually north-facing, igneous cliffs and talus slopes, and occasionally in canyon bottoms in piñon-juniper woodland and lower montane coniferous forest at 6,500 to 8,200 ft. (NMRPTC 1999). Note that elevations at this site rise to approximately 6,300 ft.
5. Wright's campion (*Silene wrightii*) grows in cliffs and rocky outcrops in montane and subalpine conifer forest at 6,800 to 8,000 ft. (NMRPTC 1999). Note that elevations at this site rise to approximately 6,300 ft.
6. Pinos altos fame flower (Pheramanthus huhmilis) grows in shallow, gravelly clay soil over rhyolite on rocky benches in sloping terrain. It occurs in Madrean grassland, oak woodland and pinon-juniper woodland, often associated with beargrass (Nolina macrocarpa), and Parry's agave (Agave parryii) (NMRPTC 1999).

There is an east-west running drainage in the southeast portion of Emma, which eventually drains into Oak Grove Creek (Figure 2) that contains potential habitat for these five species but as stated previously in this report, no rare plant species were detected. Just one closely related species (shared genera) was identified - Bill Williams Mountain giant hyssop (*Agastache pallidiflora*) occurred within the project site. A. *pallidiflora* is differentiated from the rare *A. cana* by having flowers less than 20 mm long which are less than twice the length of the calyx. No other species within any of these genera were present in the survey area.

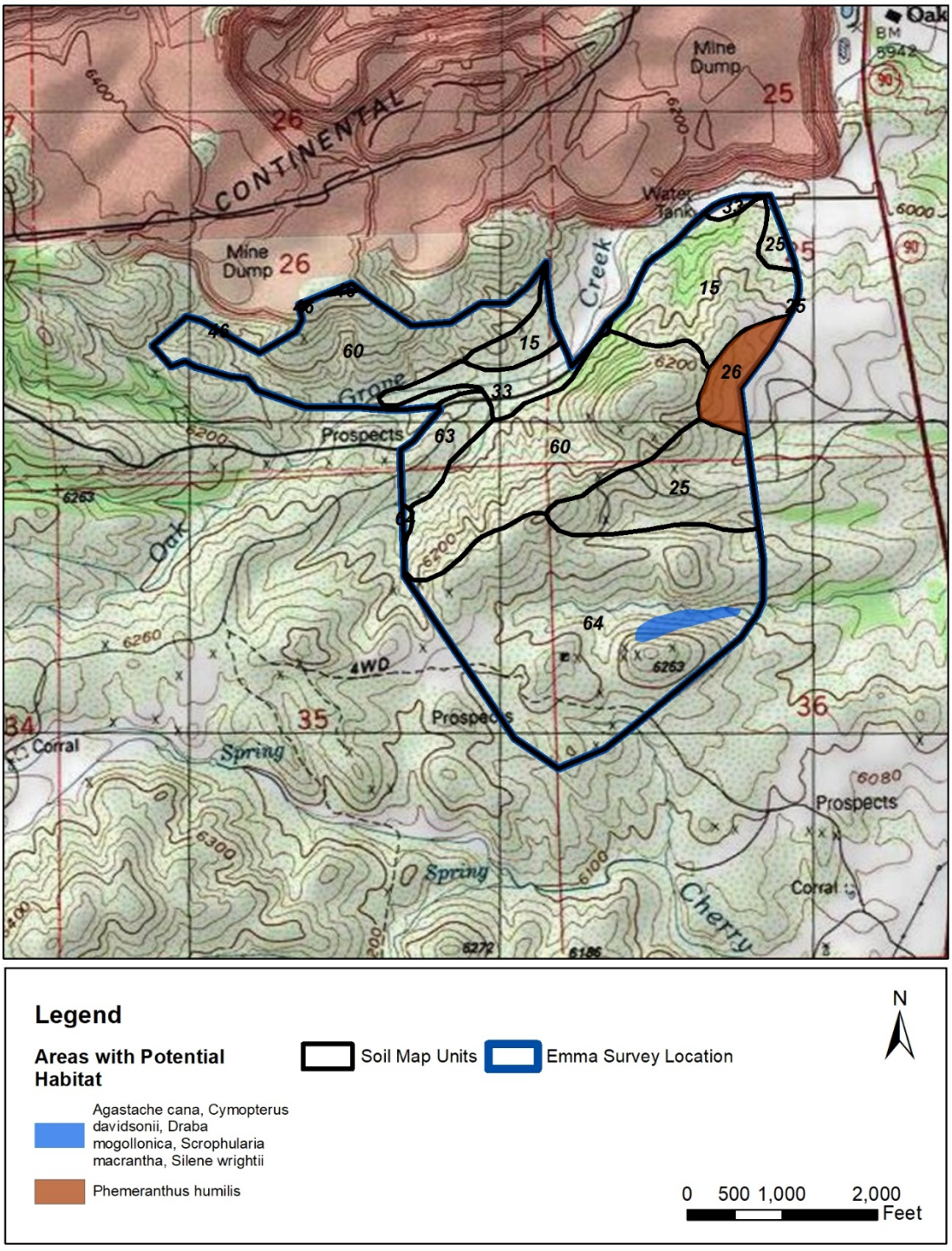


FIGURE 2. MAP SHOWING LOCATIONS WITH HABITAT POTENTIAL FOR VARIOUS RARE PLANT SPECIES

Additionally, potentially suitable habitat for Pinos altos fame flower (Pheramanthus huhmilis) was present at the site (as described above), these conditions were found on the small ridge above along the east edge of the site. Maguire's beardtongue (*Penstemon linaroides* subsp. *maguirei*) grows on limestone cliffs in pinon-juniper woodland at elevations between 6,000 and 6,500 ft. It has only been collected once in New Mexico in canyons near the Gila River in 1880 (NMRPTC, 1999). This type of habitat was not present in the project area. Penstemon specimens present at the site had linear leaves, and not oblanceolate leaves, and were determined to be the more common toadflax beardtongue (*Penstemon linaroides* subsp. *linaroides*).

A total of 114 species were encountered at the site (Table 2). The site is dominated by gray oak (*Quercus grisea*), Emory oak (*Quercus emoryi*), alligator juniper (*Juniperus deppeana*) in the overstory; shrub live oak (*Quercus turbinella*), beargrass (*Nolina microcarpa*), broom snakeweed (*Gutierrezia sarothrae*), Wright's silktassel (*Garrya wrightii*), three-leaf sumac (*Rhus trilobata*), manzanita (*Arctostaphylos pungens*) and younger oaks are the dominant species in the shrub layer. Black grama (*Bouteloua eriopoda*), blue grama (*B. gracilis*) sideoats grama (*B. curtipendula*), sand dropseed (*Sporobolus cryptandrus*), purple threeawn (*Aristida purpurea*) and Carruth's sagewort (*Artemisia carruthii*) dominate the herbaceous layers.

No state or federally listed noxious weeds were detected during the survey.

TABLE 2. PLANT SPECIES OBSERVED AT THE SITE SORTED BY LIFEFORM. RELATIVE ABUNDANCE AS FOLLOWS, A=ABUNDANT, C=COMMON, U=UNCOMMON, S=SPARCE

Scientific Name	Common Name	Relative Abundance
Trees		
Juglans major	Arizona walnut	S
Juniperus deppeana	alligator juniper	C
Pinus edulis	piñon pine	C
Prunus serotina	chokecherry	S
Quercus emoryi	Emory oak	C
Quercus grisea	gray oak	A
Shrubs		
Agave parryi	Parry's agave	S
Ageratina herbacea	fragrant snakeroot	U
Arctostaphylos pungens	manzanita	U
Atriplex canescens	fourwing saltbush	U
Baccharis pteronioides	yerba de pasmo	C
Brickellia californica	California brickell bush	C
Coryphantha vivipara	Arizona spiny star	S
Cylindropuntia spinosior	cane cholla	U
Dasylerion wheeleri	sotol	U
Ericameria laricifolia	turpentine bush	S
Ericameria nauseosa	rubber rabbitbrush	C
Cercocarpus montanus	Mountain mahogany	C
Fallugia paradoxa	Apache plume	C
Eriogonum wrightii	Wright's buckwheat	C

Scientific Name	Common Name	Relative Abundance
Garrya wrightii	Wright's silktassel	C
Gutierriezia sarothrae	broom snakeweed	A
Isocoma tennuisecta	burroweed	U
Lonicera albiflora	western white honeysuckle	S
Lycium pallidum	pale wolfberry	S
Mimosa biuncifera	catclaw mimosa	A
Nolina microcarpa	beargrass	U
Opuntia chlorotica	pancacke pricklypear	U
Quercus turbinella	shrub live oak	C
Rhus trilobata	three-leaf sumac	C
Yucca bacata	banana yucca	U
Yucca elata	soaptree yucca	U
Forbs		
Acmispon (syn.= *Lotus*) *wrightii*	Wright's deervetch	U
Ambrosia acanthicarpa	flat-spine burr-ragweed	U
Argemone pleiacantha	southwestrn pricklypoppy	U
Artemisia carruthii	Carruth's sagebrush	A
Artemisia dracunculus	tarragon	U
Artemisia ludoviciana	silver sagewort	U
Astragalus mollossimus	woolly locoweed	U
Bahia absinthifolia	hairyseed bahia	S
Baileya multiradiata	desert marigold	S
Cirsium neomexicanum	New Mexico thistle	U
Comandra umbellata	bastard toadflax	S
Croton texensis	doveweed	S
Cryptantha cinerea	James' cryptantha	S
Cucurbita foetidissima	buffalo gourd	S
Dalea sp.	prairie clover	S
Datura wrightii	sacred datura	S
Dieteria asteroides	fall tansy-aster	C
Dyssodia papposa	fetid marigold	U
Bouchera sp.	rockcress	U
Brickellia eupatorioides	false boneset	U
Brickellia floribunda	Chihuahuan brickellbush	U
Brickellia lemmonii	Lemmon's brickellbush	U
Chaetopappa ericoides	rose heath	U
Erigeron neomexicanus	New Mexico fleabane	S
Eriogonum alatum	winged buckwheat	S
Eriogonum jamesii	James' buckwheat	U

Scientific Name	Common Name	Relative Abundance
Eriogonum polycladon	sorrel buckwheat	S
Euphorbia albomarginata	whitemargin spurge	S
Euphorbia revoluta	threadstem spurge	S
Euphorbia serpillifolia	thyme-leaf sandmat	S
Evolvulus sericeus	silver dwarf morningglory	S
Glandularia bipinnatifida	Dakota mock vervain	U
Grindelia arizonica	Arizona gumweed	U
Heliomerus longifolia	longleaf false goldeneye	U
Heterotheca subaxillaris	camphorweed	U
Hymenopappus filifolius	fineleaf hymenopappus	U
Hymenothrix wrightii	Wright's thimblehead	U
Hymenoxys richardsonii	pingue	U
Lactuca serriola	prickly lettuce	U
Lappula occidentalis	flatspine stickseed	U
Lepidium sp.	pepperweed	S
Machaeranthera tanacetifolia	tanseyleaf tansyaster	U
Marrubium vulgare	horehound	S
Mentzelia multiflora	Adonis blazingstar	S
Mentzelia pumila	dwarf mentzelia	S
Noccaea fendleri	alpine pennycress	U
Packera neomexicana	New Mexico groundsel	U
Pectis angustifolia	lemonscent	S
Pectis filipes	five-bract chinchweed	S
Penellia micrantha	mountain cross	S
Penstemon barbatus	beardlip penstemon	S
Penstemon linarioides	toadflax beardtongue	S
Physaria sp.	bladderpod	S
Plantago patagonica	woolly plantain	S
Salsola tragus	Russian thistle	U
Senecio flaccidus	threadleaf groundsel	S
Solanum elaeagnifolium	silverleaf nightshade	S
Sonchus asper	spiny-leaf sow-thistle	S
Sphaeralcea digitata	juniper globemallow	S
Sphaeralcea fendleri	Fendler's globemallow	S
Sphaeralcea laxa	caliche globemallow	S
Stephanomeria pauciflora	brownplume wirelettuce	S
Verbascum thapsus	common mullein	U
Verbesina encelioides	golden crownbeard	S
Xanthisma gracile	grass-leaf sleepy daisy	U

Scientific Name	Common Name	Relative Abundance
Xanthisma spinulosum	lacy sleepy daisy	S
Zinnia grandiflora	Rocky Mountain zinnia	U
Graminoids (grasses and grass-like plants)		
Aristida purpurea	purple threeawn	C
Bothriochloa barbinodis	cane bluestem	U
Bouteloua curtipendula	sideoats grama	C
Bouteloua eriopoda	black grama	A
Bouteloua gracilis	blue grama	C
Bouteloua hirsuta	hairy grama	U
Carex sp.	sedge	S
Festuca arizonica	Arizona fescue	U
Muhlenbergia emersleyi	bullgrass	C
Muhlenbergia longiligula	long-tongue muhly	U
Muhlenbergia torreyi	ring muhly	S
Piptochaetium fimbriatum	piñon ricegrass	S
Schizachyrium scoparium	little bluestem	S
Scleropgoon brevifolius	burro grass	S
Sporobolus cryptandrus	sand dropseed	C
Relative Abundance: A=Abundant; C=Common; U=Uncommon; S=Sparse		

CONCLUSIONS

A total of 114 plant species were observed during an early October 2020 survey at the Emma-Oak Grove site. No rare plants were detected during the survey; however, potential suitable habitat was observed for six species: *Agastache cana*, *Cymopterus davidsonii*, *Draba mogollonica*, *Scrophularia macrantha*, and *Silene Wrightii*. All potential suitable habitat was surveyed, and we did not detect any rare species. However, precipitation during the spring and summer of 2020 (including monsoons) was substantially below average near the site and throughout the Southwestern U.S. Plant diversity and abundance was also below average.

REFERENCES

Brown, David E. 1994. Biotic Communities: Southwestern United States and Northwestern Mexico. University of Utah Press. Salt Lake City, Utah

New Mexico Rare Plant Technical Council (NMRPTC). 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. https://nmrareplants.unm.edu (Latest update: 13 Nov 2020)

ATTACHMENT 4

EMMA BLASTING PLAN
(Enclosed)

Emma Blasting Plan

OVERVIEW

The intent of this document is to provide the Mining and Minerals Division (MMD) with a blasting plan for the Emma Expansion to the Tyrone Mine (Emma, see map provided in Appendix B) that meets Permit requirements In Title 19 Natural Resources and Wildlife, Chapter 10 Non-Coal Mining, Part 5 Existing Mining Operations, 19.10.5.508 New Units, B. Assure Protection, (11) Explosives. "Blasting shall be conducted to prevent injury to persons or damage to property not owned by the operator. Fly rock shall be confined to the permit area. The Director may require a detailed blasting plan, pre-blast surveys or specify blast design limits to control possible adverse effects to structures."

INTRODUCTION

Blasting for Emma will be in compliance with Title XI, Regulation of Explosives (18 U.S.C. Chapter 40, 84 Statute 952), of the Organized Crime Control Act of 1970 (84 Statute 922) and 27 CFR 55 or similar, MSHA 30 CFR Part 56, the Institute of Manufacturers of Explosives (IME) safety library publications, Freeport McMoRan-Surface Blasting Policy for safe blasting procedures. Blast plans at Emma will conform with the provisions cited above under the New Mexico Mining Act Regulations and Tyrone's Air Quality PSD2448 M7 Permit. These regulations and procedures will be adhered to regardless of work being performed by a blasting contractor or the Freeport blasting crew. This blasting plan summarizes and outlines the safety standards that are related to all aspects of blasting for Emma, including:

- Blasting schedule
- Guarding of blast areas
- Flyrock control
- Safety controls
- Blast monitoring

The blast design is provided in Appendix B and is based on the same design safely utilized at the Little Rock Mine which consists of the same geologic formation as Emma. Tyrone Mine PSD2448 M7 Permit limits blasting at Emma to the following parameters for air quality purposes:

- 2 blasts per day,
- Blasting Agent Limits:
    - 200,000 pounds per blast
    - 400,000 pounds per day
- 125,000 square feet per blast

Blasting will occur as needed by the operation, potentially seven days per week, with the option for up to 2 shots per day. In the event of more than one blast within the Emma pit is conducted on a given day, the two blasts will be fired within the same firing window, unless a safety concern prevents this action such as a misfire or equipment issues. If there are two blasts within the Emma area on a given day, they will be planned to happen at the same time or within a very short amount of time.

Blasting will be conducted during daylight hours, and most often between 11am and 3pm. If a safety concern or other complication arises which prevents a blast from being fired before dark (a very rare occurrence), blasting operations must refer to Freeport McMoRan-Surface Blasting Policy for guarding loaded blast holes overnight to be fired safely the following day.

1.0 PLAN TO PREVENT INJURY TO PERSONS

Prior to blasting, the Blaster in Charge will define the blast area limits. Typical distances are 500 ft (150 m), and 1,500 ft (500 m), for equipment and personnel, respectively. If a blast pattern design is less than 1500 feet from the county road (Appendix B), the road will be blocked (guarded) prior to the blast until the post-blast all clear signal is given by the Blaster in Charge (typically total blocking time of less than 30 min). The blast area will be guarded by mine personnel prior to each blast to ensure unauthorized access to the area is prevented based on site conditions specific to the blast design. Following the blast, the Blaster in Charge will inspect the area to ensure the detonation of all blast holes and that no misfires occurred.

2.0 PLAN TO CONTROL AND CONFINE FLY ROCK

The Emma permit area is shown on Appendix B. The closest distance from the edge of the proposed Emma pit and the permit area is 450 feet. No fly rock will leave the permit boundary. Flyrock will be controlled using adequate front row burden (confinement), maintaining a proper powder factor by not overloading blast holes and using appropriate stemming length and material (see Appendix A).

3.0 PLANS FOR PRE-BLAST STRUCTURE SURVEYS

The closest residential structure from the edge of the proposed Emma pit is over 3,000 feet away (see Appendix B for details). This is more than twice the safe distance for personnel and well beyond the safe distance for structures. Before blasting at the site begins, Freeport McMoRan will offer pre-blast surveys to property owners within the Apache Mound subdivision even though this is not typically needed at these distances. These surveys will be provided by an experienced 3rd party contractor.

4.0 PLAN TO PREVENT DAMAGE TO PROPERTY AND CONTROL AND MONITOR VIBRATIONS AND AIR OVERPRESSURE LEVELS

Ground vibrations and air overpressures will be controlled by limiting the explosives charge weights loaded in blast holes, ensuring that the front row burden is adequately designed and using proper stemming material and length.

Prior to blasting, the Blaster in Charge will define boundaries of the blast area as defined by MSHA. The distance for equipment and personnel (including public) to be cleared from the blast pattern will be determined by the final blast design. These distances are intended to protect personnel and equipment from potential damage due to flyrock, concussion, and fumes.

Blast designs will be reviewed by qualified Freeport personnel, to ensure they meet the objectives of this plan. Blast monitoring of ground vibrations and air overpressure will be conducted for each blast using seismograph near the blast zone and at the edge of the permit area. The purpose of monitoring is to ensure that blasting adheres to safe limits at off-site inhabited structures. Seismographs will be placed at preplanned, appropriate locations to monitor ground vibrations and air overpressure.

The Blaster-in-Charge will prepare blast reports that document blast vibration and air overpressure measurements. These reports will be reviewed to ensure blasts are within safe blasting standards recommended by the United States Bureau of Mines Appendix B chart contained in Report of Investigation 8507.

In addition, a confirmatory vibration/attenuation analysis will be done by a third party blasting consultant, once the blasting has started at the Emma Project to ensure the site-specific blast response is consistent with best practices to protect mine personnel, public, neighboring structures, and equipment.

Appendix A

Typical Blast Parameters Little Rock/Emma

Drill bit:	10.625inch
Drill max depth (not subdrill)	56ft
Bench depth:	50ft
Subdrill:	3 – 6 ft
Pattern style:	staggered
Burden:	24ft
Spacing:	24ft
Product:	400x ANFO*
Planned production loading:	500 – 1200 lbs per hole
Stemming:	2 – 3 inch diameter crushed angular rock
Environmental permit for blasting:	125,000 ft^2 / blast
Max number of holes per prod blast:	216 holes
Wall control:	zipper row and 3 row buffers**
Delay timing:	Timing evaluated via signature hole and Alpha-Blast software
Primer:	electronic cap with 1lb PETN, with non-electrical backup
Geology:	primarily altered Precambrian granite, with east-west trending porphyry dikes that have high rock strength (similar to Little Rock)

* Ammonium Nitrate prill is mixed with Fuel Oil as is being pumped down the blasthole, emulsions might be added due to wet conditions.

** Zipper Row is the practice of blasting a series of production diameter holes on the design toe, very lightly loaded (100-150 lbs of ANFO, with a 1lb PETN booster, every other hole), at a close distance from each other (8ft at Little Rock), blasted in a series of 10 holes at the time (5 loaded, 5 not loaded), done with the dual purpose of breaking the toe of the wall design and creating a series of fractures

parallel to the crest to slow the gas propagation and fracturing to propagate past the crest or blast designated area. Refer to image 1 and 2 for visual guidance.

Image 1, Plan view example of buffer row and zipper row for wall control

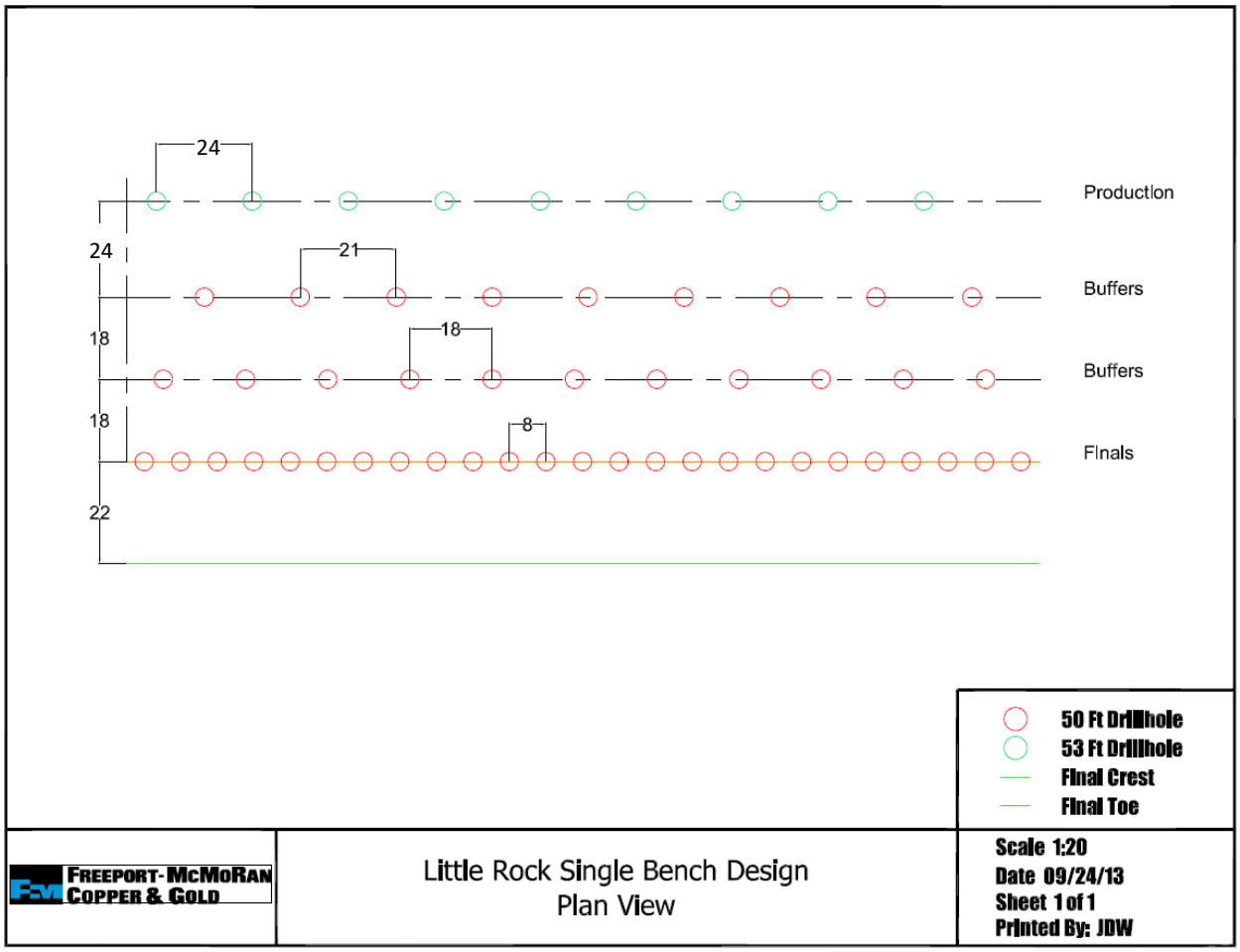


Image 2, Cross sectional view example of wall control buffer pattern

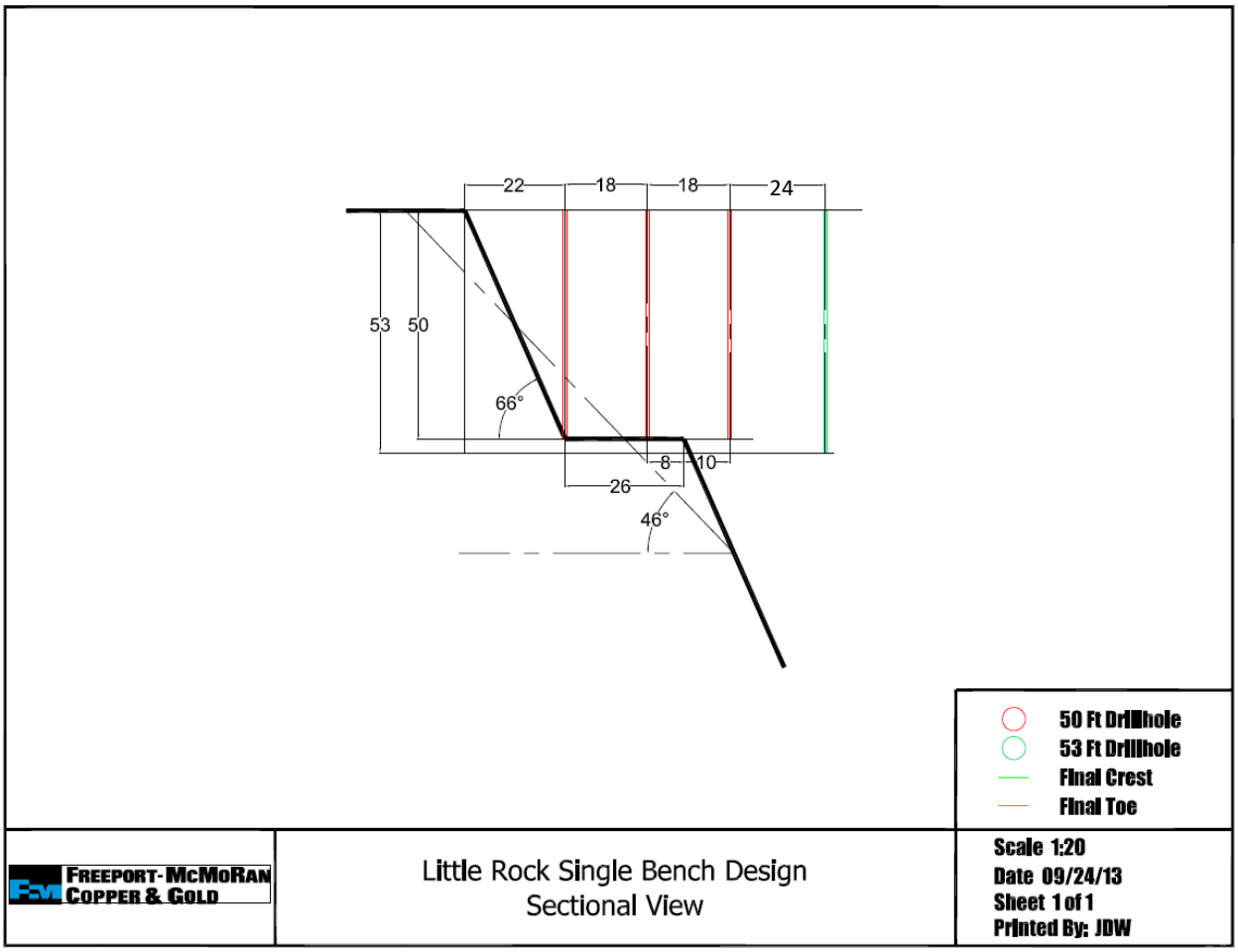


Image 3, Plan view example of production pattern,

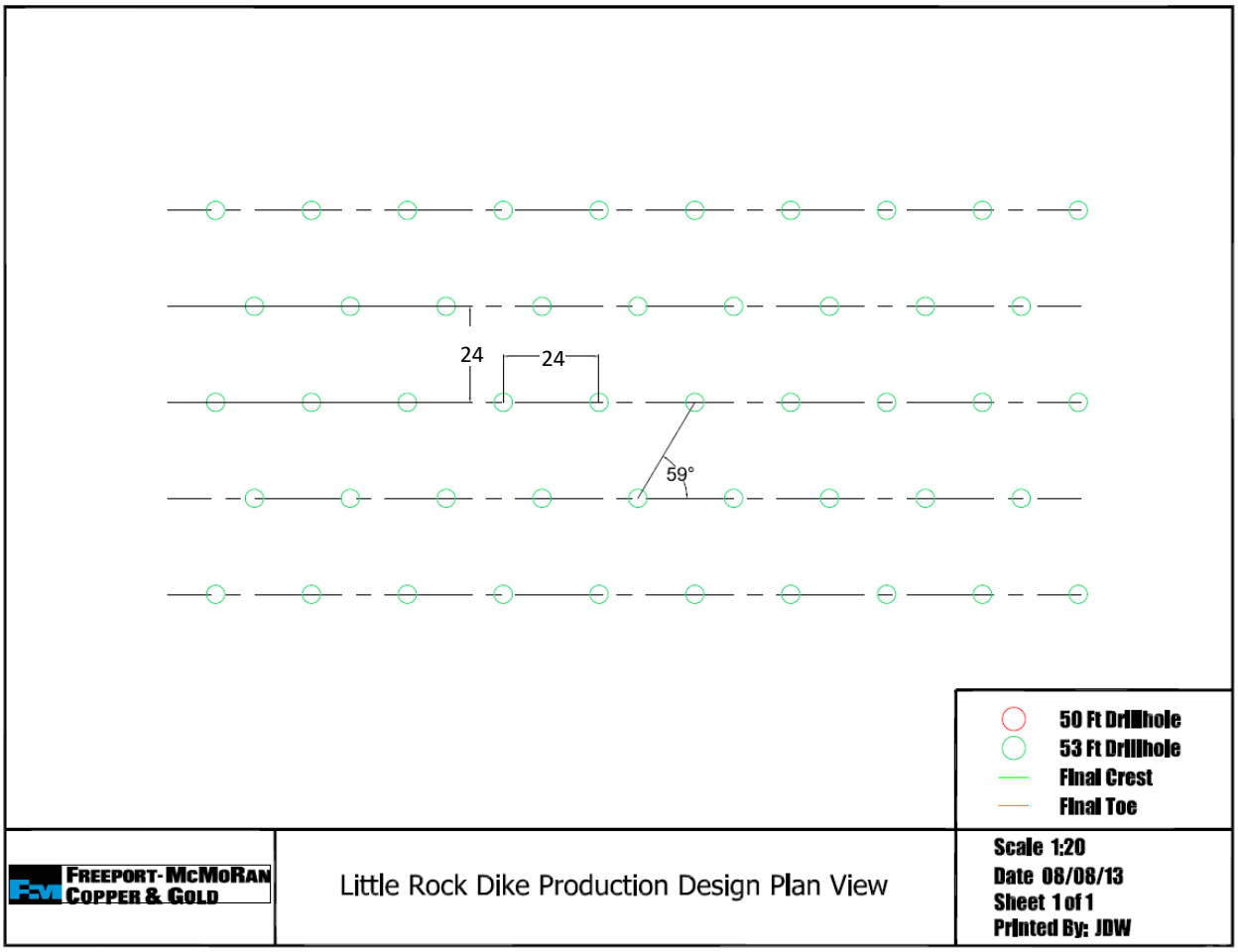


Image 4, Typical production pattern timing,

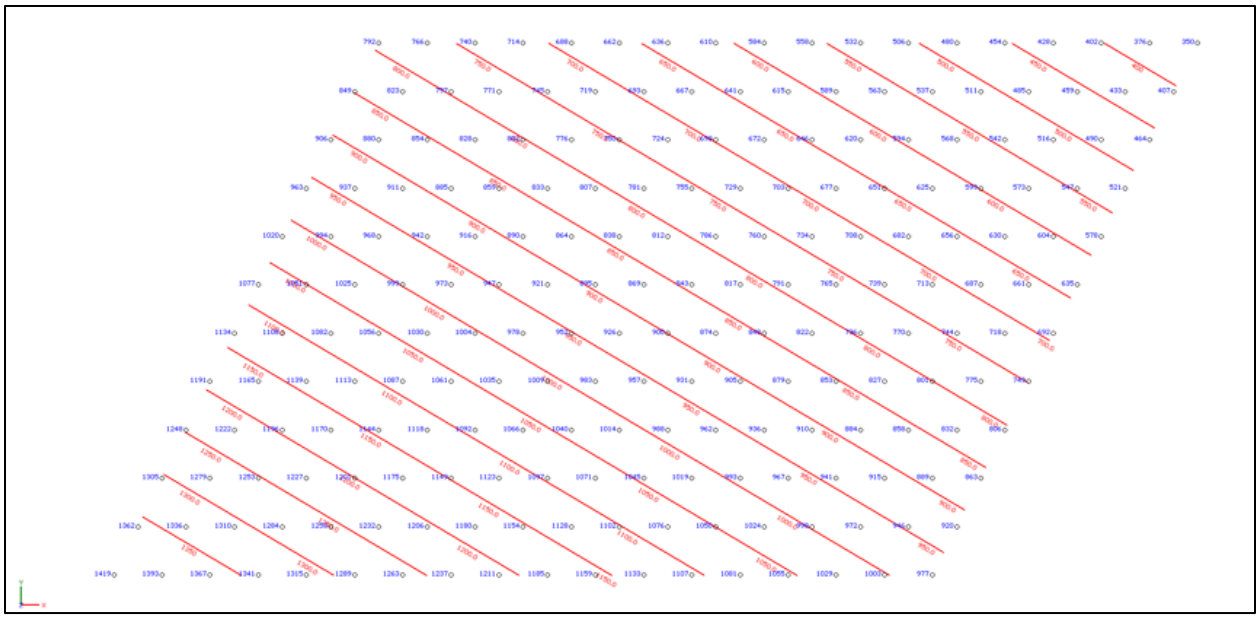
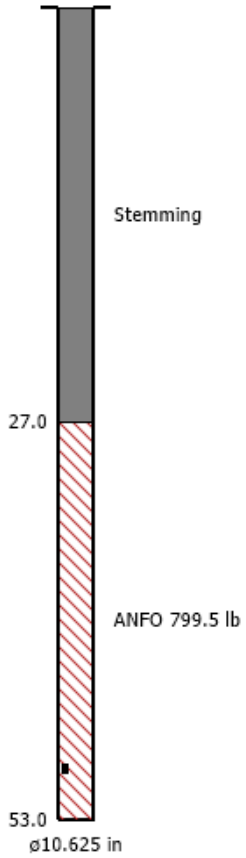


Image 5, Blasthole design example for production Blasting



27ft of stemming

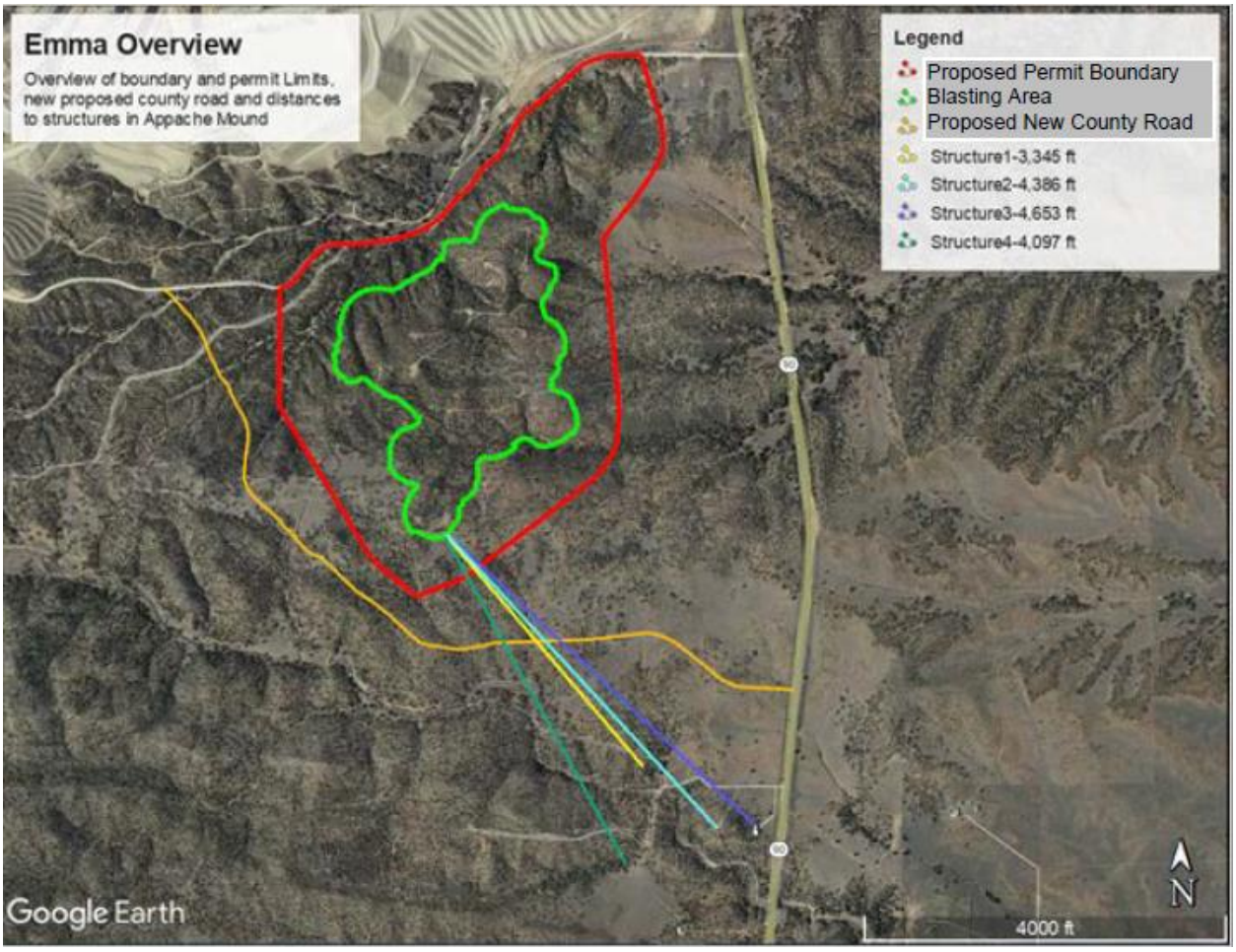
26ft of ANFO prill (800lbs)

1 PETN (1 lb) Booster at bottom

50 ft bench height + 3ft subdrill

10.625 drillhole/blasthole diameter

Appendix B


Emma Overview
Overview of boundary and permit Limits, new proposed county road and distances to structures in Appache Mound
Legend
Proposed Permit Boundary
Blasting Area
Proposed New County Road
Structure1-3,345 ft
Structure2-4,386 ft
Structure3-4,653 ft
Structure4-4,097 ft
Google Earth
4000 ft
N

ATTACHMENT 5

NORTHERN AND SOUTHERN EMMA HAUL ROAD PRELIMINARY DESIGN (Enclosed)

TELESTO SOLUTIONS • INCORPORATED

750 14th Street SW
Loveland, Colorado 80537
970-484-7704(p)/970-484-7789(f)

TECHNICAL MEMORANDUM

DATE:	**October 22, 2021**	**Telesto #**	**200552a-001**
TO:	**Tom Shelley, Adam Offutt, and Mandy Lilla**		
	Freeport-McMoRan Tyrone Mining LLC		
FROM:	**Walter L. Niccoli, PE (NM 16812) Telesto Solutions, Inc.**		
SUBJECT:	**Northern and Southern Emma Haul Road Preliminary Design**		

1.0 INTRODUCTION

The purpose of this technical memorandum is to:

- Document the design criteria utilized in the preliminary Northern and Southern Emma Haul Roads (collectively Haul Road) preliminary design
- Summarize key features of the preliminary design
- Summarize steps to make the Haul Road non-discharging

2.0 DESIGN CRITERIA

- Stormwater control and culvert design: flow induced from a storm with a 10-year return interval and a 24-hr duration (i.e., design storm)
- Fill or infrastructure in Oak Grove Wash is temporary (to be removed during reclamation). Thus, minimize use of hardened (e.g., concrete) infrastructure
- The Emma Haul Road will be constructed of non-acid generating material obtained locally or from the CSG Waste or 5A Waste stockpiles
- Sediment basins retain average peak storm volume

3.0 PRELIMINARY DESIGN

Sheets 1 through 3 (attached) display the preliminary Haul Road design. Key features of the preliminary design include:

- Roadside stormwater conveyance to the inside slope of the road
- Sediment basins sloped for maintenance equipment access
- 2-4' diameter corrugated metal culverts beneath the Haul Road crossing of Oak Grove Wash to convey design storm
- Reroute of Oak Grove Wash for a distance of approximately 300 feet
- Northern Emma Haul Road through reclaimed 7A Waste Rock Stockpile from station 28+00 to end (excavated material hauled to waste rock pile approved for acid generating waste)
- Road fill constructed of clean, non-acid generating, cover material

4.0 STEPS FOR ASSURING FACILITY IS NON-DISCHARGING

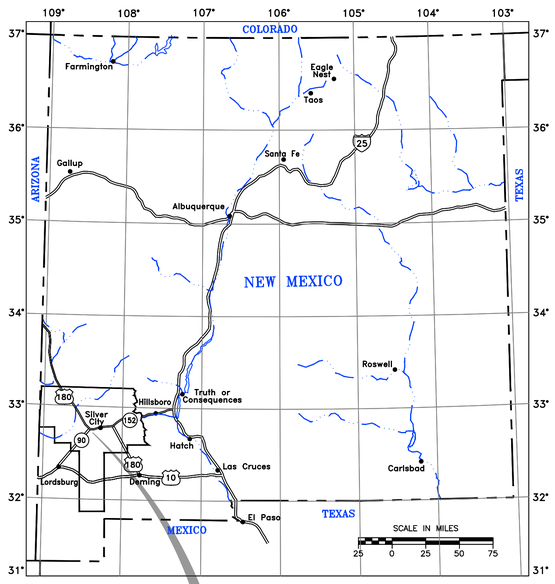
Tyrone indicates that they will commit to the following to ensure the Haul Road meets the requirement for a non-discharging facility. The primary steps for this assurance are:

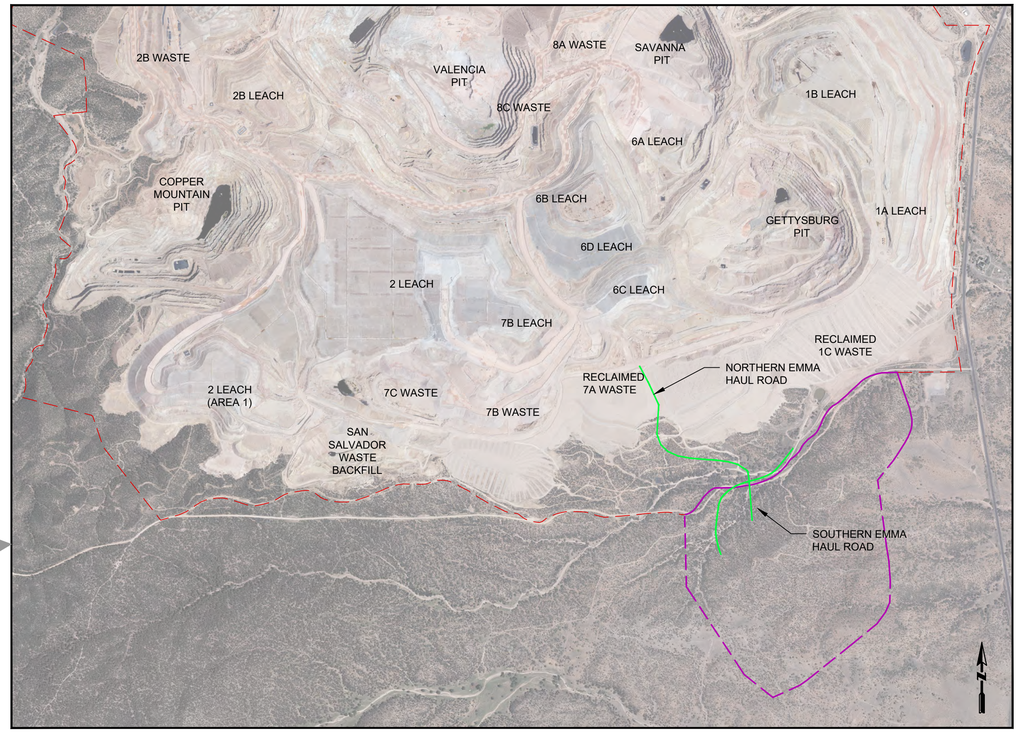
- Ensuring that all imported material is approved cover material from the CSG Waste or 5A Waste stockpiles
- Local cut and fill in native materials are non-acid generating as confirmed by recent sampling

The north portion of the Northern Emma Haul Road (station 28+00 to 40+00, approximately) may require cut into the reclaimed 7A Stockpile. This cut operation may expose potentially acid generating (PAG) material during construction. Tyrone will open a repository for the excavated PAG material on the top surface of the reclaimed 7A Stockpile, to the east of the cut area. Tyrone will salvage and store up to two feet of the existing cover from the cut sections and the PAG repository nearby to re-used as cover. They will haul any additional cover needed from approved areas of the CSG Stockpile or 5A Stockpile. To ensure that no discharge occurs during construction of this portion of the road Tyrone commits to:

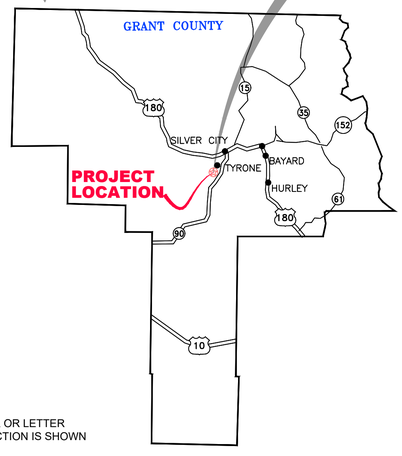
- Construct road and place cover from station 28+00 to 40+00 **ONLY** during dry weather
- Cover exposed PAG cut sections of the haul road with a minimum of three feet of cover prior to any wet weather event
- Expose no more than 200 feet of the road segment at a given time
- Stockpile sufficient volume of cover for at least 200 feet of road segment with 3 feet of cover adjacent to the project site at all times while working from station 28+00 to 40+00
- Document and retain, for quality assurance review, a daily record of weather conditions and construction activities (including a record of station segments with exposed PAG) between Stations 28+00 to 40+00

NORTHERN AND SOUTHERN EMMA HAUL ROADS
TYRONE MINE 2021
ISSUED FOR PERMITTING PURPOSES





TYRONE MINE SOUTH - 2020



CROSS SECTION REFERENCE

A/1 — SECTION IDENTIFICATION NUMBER OR LETTER / NUMBER OF SHEET ON WHICH SECTION IS SHOWN

SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
1	COVER SHEET
2	OPERATIONAL LAYOUT
3	OPERATIONAL/ RECLAMATION SECTION VIEWS

LEGEND / NOTES

- TYRONE PERMIT BOUNDARY
- HAUL ROAD ALIGNMENT
- PROPOSED EXPANSION OF TYRONE MINE PERMIT BOUNDARY ASSOCIATED WITH EMMA PROJECT

COORDINATE SYSTEM
TYRONE LOCAL

FOR DISCUSSION PURPOSES ONLY

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVED
1	FOR CLIENT REVIEW	9/27/21	JJM	TMT
1	FOR PERMITTING	10/14/21	JJM	WLN

DATE	10/14/2021
PROJECT	200552-001
TASK NUMBER	02/03
DRAWN BY	JJM
PROJECT ENGINEER	WLN
CHECKED BY	WLN

NORTHERN EMMA HAUL ROAD

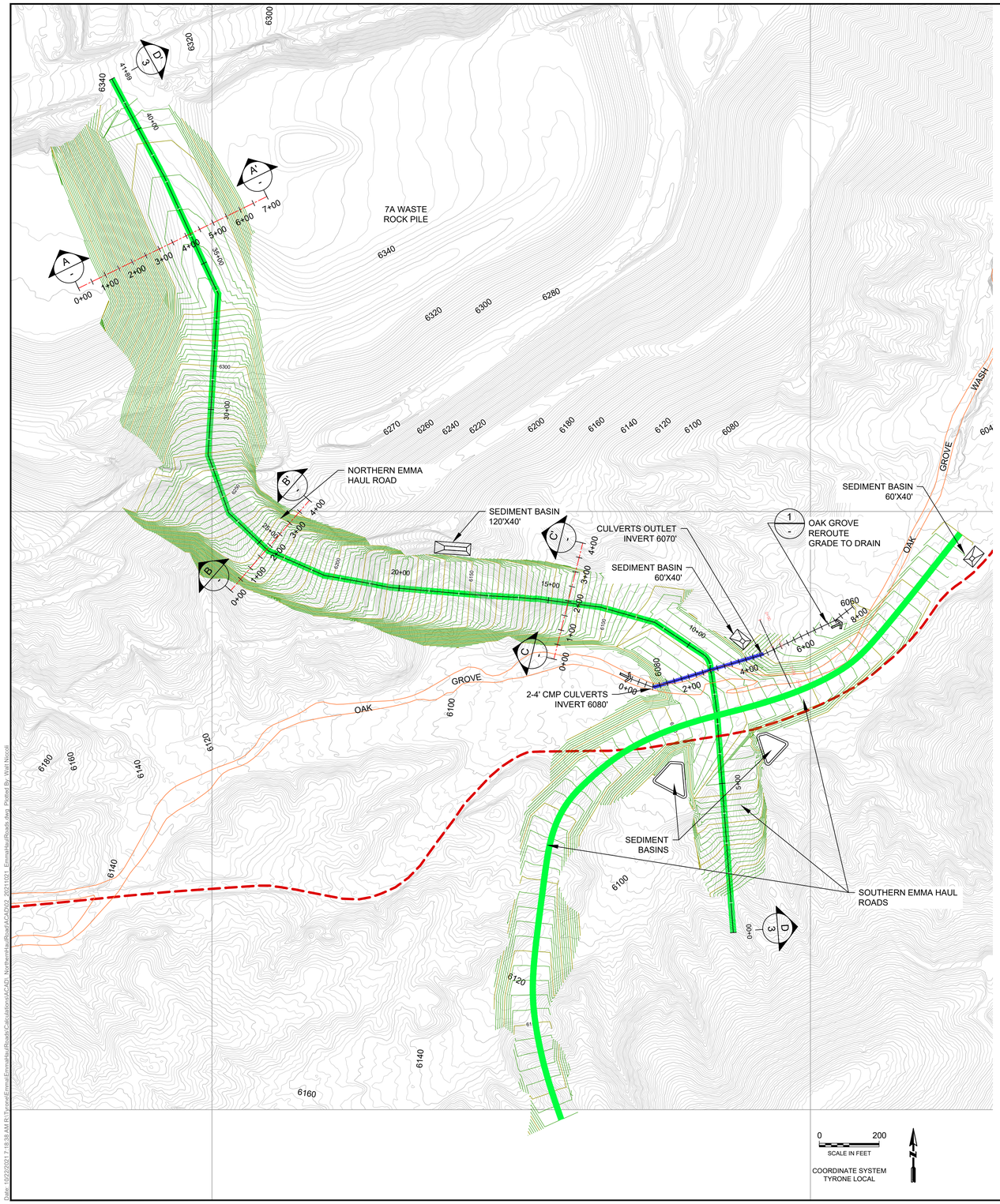
COVER SHEET

SHEET NUMBER: 1

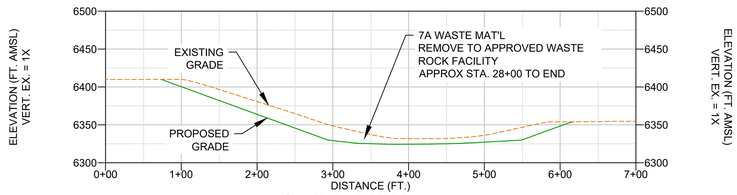
REVISION NUMBER: 1

PREPARED BY: TELESTO SOLUTIONS, INCORPORATED

PREPARED FOR: FREEPORT-McMoRan

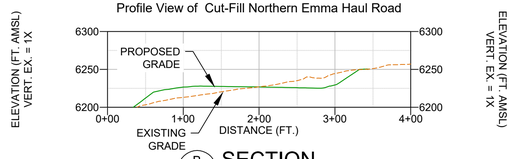


Profile View of 7A Northern Emma Haul Road



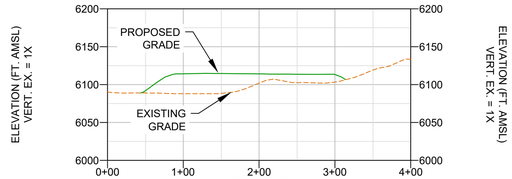
A - SECTION

Profile View of Cut-Fill Northern Emma Haul Road



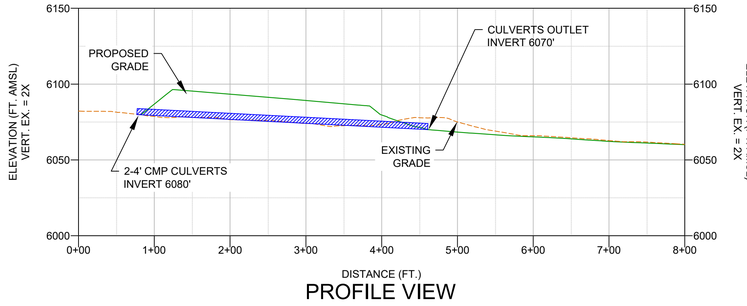
B - SECTION

Profile View of General Fill Northern Emma Haul Road



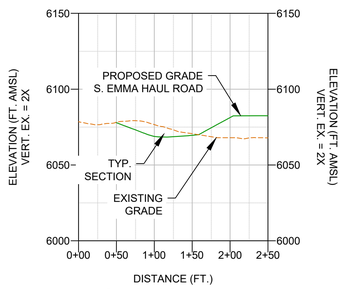
C - SECTION

Profile View of Reroute Oak Grove Wash



PROFILE VIEW

Profile View of Reroute Oak Grove Wash XSect



SECTION VIEW

1 - DETAIL
OAK GROVE WASH REROUTE AND CULVERT

LEGEND / NOTES

- TYRONE PERMIT BOUNDARY
- MAJOR CONTOUR (50 FT.)
- MINOR CONTOUR (10 FT.)
- PROPOSED MAJOR CONTOUR (10 FT.)
- PROPOSED MINOR CONTOUR (5 FT.)
- FLOW DIRECTION
- HAUL ROAD ALIGNMENT
- PROPOSED EXPANSION OF TYRONE MINE PERMIT BOUNDARY ASSOCIATED WITH EMMA PROJECT

NOTES:

1. PRE-CONSTRUCTION TOPOGRAPHY FREEPORT-MCMORAN TYRONE INC. 2012
2. SEE SHEET 3 FOR DISPOSITION OF MATERIAL TYPES
3. SEE SHEET 3 FOR TYPICAL SEDIMENT BASIN PLAN AND PROFILE

FOR DISCUSSION PURPOSES ONLY

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVAL
0	FOR CLIENT REVIEW	9/27/21	JJM	TMT
1	FOR PERMITTING	10/14/21	JJM	WLN

DATE	10/14/2021
PROJECT	200552-001
TASK NUMBER	02/03
DRAWN BY	JJM
PROJECT ENGINEER	WLN
CHECKED BY	WLN

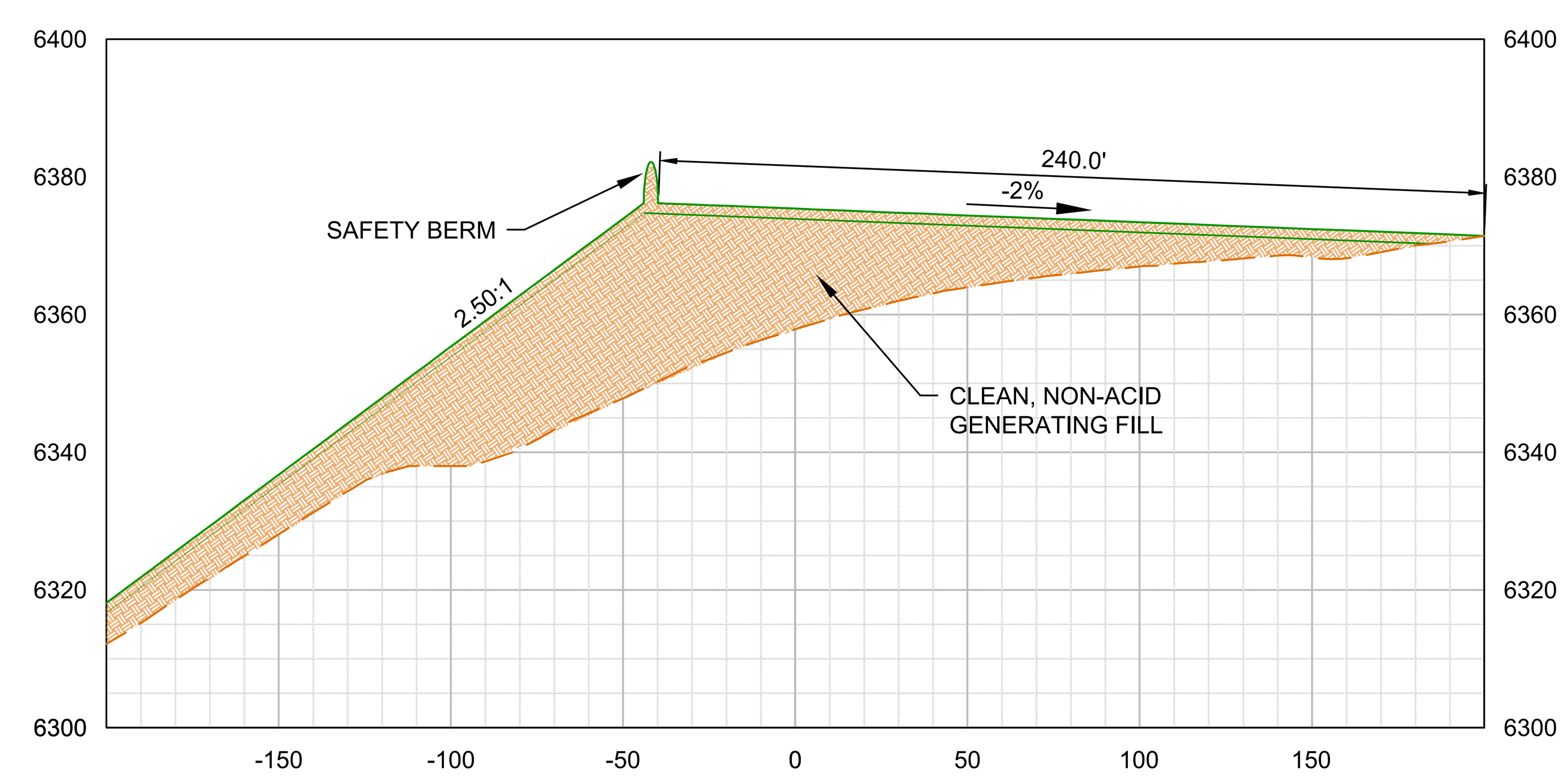
NORTHERN EMMA HAUL ROAD

OPERATIONAL LAYOUT

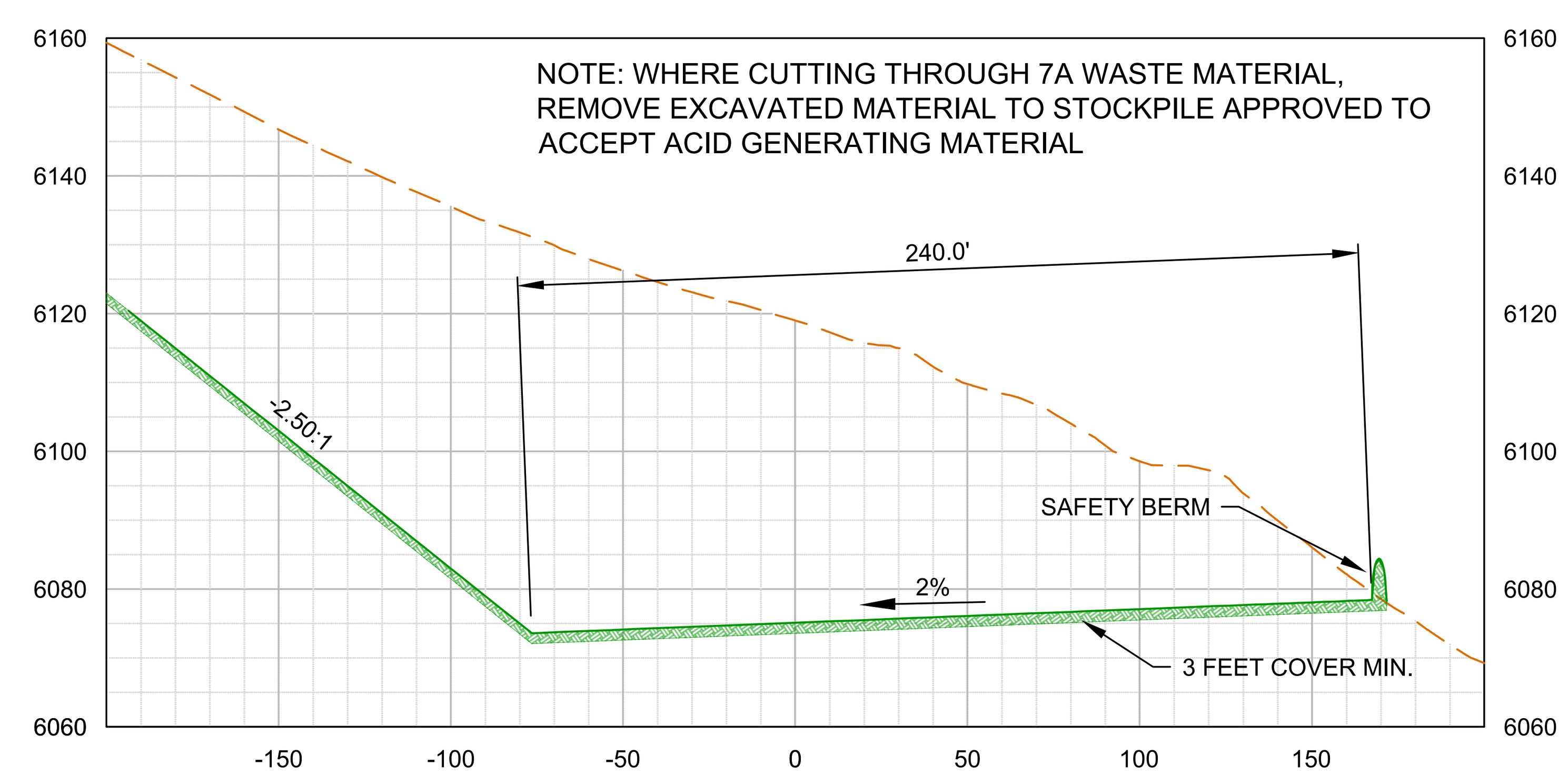
SHEET NUMBER:	REVISION NUMBER:
2	1

PREPARED BY: TELESTO SOLUTIONS INCORPORATED

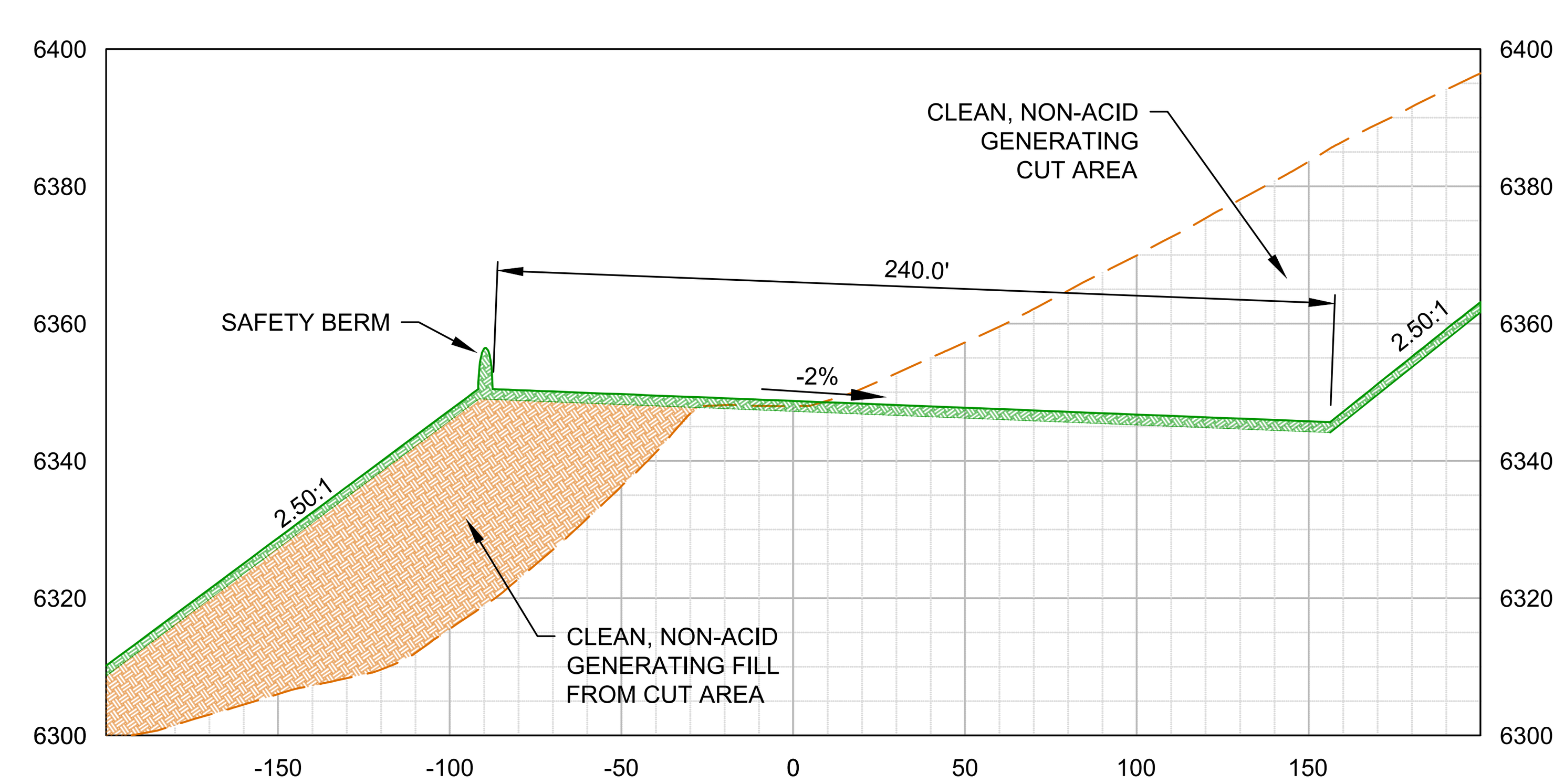
PREPARED FOR: FREEPORT-McMoRan



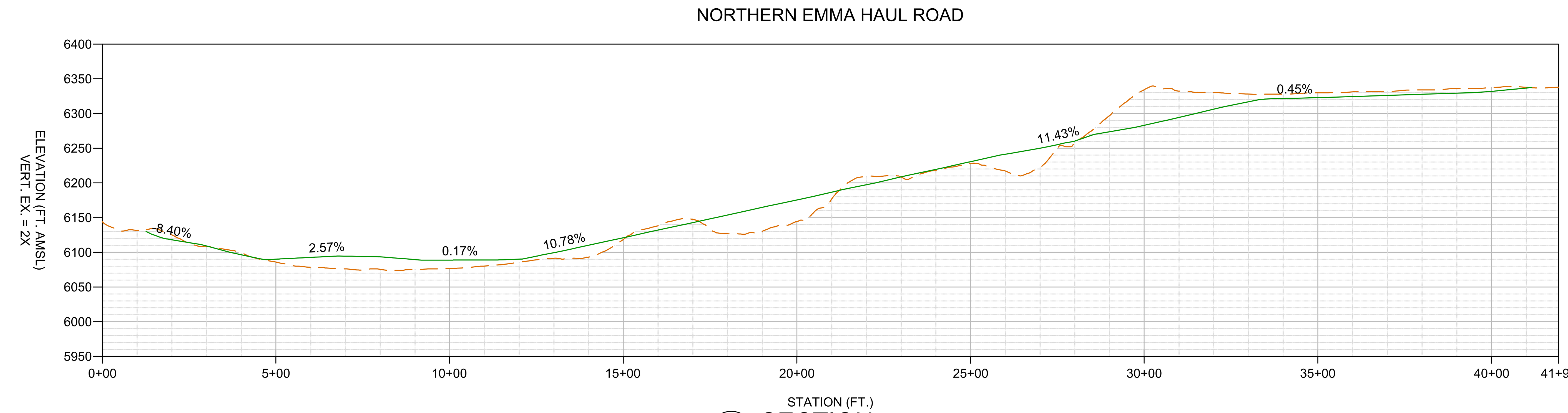
CONCEPTUAL FILL SECTION



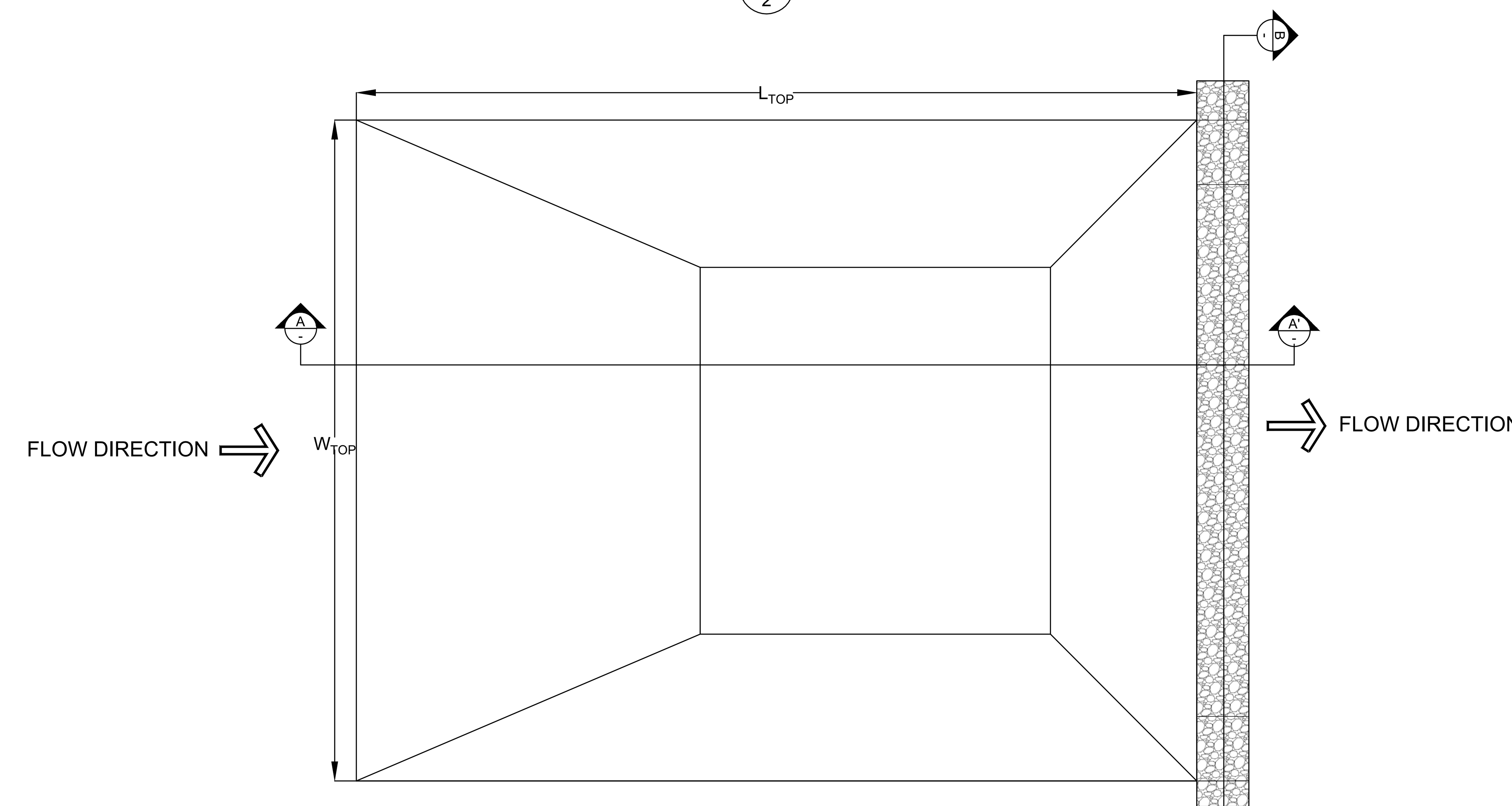
CONCEPTUAL CUT SECTION



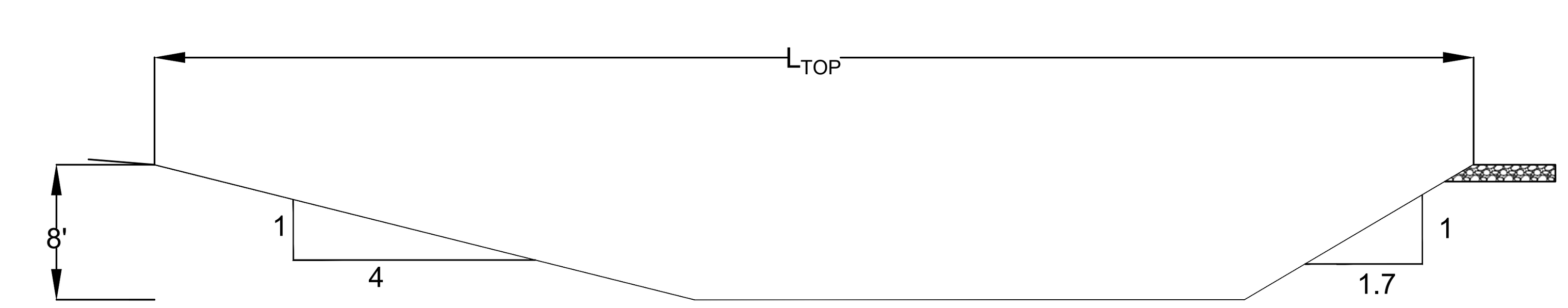
CONCEPTUAL CUT/FILL SECTION
ON NATIVE GROUND ONLY



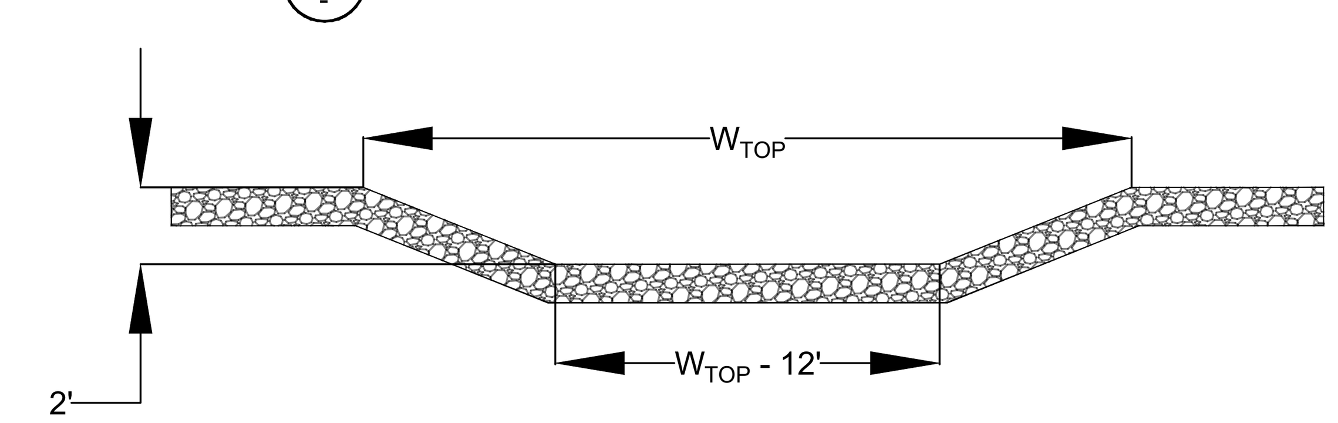
D / 2 SECTION



TYPICAL SEDIMENT BASIN



A TYPICAL SEDIMENT BASIN CROSS SECTION



B TYPICAL SEDIMENT TRAP OUTLET

LEGEND / NOTES

- 2020 SURFACE
- RECLAIMED SURFACE

NOTES:

1. HAUL ROADS CONSTRUCTED WITH CLEAN MATERIAL SUITABLE FOR COVER
2. HAUL ROADS CUT INTO RECLAIMED WASTE ROCK - EXCESS WASTE ROCK HAULED TO APPROVED WASTE ROCK FACILITY - ROADS COVERED WITH 3' MIN COVER MATERIAL

COORDINATE SYSTEM
TYRONE LOCAL

FOR DISCUSSION PURPOSES ONLY

REVISIONS

#	DESCRIPTION	DATE	BY	APPROVAL
0	FOR CLIENT REVIEW	9/27/21	JJM	TMT
1	FOR PERMITTING	10/14/21	JJM	WLN

DATE	10/14/2021
PROJECT	200552-001
TASK NUMBER	02/03
DRAWN BY	JJM
PROJECT ENGINEER	WLN
CHECKED BY	WLN

NORTHERN EMMA HAUL ROAD

OPERATIONAL/ RECLAMATION SECTION VIEWS

SHEET NUMBER: 3
REVISION NUMBER: 1

PREPARED BY: TELESTO SOLUTIONS INCORPORATED

PREPARED FOR: FREEPORT-McMoRAN