Bagdad Mine
Stockpile Extension
Modification to the
Mine Plan of Operations (AZA-28639)

Prepared for submittal to:

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May 2014
revised July 2014

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ACRONYMS AND ABBREVIATIONS

1996 MPO	*Plan of Operations for Upper Mammoth Tailings & South Waste Rock Disposal Facilities (Revision No. 5*; 1996*)*
AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
AL	alert level
amsl	above mean sea level
APP	Aquifer Protection Permit
APS	Arizona Public Service Co.
AQL	aquifer quality limit
ARS	Arizona Revised Statutes
ASLD	Arizona State Land Department
ASMI	Arizona State Mine Inspector
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
BLM	Bureau of Land Management
BMPs	best management practices
CAA	Clean Air Act
CFR	Code of Federal Regulations
Corps	US Army Corps of Engineers
CWA	Clean Water Act
DNA	Determination of NEPA Adequacy
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	US Environmental Protection Agency
EPCR	Emergency Preparedness, Contingency, and Response Plan
ESA	Endangered Species Act
FMBI	Freeport-McMoRan Bagdad Inc.
GSRB&M	Gila and Salt River Baseline & Meridian
HDPE	high density polyethylene
HUC	hydrologic unit code
ISO	International Organization for Standardization
MPO	Mine Plan of Operations
MSGP	Multi-Sector General Permit
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOD	Notice of Disposal
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
Plan IX	Plan 9
PLS	pregnant leach solution
PM_{10}	particulate matter less than 10 microns in diameter
POC	Point of Compliance
QAP	quality assurance plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROW	right-of-way
SPCC	Spill Prevention, Control and Countermeasure
Stockpile	consolidated Plan IX Leach/South Waste Rock Stockpile
SWPPP	Storm Water Pollution Prevention Plan
SX/EW	solution extraction/electrowinning
USFWS	US Fish and Wildlife Service
USGS	US Geologic Survey

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1.0 INTRODUCTION

1.1 DOCUMENT PURPOSE

Pursuant to the requirements of the Bureau of Land Management (BLM) Surface Management Regulations, 43 Code of Federal Regulations (CFR) Part 3809, Freeport-McMoRan Bagdad Inc. (FMBI) has prepared this *Stockpile Extension Modification to the Mine Plan of Operations* (MPO Modification; AZA-28639). FMBI seeks approval of this MPO Modification for the extension of the existing, consolidated Plan IX Leach/South Waste Rock Stockpile (the Stockpile) at the Bagdad Mine. In addition, this MPO Modification proposes future, distributed facilities south of the Stockpile.

As depicted in Figure 1, the project area is located in western Yavapai County, immediately west of the unincorporated community of Bagdad and on the south side of the existing Bagdad Mine.

1.2 EARLIER OPERATIONS

Mining has occurred in the Bagdad area since the early 1880s, initiated with the staking of claims along Copper Creek and the formation of the Eureka Mining District in 1884. Prior to 1900, gold, silver, and lead were the primary minerals extracted (BLM, 1995a). Copper production began generally after 1900, and the first mill began production in 1928 to process ore from the underground mine. A transition to open pit mining began in 1945 (Freeport-McMoRan, 2014).

Following numerous ownership changes through first half of 20th century, the Bagdad Copper Company merged with Cyprus Mines Corporation and formed the Cyprus Bagdad Copper Company in 1973. The Phelps Dodge Corporation acquired the mine in 1999, following which the mine operated as Phelps Dodge Bagdad, Inc. Freeport-McMoRan Copper & Gold, now known as Freeport-McMoRan Inc., acquired Phelps Dodge Corporation in 2007, and the mine continues operations today as a subsidiary, FMBI.

1.3 CURRENT MINE FEATURES AND FACILITIES

The open pit copper mining operation includes mine production (drilling, blasting and stripping), material haulage, milling and flotation processes, and solution extraction/electrowinning (SX/EW) operations. Primary facilities at the Bagdad Mine include:

- Open pit
- Stockpiles of overburden, mineralized waste rock (leach facilities), and tailings material
- SX/EW plant
- Milling plant and flotation cells
- Security gate
- Maintenance shops
- Fueling stations and areas
- Acid bulk tank stations
- Explosives storage area
- Laydown yards and general storage areas
- Tailings impoundments

Currently, three existing tailings impoundments, Upper Mammoth, Mammoth and Mulholland, store the mill tailings material. Existing leach stockpiles at the Bagdad Mine allow for the extraction of copper from mineralized waste rock, including the Plan IX Leach portion of the Stockpile. The leachate (pregnant leach solution or PLS) from this portion of the Stockpile is collected at the downstream toe of the facility and gravity flows to the Alum Sump PLS Pond and Kimberly Pond catchments. The South Waste Rock portion of the Stockpile can receive mineralized waste rock, un-mineralized overburden, or relocated tailings. This portion of the Stockpile does not conduct leaching activities.

Figure 2 shows the location of the elements proposed in this MPO Modification in relation to some of the primary features of the Bagdad Mine. The approximate, planned extents of the Upper Mammoth Tailings Impoundment are also depicted (as addressed in the approved, original Mine Plan of Operations [1996 MPO]; refer to Section 1.7.1.1). No changes are proposed to the Upper Mammoth Tailings Impoundment in this MPO Modification.

1.4 EXISTING RIGHT-OF-WAY (BY OTHERS)

Currently, Arizona Public Service Company (APS) provides power to the Bagdad Mine. In order to operate more safely and efficiently, FMBI entered into an agreement with APS in 2008 to move the power line where it would be less exposed to mining activities, as originally contemplated in the 1995 Draft *Proposed Tailings and Waste Rock Storage Areas Environmental Impact Statement* (EIS; BLM, 1995a). APS applied for and was granted a right-of-way (ROW) through lands administered by the BLM in 2009, as shown in Figure 3; APS was also granted a ROW by the Arizona State Land Department (ASLD) for the segment of the power line crossing lands administered by ASLD in 2010.

1.5 OPERATOR INFORMATION

In accordance with 43 CFR 3809, the MPO Modification operator information is presented in Table 1.

Table 1 Operator Information

Project Name:	Stockpile Extension MPO Modification (proposed)
Corporation Name:	Freeport-McMoRan Bagdad Inc., a Delaware Corporation
Federal ID:	AZA-28639
Partnership Information:	Not applicable
Property Ownership and Point of Contact Information	
Full Name:	Brent Callen
Title:	Senior Environmental Engineer
Business Name:	Freeport-McMoRan Bagdad Inc.
Telephone Number:	(928) 633-3472
Street Address:	100 Main Street, Bagdad, Arizona 86321
Business Address:	PO Box 245, Bagdad, Arizona 86321
Claim Owner's Address:	Same as above
Federal Tax Identification No.:	84-1074663

Project Location	
County/State:	Yavapai County/Arizona
Claim Type:	Patented and Unpatented Lode and Mill Site Claims
Primary Commodity:	Copper
Meridian:	Gila and Salt River Baseline and Meridian
Sections:	16 and 17
Township, Range:	T14N, R9W
BLM (Public Land Ownership) Contact Information	
Name:	Bureau of Land Management, Kingman Field Office
Address:	2755 Mission Boulevard, Kingman, Arizona 86401
Telephone:	(928) 718-3700

1.6 PROJECT LOCATION AND OWNERSHIP

1.6.1 Project Location

As depicted in Figure 2, the proposed Stockpile extension and distributed facilities lie within Sections 16 and 17 of Township 14 North, Range 9 West of the Gila and Salt River Baseline and Meridian (GSRB&M).

1.6.2 Land Ownership

Figure 2 also depicts the land ownership within and surrounding the existing Bagdad Mine. The majority of the existing Bagdad Mine operations and facilities are situated on private lands. As discussed in detail in Section 1.7.1.1, the 1996 MPO and subsequent amendments have been approved by the BLM to allow the surface disturbances necessary for the Upper Mammoth Tailings Impoundment and the construction and extension of the Stockpile.

The surface disturbances approved by the 1996 MPO and subsequent modifications are depicted in Figure 3 and encompass the BLM-managed lands in Sections 8 and 9 of Township 14 North, Range 9 West of the GSRB&M.

The Stockpile extension and distributed facilities proposed in this MPO Modification will occur on a combination of private and public lands within Sections 16 and 17 of Township 14 North, Range 9 West of the GSRB&M, as depicted in Figure 4 and Figure 5. The elements of this MPO Modification are discussed in detail in Section 2.0.

1.6.3 Land Setting

The Bagdad Mine lies within the Central Highlands transition zone physiographic province, lying between the Colorado Plateau to the north and east and the Basin and Range physiographic province to the south and west. The Central Highlands physiographic province is characterized by rugged mountains of igneous, metamorphic, and sedimentary rock. The Santa Maria Mountains are located to the northeast of Bagdad and the Poachie Range lies to the southwest. The area more proximate to the Bagdad Mine is characterized by low rolling hills, lava-capped mesas, and narrow, deeply incised canyons. Elevations in

the vicinity of Bagdad Mine range from approximately 2,300 feet above mean sea level (amsl) at Burro Creek to roughly 5,100 feet amsl in the Grayback Mountains south of the mine.

The project lies within the Bill Williams River Basin (HUC6 150302)[1] of the Lower Colorado Subregion. On the north side of the Bagdad Mine, Boulder Creek generally flows westward to Burro Creek (Figure 1), which joins the Big Sandy River more than 30 river miles downgradient of the mine. As depicted in Figure 2, the drainage divide (ridgeline) between the Burro Subbasin (HUC8 15030202) and the Santa Maria Subbasin (HUC8 15030203) roughly corresponds to the southern boundary of the proposed limit of the Stockpile extension. On the regional basis, stormwater flows originating on the north side of this drainage divide are directed along this course; however, the earlier operations and creation of the open pit have altered the natural hydrology in the upper reaches of the watershed. Stormwater flow from the Stockpile and proposed Stockpile extension is captured by the open pit and does not have the potential to discharge to downgradient, receiving waters, as discussed in Section 1.7.2.

South of the drainage divide, stormwater flows are naturally directed towards Bridle Creek, which joins the Santa Maria River approximately 16 river miles south of the project area; the Santa Maria River continues for approximately 25 miles before reaching Alamo Lake (Figure 1). The confluence of the Big Sandy and Santa Maria rivers is located approximately five miles upgradient of Alamo Dam. Downgradient of Alamo Dam, the Bill Williams River continues in a westerly direction for more than 40 miles before joining the Colorado River at Parker Dam. The future, distributed facilities proposed in this MPO Modification generally lie on the south side of the drainage divide.

1.6.4 Statement of Basis (Right to Enter Property)

FMBI is a legal entity authorized to do business in the state of Arizona. FMBI holds legal interests in the areas incorporated into the MPO Modification through the ownership of patented claims, as well as the ownership of unpatented claims located on BLM-managed public lands. Appendix A presents a list of unpatented claims that intersect or lie within the areas proposed for disturbance in this MPO Modification (Table A.1) and the related, prior approvals under 43 CFR 3809 (Table A.2).

1.7 PERMITTING INFORMATION

FMBI holds the state and federal permits and authorizations necessary to mine and process metal minerals from the existing facilities at the Bagdad Mine. Table 2 lists the permits under which the Bagdad Mine currently operates; these permits are further discussed in the following sections.

[1] The US Geologic Survey (USGS) has delineated watersheds in the United States using a national standard hierarchical system based on surface hydrologic features, classified into hydrologic units (HUCs), as follows.

HUC	Level	Common Name
2-digit HUC	First-level	Region
4-digit HUC	Second-level	Subregion
6-digit HUC	Third-level	Accounting unit or Basin
8-digit HUC	Fourth-level	Cataloguing unit or Subbasin
10-digit HUC	Fifth-level	Watershed
12-digit HUC	Sixth-level	Subwatershed

Table 2 Applicable Permits and Regulatory Framework

Environmental Media/Regulatory Framework	Permit Number	Description	Issuing Agency	Status
Land Permits				
BLM Surface Management Regulations (43 CFR 3809)	AZA-28639	▪ 1996 MPO (approved 1996) ▪ 1996 MPO Amendment (approved 1997) ▪ 2004 Minor Modification (approved 2005) ▪ 2011 MPO Addendum (approved 2012)	BLM	Current
Arizona State Mine Inspector (Mined Land Reclamation Act)		Reclamation Plan (EnviroNet, Inc. 1997)	ASMI	Current
Water Permits				
Clean Water Act	AZ0022268	AZPDES Permit for discharges to Copper Creek, Mulholland Wash, and Mammoth Wash	ADEQ	Current
	AZMSG-64654 (AZ Mining MSGP-2010 Authorization Number)	AZPDES MSGP: Sector G – Metal Mining (Ore Mining and Dressing) and Sector J – Non-Metallic Mineral Mining and Dressing	ADEQ	Current; (ADEQ's 2010 Mining MSGP expires 02/01/16) SWPPP maintained on site
	Oil Pollution Prevention	CWA Section 311 – Spill Prevention Control and Countermeasure Plan	EPA	Current; SPCC Plan maintained on-site
Aquifer Protection Permit	P-105258	Area-wide Permit	ADEQ	Current, dated 08/28/2013
ADWR Permitting	Various permits	See discussion in Section 1.7.2.3	ADWR	Current
Air Permit				
Air Quality	29846	Class II Synthetic Minor Air Quality Permit	ADEQ	Current; expires 12/07/2014
Hazardous Waste Permit				
Resource Conservation and Recovery Act	HW EPA ID AZD-083717843	Small Quantity Generator	EPA	Current; no expiration date

1.7.1 Land Permits

1.7.1.1 BLM Surface Management

Mining-related surface disturbing activities conducted on lands managed by the BLM must comply with 43 CFR 3809, which requires a mine plan of operations. The *Plan of Operations for Tailings Facility Expansion and South Waste Rock Disposal Facility (Revision No. 4)* was submitted to the BLM in July 1995 and updated in February 1996 (*Plan of Operations for Upper Mammoth Tailings & South Waste Rock Disposal Facilities [Revision No. 5])* to incorporate the mitigating measures required by the Record of Decision (ROD). The ROD was issued March 5, 1996, which followed the preparation of the Draft and Final EIS (BLM, 1995a and 1995b) in accordance with the requirements of the National

Environmental Policy Act (NEPA). The February 1996 *Plan of Operations for Upper Mammoth Tailings & South Waste Rock Disposal Facilities (Revision No. 5)* is the approved, original Mine Plan of Operations (1996 MPO).

The following amendments to the 1996 MPO have been submitted to and approved by the BLM:

- *Amendment to the Existing Plan of Operations to Include Portions of the Plan 9 Dump*, dated December 1996 and approved via an Administrative Determination in February 1997. This 1997 Amendment expanded the Plan 9 (now Plan IX) facility onto additional BLM-managed lands.
- *Addendum to the Existing Plan of Operations (Revision No. 8),* dated November 2004 and approved via BLM Decision and Documentation of Land Use Plan Conformance and NEPA Adequacy (DNA) in April 2005. This 2005 Minor Modification requested approval to expand the area for material placement in the Plan IX Stockpile. The lateral, eastward expansion of the Plan IX Stockpile also converted a portion of the South Waste Rock Stockpile to a leaching facility.
- *Addendum to Plan of Operations for Plan IX Leach Stockpile and South Waste Rock Disposal Facilities*, dated and approved in November 2012. The 2012 Addendum requested approval for the expansion and consolidation of the Plan IX Leach Stockpile and the South Waste Rock Stockpile onto additional BLM-managed lands.

Approximately 671 acres of BLM-managed lands have been approved for disturbance through the approval of the 1996 MPO and subsequent amendments. BLM records document that prior MPO-related approvals were granted based on the unpatented claim boundaries listed in the 1996 MPO and subsequent amendments and comprise all of the public lands within Sections 8 and 9 of Township 14 North, Range 9 West of the GSRB&M. Figure 3 shows land ownership and the existing, BLM-permitted disturbance areas associated with the Stockpile. Figure 2 shows the existing, approved limits of disturbance for the current operation and provides general locations of existing mine facilities.

1.7.1.2 Mined Land Reclamation Plan

The Arizona State Mine Inspector (ASMI) requires that reclamation plans and associated costs must be submitted and approved for surface disturbances on private lands that are greater than five acres in extent. The ASMI also requires financial assurance for the reclamation of disturbed areas.

The Bagdad Mine maintains a mined land reclamation plan and the required financial assurance for compliance with the ASMI rules and regulations (EnviroNet Inc., 1997). In accordance with Title 11, Chapter 2, Article 5 of the Arizona Administrative Code (AAC), the mined land reclamation plan defines the post-mining land uses for the mining units at the Bagdad Mine, including rangeland, future mineral exploration and development, industrial/commercial, stormwater management, and borrow material. The reclamation plan describes the post-mining measures to be implemented for public safety, erosion control, topographic contouring, roadway reclamation, revegetation, and soils management. Annually, the Bagdad Mine reports the extent of surface disturbance, and the reclamation plan and financial assurance are updated accordingly.

1.7.2 Water Permits

1.7.2.1 Clean Water Act

The primary focus of the Clean Water Act (CWA) is to improve water quality by regulating the discharges of pollutants into waters of the US and regulating quality standards for surface waters. Compliance with Sections 404 and 401, Section 402, and Section 311 of the CWA are applicable to operations at the Bagdad Mine.

1.7.2.1.1 Section 404 and 401 of the CWA

Administered by the US Army Corps of Engineers (Corps), Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the US. The Corps was a cooperating agency for the 1995 EIS and issued a 404 permit (Corps File No. 954-0194-MB) for impacts to waters of the US related to the Upper Mammoth Tailings Impoundment and the South Waste Rock Stockpile. In parallel to the 404 permits issued by the Corps, the Arizona Department of Environmental Quality (ADEQ) provided water quality certifications pursuant to Section 401 of the CWA.

The elements proposed in this MPO Modification are not anticipated to result in impacts to waters of the US. However, FMBI will work with the Corps to gain the appropriate approvals, if needed.

1.7.2.1.2 Arizona Pollutant Discharge Elimination Systems (Section 402 of the CWA)

Section 402 of the CWA requires a National Pollutant Discharge Elimination System (NPDES) permit for all existing and new sources of pollution that could discharge to waters of the US. In Arizona, the ADEQ has the authority to administer this program; ADEQ has the responsibility for the Arizona Pollutant Discharge Elimination System (AZPDES) program and permits.

Industrial activities with stormwater discharges are required to obtain an AZPDES stormwater permit. The ADEQ issued the most recent Multi-Sector General Permits (MSGPs) for certain classes of industrial activities in 2010. The Bagdad Mine maintains coverage under the MSGP for Sector G, Metal Mining (Ore Mining and Dressing), and Sector J, Non-Metallic Mineral Mining and Dressing. ADEQ's Mining MSGP was signed on December 20, 2010, and is valid for five years. The Bagdad Mine operates under MSGP authorization number AZMSG-64654 for stormwater discharges.

Under the terms of the MSGP, the Bagdad Mine maintains a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP identifies pollution prevention procedures for areas of the site that could potentially discharge stormwater associated with mining activities. The SWPPP describes best management practices (BMPs) and control measures for the management of stormwater.

The portions of the mine facility that do not discharge stormwater to downgradient, receiving waters are not subject to coverage under the MSGP and are designated as non-discharging areas in the SWPPP. This includes the Stockpile and proposed Stockpile extension, the open pit, areas that drain to the open pit, the mill area, and other areas of the mine facility where stormwater is collected and used as process water, is left in the collection area and disposed through evaporation, or is contained within a hydrologic boundary.

Areas of the Bagdad Mine that have been identified to potentially discharge stormwater include:

- Mammoth stormwater basin
- Mulholland stormwater basin
- Copper Creek Flood Basin/mine shop un-mineralized overburden stockpile out slope
- Butte Creek un-mineralized overburden stockpile out slope

In addition to compliance with the MSGP for stormwater discharges, the Bagdad Mine has three discharge points (outfalls) regulated under an individual AZPDES Permit (No. AZ0022268). The following facilities are covered under the individual AZPDES permit:

- Copper Creek Flood Basin (Outfall 001)
- Mulholland Tailings Impoundment (Outfall 003)
- Mammoth Tailings Impoundment (Outfall 006)

Because the Stockpile extension area drains to the open pit, no change to the MSGP or SWPPP is anticipated for this element of the MPO Modification. Construction of distributed facilities may mandate an update to the SWPPP. The elements proposed in this MPO Modification will not affect the discharges regulated by the individual AZPDES permit.

1.7.2.1.3 Oil Pollution Prevention (Section 311 of the CWA)

Pursuant to the US Environmental Protection Agency's (EPA) oil pollution prevention regulations (40 CFR 112), the Bagdad Mine maintains a Spill Prevention, Control and Countermeasure (SPCC) Plan. The SPCC Plan documents measures for the prevention of, preparedness for, and response to oil discharges to navigable waters as required by Section 311 of the CWA. The SPCC Plan establishes procedures, methods, and equipment requirements to contain discharges of oil and prevent oil from reaching navigable waters. If necessary, the SPCC Plan will be updated to reflect the proposed MPO Modification.

As with the AZPDES permit, portions of the mine facility do not discharge and do not have the potential to discharge to downgradient, receiving waters. These areas are not subject to coverage under the SPCC Plan and include the Stockpile and proposed Stockpile extension, the open pit, and other areas of the mine facility contained within a hydrologic boundary. Nevertheless, the SPCC Plan includes oil-filled containers and equipment located within the open pit, the Stockpile, and proposed Stockpile extension on a voluntary basis to identify the associated spill prevention and containment measures, as discussed in Section 2.7.1.

1.7.2.2 Aquifer Protection Permit

The ADEQ administers the Aquifer Protection Permit (APP) program for the protection of groundwater quality; the program was promulgated in 1989. Facilities that discharge a pollutant either directly to an aquifer or to the land surface or the vadose zone require an APP if there is a reasonable probability that the pollutant may reach an aquifer. Key components of the APP requirements include: (1) demonstrating Best Available Demonstrated Control Technology (BADCT) and (2) not causing or contributing to the violation of aquifer water quality standards at the point(s) of compliance (POCs). The APP program also prescribes monitoring requirements, record keeping and reporting requirements, contingency planning, discharge limitations, compliance schedules, and closure/post-closure monitoring and maintenance

requirements. The APP remains in effect for the life of the facility, including the operational, closure, and post-closure periods (unless suspended or revoked).

Prior to the promulgation and implementation of the APP program, the Bagdad Mine operated under a Notice of Disposal (NOD). Pursuant to AAC R18-9-104 and 105, during the transition to the APP program the Bagdad Mine continued to be covered under the NOD and was in compliance with the APP program as long as the facility did not cause or contribute to a violation of aquifer water quality standards. The allowance for "permit continuance" under the regulations was applicable to the discharging facilities at the mine until the ADEQ either issued or denied an APP.

In accordance with the APP program regulations, an application for an area-wide APP for the Bagdad Mine was submitted to the ADEQ in 1993 (P-105258). A separate APP (P-101353) was issued in 1996, which included coverage for the Kimberly Pond, Mammoth and Upper Mammoth tailings impoundments, the Mammoth Tailings Seepage Collection Pond, and the South Waste Rock Stockpile. The ADEQ consolidated these permits on October 4, 2012, and all the mining-related operations at the Bagdad Mine are now covered by the area-wide APP P-105258. An amendment to the area-wide APP was signed on August 28, 2013, and is the current version of the permit. A copy of the current APP is provided in Appendix B.[1] The APP will be reviewed and updated to reflect the proposed Stockpile extension.

If specific elements meeting the definition of a discharging facility are proposed within the area indicated for distributed facilities, the APP would be reviewed and updated appropriately.

1.7.2.2.1 Best Available Demonstrated Control Technology Demonstration

The BADCT demonstration ensures that engineering controls, processes, operating methods or other alternatives, including site-specific characteristics, are employed to reduce discharges of pollutants to the greatest degree achievable before pollutants can reach the aquifer or to prevent pollutants from reaching the aquifer. The Arizona Revised Statutes (ARS) § 49-243.G state:

> *A discharging facility at an open pit mining operation shall be deemed to satisfy [the BADCT requirements of ARS 49-243.B.1] if the [ADEQ] determines that both of the following conditions are satisfied:*
>
> 1. *The mine pit creates a passive containment that is sufficient to capture the pollutants discharged and that is hydrologically isolated to the extent that it does not allow pollutant migration from the capture zone. For purposes of this paragraph, 'passive containment' means natural or engineered topographical, geological or hydrological control measures that can operate without continuous maintenance. Monitoring and inspections to confirm performance of the passive containment do not constitute maintenance.*
> 2. *The discharging facility employs additional processes, operating methods or other alternatives to minimize discharge.*

[1] Consistent with Sections 4.3.3.2.2 and 4.4.3.2 of the H-3809-1 Surface Management Handbook (BLM 2012), the MPO Modification will be appended in the future to include the current version of the APP permit.

The Bagdad Mine area-wide APP states that the open pit and the resulting passive containment capture zone will be used as an integral part of BADCT for the Stockpile and several other permitted facilities at the mine. The BADCT demonstration for the Stockpile is based upon site-specific characteristics, which include a combination of crystalline bedrock with a low hydraulic conductivity and northward sloping topography beneath the Stockpile. In addition, the presence of an inward hydraulic gradient (or cone of depression) created by the excavation of the open pit captures groundwater potentially impacted by the Stockpile. These site-specific characteristics are discussed in detail in Sections 5.1 and 5.2. Together, these site-specific characteristics comprise the "passive containment capture zone" required for BADCT demonstration and are summarized in the APP as follows:

> *Based on supporting documentation provided in the Application, the permittee has satisfactorily predicted that the Bagdad open pit mine will create a 'passive containment capture zone,' as per ARS § 49-243(G). The water balance in the numerical model for the Bagdad open pit predicts that static equilibrium will be maintained in the pit lake following closure at a maximum elevation of 2,410 feet [amsl]. Passive containment of the hydraulic capture zone will be maintained if the pit lake elevation remains below 2,750 feet amsl. The model estimates that static equilibrium in the pit lake will not be reached for approximately 500 years.*

The APP requires a review and update of the approved groundwater model every five years to compare current groundwater data to previous model predictions. The model review evaluates available data on groundwater inflow, the estimated static water level in the pit, the estimated time to reach static water level, and the potential for the water level in the pit to rise to an elevation where the pit ceases to function as a passive containment capture zone. The first review and update of the groundwater model is due to the ADEQ on March 25, 2014. The preliminary results of the review and update of the groundwater model are depicted in Figure 6. The groundwater contours shown in the figure estimate the current elevation which separates saturated from unsaturated bedrock. Beneath the Stockpile and proposed Stockpile extension (and other areas surrounding the open pit), the groundwater gradient is sloped in the direction of the open pit. Therefore, the review and update of the groundwater model continues to demonstrate the inward hydraulic gradient created by the open pit. Additionally, the Stockpile extension is proposed entirely on northward sloping topography underlain by the low hydraulic conductivity crystalline bedrock, ensuring that the Stockpile and proposed Stockpile extension will continue to convey stormwater flow and leachate to the open pit.

Figure 2 depicts the facilities regulated under the area-wide APP related to the operation of the Stockpile, and a brief description of the facilities and the applicable BADCT are provided in Table 3.

The Alum Sump PLS and Kimberly ponds are identified as process solution impoundments within the passive containment capture zone in the APP. To maintain compliance with the BADCT, these facilities are equipped with pumps, as needed, to maintain a controlled, ponded surface elevation and minimize the risk of overtopping during storm events. Should overtopping occur for catchments within the pit area, the overflow solution will be contained within the passive containment capture zone of the open pit; these areas do not have the potential to discharge stormwater to downgradient, receiving waters.

Table 3 APP Facilities for Stockpile Operation

Facility	Facility Description and BADCT
Plan IX Leach Stockpile and South Waste Rock Stockpile (collectively, the Stockpile)	The Stockpile (including both the Plan IX Leach and South Waste Rock portions of the facility) is located within the passive containment capture zone of the open pit. The Plan IX Leach portion of the Stockpile is a low-grade leach facility located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock, and constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (pregnant leach solution or PLS) from the Stockpile is collected at the downstream toe of the facility and gravity flows to the Alum Sump PLS Pond and Kimberly Pond catchments. To minimize discharge, surface water run-on is diverted away from the facility and is ultimately captured by the open pit. The South Waste Rock Stockpile portion of the facility is a waste rock stockpile for mining overburden and is not leached.
Alum Sump Pregnant Leach Solution (PLS) Pond	The facility is a lined impoundment designed to receive leachate from the Stockpile. The impoundment has a total solution capacity of approximately 774,000 gallons, including approximately 414,000 gallons at the normal operating level, and an approximate total depth of 12 feet, including 8 feet at the normal operating level. Accumulated process solution is pumped through a high-density polyethylene (HDPE) pipeline to the SX/EW plant. The Alum Sump PLS Pond is located on private land, on a bench in the pit at an elevation of 3,200 feet amsl and is within the passive containment capture zone of the open pit. The impoundment is lined with an 80-mil HDPE geomembrane underlain with a minimum 1-foot thick compacted subgrade, constructed of select on-site alluvial material, and overlain with 2 feet (minimum) aggregate cover to protect the liner from rock fall. The geomembrane is secured by an engineered trench. A water-tight seal is located at the southwest corner of the impoundment to receive PLS from the existing bedrock seeps onto the liner embedded in non-shrink grout. A 3-foot-high berm has been constructed between the pit wall and the impoundment to prevent liner damage from rock fall. Surface water runoff is diverted away from the facility. During process upset or severe storm events, the overflow reports to the open pit.
Kimberly Pond (process solution impoundment)	The Kimberly Pond is situated on private land within the passive containment capture zone of the open pit. The facility receives leachate and stormwater runoff from the Stockpile. The base of Kimberly Pond is comprised of a 2-foot thick layer of compacted Gila conglomerate. The area is underlain by crystalline bedrock that is covered with approximately 150 feet of Kimberly tailings from earlier mine workings. The pond has an operating solution holding capacity of approximately 17.9 million gallons. The pond is protected from stormwater run-on by ditches and berms and is surrounded on all sides by leach stockpiles. Stormwater is directed to the open pit. A slope stability analysis for Kimberly Pond has determined acceptable factors of safety for both static and pseudostatic loading conditions.

1.7.2.2.2 Compliance with Aquifer Water Quality Standards

APP applicants are also required to demonstrate that discharged pollutants will not cause or contribute to a violation of aquifer water quality standards at POC(s). The APP states:

> *The permittee shall construct, operate, and maintain the permitted facilities [including the Stockpile and applicable to proposed Stockpile extension]:*
>
> 1. *Following all the conditions of this permit including the design and operational information documented or referenced [in the permit], and*

> 2. *Such that Aquifer Water Quality Standards are not violated at the applicable [POCs] set forth [in the permit], or if an [Aquifer Water Quality Standard] for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant, and as determined at the applicable POC, occurs as a result of the discharge from the facility.*

In accordance with these two overarching requirements of the APP, the Bagdad Mine area-wide APP specifies aquifer quality limits (AQL) and alert levels (ALs) for the individual POCs based on the aquifer water quality standards and ambient conditions.

The POCs for the Bagdad Mine area-wide APP are listed in Table 4 and are depicted in Figure 2. Quarterly and biennial monitoring is required at each POC well for physical and chemical parameters to demonstrate adherence to the AQLs established in the permit.

Table 4 Points of Compliance for the Bagdad Mine Area-wide APP

Point of Compliance ID	Latitude	Longitude	ADWR Well Registration No.
609	34° 36’ 25” N	113° 13’ 57” W	55-537609
610	34° 36’ 25” N	113° 13’ 56” W	55-537610
611	34° 35’ 51” N	113° 13’ 26” W	55-906854
020	34° 35’ 47” N	113° 16’ 57” W	55-562020
803	34° 35’ 41” N	113° 17’ 08” W	55-543803
283	34° 35’ 36” N	113° 17’ 57” W	55-55283
613	34° 35’ 17” N	113° 17’ 30” W	55-546613
810	34° 34’ 55” N	113° 17’ 31” W	55-543810

1.7.2.2.3 Summary of Additional APP Requirements

In addition to the demonstration and maintenance of BADCT, the APP defines:

- Operational requirements, which mandate quarterly and precipitation-prompted inspections and monitoring for:
  - Instability/deformation, erosion, debris, and access impairment on the Stockpile
  - Operational condition and structural integrity of pumps, valves, and structures related to the process solutions impoundments
- Discharge limitations, requiring permitted facilities to be operated and maintained to prevent unauthorized discharges resulting from failure or bypassing BADCT pollutant control technologies
- Monitoring, reporting, and recordkeeping requirements, including facility and operational monitoring, groundwater monitoring, and sampling protocols
- Contingency and emergency response plans, which define actions for exceeding ALs or AQLs for groundwater monitoring, discharge limits, operational performance levels (such as freeboard), and leakage rates

The APP defines actions to be taken in the event of violations of discharge limits (such as liner or containment structure failure, unexpected loss of fluid, and overtopping of a surface impoundment), exceedences of ALs, and violations of AQLs. Emergency response and contingency requirements for unauthorized discharges mandate FMBI's duty to respond and act immediately to correct the condition. The emergency response and contingency plan includes measures to isolate, identify, record, and report unauthorized discharges. If needed, the APP provides a process for the implementation of corrective actions (including review and approval by ADEQ for actions beyond emergency response) to accomplish any of the following goals in response to exceeding an AL or violation of an AQL, discharge limit, or other permit condition:

- Control of the source of an unauthorized discharge
- Soil cleanup
- Cleanup of affected surface waters
- Cleanup of affected parts of the aquifer
- Mitigation to limit the impact of pollutants on existing uses of the aquifer

The APP program also requires a demonstration of the technical and financial capability of the applicant to carry out the terms and conditions of the permit and the maintenance of financial assurance throughout the life of the facility, including operational, closure, and post-closure periods.

1.7.2.2.4 Closure and Post-Closure

The APP permit requires a closure and post-closure plan which outlines the strategy to achieve clean closure at the end of mining. During operations, the closure plan must provide sufficient detail to establish the required financial assurance. When the Bagdad Mine intends to cease operations permanently, the APP requires ADEQ notification and submittal of a final closure plan for approval. The final closure plan must include site investigations, designs, and a schedule to identify and address potential contamination of soils and groundwater. Post-closure monitoring and maintenance activities are also mandated under the APP program until approval of clean closure is achieved or a post-closure plan for controls and monitoring is approved. The closure and post-closure plan for the Stockpile are discussed further in Section 6.0 of this MPO Modification.

The financial assurance required by the APP for closure activities has been established and maintained with the ADEQ, and will be updated in accordance with the APP requirements as necessary.

1.7.2.3 Arizona Department of Water Resources Permitting

The Arizona Department of Water Resources (ADWR) administers programs for the management of the drilling of groundwater wells and the use of groundwater and surface water. These programs include:

- Drilling and Water Use: A notice of intent to drill must be filed with the ADWR for the installation of groundwater production wells, piezometers, and monitoring wells.
- Appropriations of Surface Water: The use of surface water is subject to appropriation and beneficial use, as administered by the ADWR.

- Withdrawal and Use of Groundwater: Use of groundwater in Arizona is administered by the ADWR. Outside of active management areas (which includes the Bagdad Mine), the use of groundwater may be used for any reasonable and beneficial use.

The Bagdad Mine maintains compliance with the programs administered by the ADWR.

1.7.3 Air Permit

The Clean Air Act (CAA) established primary and secondary National Ambient Air Quality Standards (NAAQS). The ADEQ administers air quality permitting in Arizona, requiring sources of air pollution to obtain permits to ensure compliance with applicable federal and state air pollution control requirements and air quality standards.

The Bagdad Mine operates under an active Class II Synthetic Minor air quality permit number 29846, which covers air emissions from the Bagdad Mine facilities and associated infrastructure. The air quality permit states that the Bagdad Mine has the potential to emit more than 100 tons per year of particulate matter with an aerodynamic diameter of less than 10 microns (PM_{10}), and that the mine will operate air pollution controls and accept voluntary emissions limitations to stay below the major source threshold. This permit currently is valid through December 7, 2014. The changes proposed in this MPO Modification are not anticipated to require a change in the air emissions and air permitting (*i.e.*, no changes in production rates or equipment are anticipated by the actions described in this MPO Modification). Regardless, changes will be evaluated to determine applicability of the air quality permit requirements, and FMBI will request the appropriate modifications, if needed.

1.7.4 Hazardous Waste Permit

Management of hazardous wastes, including those generated by the minerals industry, is regulated under the Resource Conservation and Recovery Act of 1976 (RCRA). The RCRA regulations establish a comprehensive hazardous waste management system that governs the management of hazardous waste from the point of generation through final disposition. The EPA has generator standards that address on-site accumulation of hazardous waste, cradle-to-grave tracking (manifest system), labeling, and recordkeeping and reporting requirements.

The Bagdad Mine is identified as a small quantity generator and maintains compliance with the requirements under RCRA for hazardous waste management under Hazardous Waste EPA identification number AZD-083717843.

2.0 STOCKPILE EXTENSION MODIFICATION TO THE MINE PLAN OF OPERATIONS

This MPO Modification proposes an increase to the area of surface disturbance of BLM-managed land associated with the Stockpile at the Bagdad Mine. An additional 441 acres of surface disturbance to BLM-managed land will provide for the construction, operation, closure and post-closure of the proposed Stockpile extension. As discussed in Section 1.7.1.1, approximately 671 acres of BLM land has been previously approved for disturbance. Including the prior approvals, a total of 1,112 acres of BLM-managed land (671 acres of prior approvals in Sections 8 and 9 of Township 14 North, Range 9 West plus 441 acres delineated as the proposed limit of Stockpile extension) will be approved for disturbance for the construction, operation, closure and post-closure of the Stockpile and proposed Stockpile extension. The proposed Stockpile extension is depicted in Figure 4 and Figure 5 and is discussed in detail in Section 2.1.1.

In addition, this MPO Modification contemplates the installation of limited, distributed facilities on an as-needed basis in the future. The surface disturbance proposed for the limited, distributed facilities is not anticipated to exceed a cumulative total of 150 acres of the approximately 670 acres of BLM-managed lands identified in Sections 16 and 17 of Township 14 North, Range 9 West. The area for future, distributed facilities is depicted in Figure 4 and Figure 5 and is discussed in detail in Section 2.1.2. Distributed facilities may also extend into the area of the proposed Stockpile extension.

Table 5 Approximate Proposed Disturbance Areas

	BLM-Managed Land Area (acres)	Private Land Area (acres)	Total Area (acres)
Proposed limit of Stockpile extension	441	79	520
Distributed facilities	150	2	152
Total	591	81	672

Notes:

- Slight discrepancies may exist in subtotal and total values due to rounding.
- Distributed facilities may be constructed within the proposed limit of Stockpile extension; the disturbance area for such cases is accounted for within the proposed limit of Stockpile extension.
- Approved and proposed disturbances on private lands are not subject to BLM authorizations; the area of private land delineated is limited to the "islands" of private land (completely surrounded by BLM-managed land) and occurring in Sections 16 and 17 of Township 14 North, Range 9 West of the GSRB&M.
- FMBI will continue to use and maintain (if needed) existing roads in the vicinity of the Bagdad Mine for light vehicle access; existing roads are not delineated in this table.

This MPO Modification presents a conceptual or preliminary level of planning and engineering for the Stockpile extension and distributed facilities necessary for the construction, operation, monitoring, closure, and post-closure of the mine. This MPO Modification provides the basic information related to the proposed limits of disturbance, location, operations, type of waste generated, and engineering factors to evaluate the project performance. The content in this MPO Modification may be updated or appended to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available. This approach is proposed in order to preclude the need for future plan amendments as the mine plan for Bagdad is advanced and refined and is consistent with Sections 4.3.3.2.2 and 4.4.3.2 of the H-3809-1 Surface Management Handbook (BLM, 2012).

2.1 PROPOSED FACILITIES AND FEATURES

2.1.1 Stockpile Extension

This MPO Modification proposes both the lateral and vertical extension of the Stockpile. Figure 4 (with an aerial photograph background) and Figure 5 (with a USGS quadrangle map background) depict the proposed limit of Stockpile extension and the existing and conceptual extents of the Stockpile. The conceptual extent of the Stockpile is based on preliminary planning and engineering estimates of the required rock storage volume and side slopes. The final design, construction, and actual configuration of the Stockpile extension may vary to accommodate adjustments or refinements to the engineering design and/or possible slope stability, safety, access, water management, or other construction, operational, closure or post-closure needs. Additionally, FMBI recognizes that as economics change in the future, a degree of flexibility in the Stockpile configuration is desirable. For these reasons, this MPO Modification identifies the proposed limit of Stockpile extension as the anticipated, maximum area of disturbance. The identification of the upper limit on the facility size to accommodate FMBI's potential future needs avoids fragmenting the approval process later with modifications and is consistent with the approach described in Section 4.3.3.2.2 of the H-3809-1 Surface Management Handbook (BLM, 2012).

The operation of the expanded Stockpile will continue in the same manner as the current Stockpile. Overburden and mineralized waste rock materials from the open pit will continue to be placed on the Stockpile by haul trucks. Leaching will occur on the western, Plan IX Leach portion of the Stockpile, and overburden/mineralized waste rock will be stored on the eastern, South Waste Rock portion of the Stockpile. Figure 4 and Figure 5 depict the maximum extent of leaching for the existing portion of the Stockpile (as established under the existing APP P-105258) and estimates the future location of this dividing line over the proposed Stockpile extension; leaching will not occur east of this line.[1] Leaching operations will continue the application of raffinate to the surface of the Plan IX Leach portion of the Stockpile and proposed Stockpile extension. Leaching operations and processing are further discussed in Section 2.2.6.

A topographic map of the Stockpile configuration at the end of mining is provided in Figure 7, and Figure 8 depicts representative cross sections of the conceptual Stockpile configuration at the end of mining. The southern boundary of the proposed limit of Stockpile extension generally corresponds to the drainage divide (ridgeline) between the Burro Subbasin (HUC8 15030202) and the Santa Maria Subbasin (HUC8 15030203), as depicted in Figure 5.[2] Stockpiled materials will not be placed south of this drainage divide. As discussed in Section 1.7.2.1.2, stormwater runoff from the existing Stockpile is currently directed to the passive containment capture zone of the open pit. Stormwater runoff from the Stockpile extension will also be directed to the passive containment capture zone of the open pit, and is further discussed in Section 2.4.

[1] The location of the maximum extent of leaching is estimated for the proposed Stockpile extension; the final location of this line will be established under APP P-105258.

[2] The southern boundary of the proposed limit of Stockpile extension corresponds to the drainage divide based on site flown topographic contours that are more refined that the HUC drainage divide produced by the USGS.

Construction of the Stockpile will generally consist of placement of mined materials in 50-foot lifts. In accordance with requirements of the Mine Safety and Health Administration (MSHA), safety berms will be constructed at the edge of each lift. Benches (generally designed to be 115-feet wide) will be constructed roughly every 250 to 300 feet of elevation for slope stability and to catch potential rockfall.

The inter-bench and overall slope angles of the Stockpile will vary depending on location and existing topography. Generally, the side slopes will be shallower toward the open pit and steeper where the Stockpile extension ties into up-sloping natural terrain. Inter-bench slopes may be up to the angle of repose,[1] which is approximately 35 to 45 degrees for the coarsely broken mineralized waste rock and overburden. However, accounting for the slope stability benches, the overall slope angle may be up to approximately 22 degrees. The geotechnical stability of the Stockpile is subject to review by the ADEQ under the requirements of the APP, including a demonstration of the stability under static and pseudostatic loading conditions, and is further discussed in Section 2.2.4.3.

In addition, the Stockpile configuration must be routinely monitored, inspected, documented, and reported under the terms of the APP. This includes visual inspections on a monthly basis (or following specified precipitation events) for deformation and instability such as surface cracking, slides, sloughs, and differential settlement. The APP also mandates appropriate action to evaluate and remedy signs of instability. Monitoring requirements are further discussed in Sections 2.6 and 3.3. Stockpile construction also accounts for concurrent reclamation, by conducting material placement in a manner such that it will not require major reshaping to meet the reclamation standards or goals.

Access to the Stockpile will vary over time, with traditional mine haul trucks delivering rock from the open pit over an extensive ramp system. Access roads will be built into the lifts, at a maximum 10 percent grade and will meet or exceed MSHA standards. MSHA standards are based on the largest vehicle traversing the roads, and require berms equal to the mid-axel height (approximately seven feet) and roadway widths to accommodate one half the vehicle width on each side. Thus, the surface width of a two-direction haul road will be a minimum of approximately 110 feet, or 3.5 times the width of the largest vehicle (approximately 31 feet). The current Stockpile has been constructed using traditional mine haul truck equipment. Additional mine equipment supporting Stockpile operations include: track dozers for safety berm construction, spreading of placed material, and ramp construction; a grader and tire dozer for haul road maintenance; and water trucks for dust suppression. The same equipment will continue to be used for the Stockpile extension.

2.1.2 Distributed Facilities

The distributed facilities proposed in this MPO Modification fulfill the need for future, support facilities that are typically associated with mining operations to meet safety, environmental, operational, closure, and post-closure requirements. As depicted in Figure 4 and Figure 5, the distributed facilities are contemplated south of the drainage divide that demarks the southern limit of the proposed Stockpile extension, although facilities may also be constructed within the area proposed for the Stockpile extension. While the area identified for limited, future, distributed facilities encompasses a total of

[1] The angle at which loosely placed rock will stand under its own weight.

approximately 670 acres of BLM-managed lands, the surface disturbance from individual distributed facilities will be minimized where practicable, and the cumulative total surface disturbance for distributed facilities is not anticipated to exceed 150 acres.

The basic description and typical configuration of possible distributed facilities are presented in Appendix C. Distributed facilities may include, but are not limited to:

- passenger vehicle/light-duty truck access roadways;
- linear features and utilities (such as, power lines, raw or process water lines, and/or gas lines);
- monitoring wells;
- communications equipment and apparatus;
- water management facilities;
- wildlife monitoring stations;
- signage, barriers, or berms;
- scientific monitoring equipment; and/or
- geotechnical/slope stability monitoring equipment.

As an example, access roads may be necessary where routes do not currently exist and would be planned for the minimum width needed for operations; access roads would follow natural terrain where practicable to minimize cut and fill. FMBI will continue to use and maintain existing roads in the vicinity of the Bagdad Mine for light vehicle access, as needed; use and maintenance of existing roads will continue and is not subject to approval under this MPO Modification.

The distributed facilities represent a preliminary level of planning. FMBI anticipates that a condition of the approval of this MPO would require the submittal of final engineering plans to the BLM prior to ground disturbing activities related to the distributed facilities. FMBI would incorporate findings, requirements, and/or mitigation, as appropriate, resulting from the environmental review under NEPA into final engineering plans.

Alternately, FMBI may request or the BLM may require a new modification to the MPO pursuant to 43 CFR 3809.430 or 3809.431, respectively. In such instance, the BLM may elect to initially review such future modification(s) to the MPO for the development of features consistent with these concepts using a DNA, and possibly accept such modifications as a minor modification pursuant to 43 CFR 3809.432(b), which states "BLM will accept a minor modification without formal approval if it is consistent with the approved plan of operations and does not constitute a substantive change that requires additional analysis under NEPA." If final engineering plans or modification requests do not fall under 43 CFR 3809.411(d)(2) or 3809.432(b), then FMBI may request or the BLM may require a review of a new modification pursuant to 43 CFR 3809.432(a), which states "BLM will review and approve a modification of your plan of operations in the same manner as it reviewed and approved your initial plan."

2.2 OPERATIONS AND PROCESSING

The following sections provide an overview of mining operations and processing that occur at the Bagdad Mine. The majority of the mining operations occur on private lands and are not elements proposed in this MPO Modification or subject to the requirements of 43 CFR 3809.

2.2.1 Mine Production

The FMBI operation includes an open pit copper mine with oxide and sulfide mineralization that is processed by SX/EW and conventional sulfide concentration methods. The mine has operated as an open pit operation since the middle of the 20th century. Conventional drilling, blasting and stripping techniques are used to generate ore for processing, mineralized waste rock for leaching, and overburden materials from the open pit. The open pit, SX/EW plant, mill and processing facilities are located on private lands.

2.2.2 Material Handling Techniques

After blasting, the materials are loaded into haul trucks for delivery to the appropriate destination. Ore is directed to the mill for processing. Leachable, mineralized waste rock is delivered to leach stockpiles around the periphery of the open pit; overburden materials are stockpiled in several locations. A computer-based truck dispatch system maximizes production by optimally routing trucks to and from the shovels and stockpiles.

2.2.3 Mine Production Rate

The mine production rate is currently around 220,000 tons per day of combined mill ore, mineralized waste rock, and overburden. Currently, the production rate is approximately 80,000 tons per day of ore and 140,000 tons per day of mineralized waste rock and overburden; however, the ratio of ore to waste rock/overburden varies over the life of the mine, generally with an increase in the amount of ore and a reduction in waste rock and overburden generation towards the end of mine life.

2.2.4 Rock Management

2.2.4.1 Rock Characterization

The materials generated from the open pit are placed in three categories: ore, mineralized waste rock, and un-mineralized overburden. Ore material is characterized by assay determinations from blasthole drill cuttings and supplemented by visual geologic characterizations. Material with an assay grade above the copper minimum is directed to the mill for processing (ore); the remaining material is directed to stockpiles as mineralized waste rock. The ore cutoff grade which distinguishes ore from mineralized waste rock varies based on economics. Un-mineralized overburden material generally consists of Gila conglomerate and basalt and may be placed in separate stockpiles to be used for future reclamation needs. For the Stockpile extension, ore and waste rock determinations will continue to be completed as in current operations. Given the generally uniform characteristics of the materials directed to the Stockpile, placement is determined primarily by access routes and haul distance.

2.2.4.1.1 Ore Material

The ore and associated minerals are generally grouped according to their origin; those formed by ascending ore-forming solutions (hypogene minerals) and those formed by the action of descending solutions (supergene minerals). Hypogene alteration and mineralization of the quartz monzonite at Bagdad resulted in the formation of quartz, orthoclase, albitic plagioclase, leafy biotite, sericite, pyrite, chalcopyrite, and molybdenite. Supergene enrichment formed a chalcocite blanket before accumulation of the Gila conglomerate; the dominant northeast faults were important in controlling deposition of the chalcocite. The geology of the area is further discussed in Section 5.1.

2.2.4.1.2 Mineralized Waste Rock

Mined materials that do not contain mineralization above the cutoff grade are directed to stockpiles. Generally, the mineralized waste rock includes portions of the quartz monzonite porphyry and minor quantities of porphyritic veins, dikes, and plugs along faults, fractures, fissures, and the surrounding Precambrian granitic and metamorphic rocks. Mineralized waste rock placed on the Stockpile may or may not be leached to recover residual copper. The eastern, South Waste Rock Stockpile portion of the facility currently is not permitted for leaching activities. Previously, the materials placed on the eastern portion of the Stockpile have included relocated mill tailings, mineralized waste rock, and un-mineralized overburden.

2.2.4.1.3 Un-mineralized Overburden

The un-mineralized overburden predominantly consists of Gila conglomerate and basalt. Because of its silt and clay content and un-mineralized character, the Gila conglomerate makes ideal cover material and is readily revegetated. Calcium carbonate cementation of the Gila conglomerate is substantial, helping to neutralize acid when placed in contact or mixed with rocks of an acidic nature. Gila conglomerate material may be used for surfacing the coarse rock ramps and stockpile levels to minimize tire wear and other maintenance costs. Due to its origin, and chemical and physical make up, Gila conglomerate and the basalt are inert and non-acid generating (due to a lack of mineralization); these materials do not pose a risk to the environment.

2.2.4.2 Acid-generating Potential

The mineralized waste rock and other materials (un-mineralized overburden) to be placed on the proposed Stockpile extension are the same materials that have been placed on the Stockpile in the past. A series of analyses was performed to determine the acid-generating potential of the various rock types in the vicinity of the open pit, as documented in the Draft EIS (BLM, 1995a). The majority of the rock types are not acid-producing, with the exception of the quartz monzonite porphyry, which generally is characterized as ore material and directed to the mill for processing. The *Closure Plan – South Waste Rock Disposal Facility* (Titan Environmental Corporation, 1995) also assessed the acid-generating potential for the mineralized waste rock and other materials. Based on acid base accounting with a strong digestion, there is a 78% probability that the rocks tested were net neutralizing, and when a weak digestion was used (in order to simulate pyrite content) there is a 98% probability that rocks are net-neutralizing. Rocks with negative net neutralizing potential that were subjected to humidity test cells produced ultimate leachates above a pH of 5 (the minimum to allow vegetation to germinate) with only one exception.. The text, tables, and detailed analysis of the acid-generating potential of materials to be placed in the Stockpile, and proposed Stockpile extension, from the 1995 Closure Plan are reproduced in Appendix D.

The identification, handling, and control of potentially acid-forming materials is managed through the establishment of the passive containment capture zone, demonstration of BADCT compliance, and monitoring requirements mandated by the APP.

2.2.4.3 Geotechnical Stability

The geotechnical stability of the Stockpile is subject to review by the ADEQ under the requirements of the APP, including a demonstration of the stability under static and pseudostatic loading conditions.

Pursuant to the stability design guidance in Appendix E of the *Arizona Mining BADCT Guidance Manual* (ADEQ, 2005), SRK Consulting completed a stability analysis for the Plan IX Leach portion of the Stockpile in 2009. Geotechnically, the mineralized waste rock that will be placed on the proposed Stockpile extension is the same as the material previously placed. Further, the Stockpile extension will be built at the same slope angles as the existing stockpile facility. Thus, the 2009 stability analysis is still valid and demonstrates that the Stockpile extension will be stable. Additionally, the existing Stockpile has been in place in a similar configuration for more than 30 years (on private lands) and has exhibited no major slope failures, further verifying the geotechnical evaluation results.

The ADEQ stability design guidance requires factors of safety of 1.5 for static conditions and 1.1 for pseudostatic loading conditions. The geotechnical model for the stability analysis assumed (SRK, 2009):

- The mineralized waste rock generally consists of coarse-grained, angular gravel and rock fragments with a median grain size (D50) of about 10.5 inches.
- Shear strength parameters for the mineralized waste rock were back-calculated based on observation and measurement of small scale failures, including:
    - internal friction angle (φ) of 34 degrees
    - cohesion (c) of 20 pounds per square foot
- The foundation materials consist of a limited thickness of alluvium, colluvium and/or residual soil and crystalline bedrock which outcrops at the surface, and was assigned strength parameters for the geotechnical model of
    - friction angle (φ) of 45 degrees
    - cohesion (c) of 1,500 pounds per square foot
- The leach facility was assumed to be free-draining (high permeability with no excess pore pressure buildup), in accordance with the facility design and nature of the granular, mineralized waste rock

In addition, the stability analysis considered pseudostatic loading conditions, using a horizontal acceleration in the geotechnical model. A site-specific seismic peak ground acceleration of 0.058 g was assumed based on USGS seismic risk mapping for a 10 percent probability of occurrence in 50 years.

2.2.5 Milling and Flotation Processing

Blasted ore from the open pit that is directed to the mill undergoes primary, secondary, and tertiary crushing to reduce the ore size, increasing the surface area to facilitate the release of minerals. The crushed ore is fed to the concentrator where it is mixed with water in mills to achieve further size reduction. Reagents are added to the resulting slurry, which is conveyed to flotation cells. Air is bubbled through the flotation cell where the reagents and air create a froth to which select minerals attach and float to the surface; the froth is skimmed from the surface and collected as a concentrate. Waste particles sink to the bottom of the flotation cell and are sent to a thickening tank prior to deposition in the tailings impoundments.

2.2.6 Leaching

Stockpile leaching starts with the application of raffinate, a dilute sulfuric acid solution, to the stockpiled materials via a network of corrosion-resistant pipelines arranged on the surface of each lift. Figure 9 depicts a schematic of the typical distribution system piping layout for raffinate delivery on the surface of

each lift. Generally, raffinate is pumped via a HDPE main header pipeline, typically ranging in diameter from 12 to 36 inches; the typical HDPE pipeline has a standard dimension ratio[1] of 11, providing a general pressure rating of approximately 160 pounds per square inch. As the height of the Stockpile increases, the header pipeline(s) may require different materials to accommodate a higher pressure rating. On top of each lift, the distribution system piping progressively steps down in size, teeing to delivery headers and then to feed lines, typically 4 inches in diameter. The feed lines typically extend about 400 feet to distribute raffinate to a series of roughly parallel, 18-millimeter diameter polycarbonate drip lines. The drip lines are typically spaced about two feet apart and extend about 200 feet from the feed line. Emitters on the drip lines apply the raffinate to the surface of the lift and typically are spaced at approximately 18 inches. A distribution line completes the loop, tying the ends of the drip lines back to the delivery header. Multiple loops of feed lines, polycarbonate drip lines, and distribution lines typically are installed across the surface of each lift of the Stockpile. Valves and fittings are used as appropriate to connect pipelines, and are typically stainless steel (for the large diameter main and header pipelines) or polypropylene (for feed and delivery lines). The layout, materials, and sizes of the actual raffinate distribution system may vary from this description.

Ancillary facilities requiring electrical power (such as booster pumps, filters, or meters) will be installed as required. For example, booster pumps may be needed as the Stockpile increases in height. Booster pumps may be anticipated along pipeline routes to the top of the Stockpile at 200- to 400-foot vertical intervals. Alternately, pumping may be accomplished by increasing the capacity and size of existing pumps located on private land. Pumps would be electric with power delivered by generator or temporary power line (which would be anticipated to parallel the main header pipeline and/or haul road). Booster pumps would likely be located on the north or northwest side of the Stockpile, between the SX/EW and leaching location.

Raffinate is applied to the surface of each lift via the drip line emitters; the raffinate percolates downward through the stockpiled materials and dissolves soluble minerals. The raffinate increases in metals concentration as it flows to the bottom of the Stockpile. The resulting fluid, PLS, reaches the bottom of the Stockpile where it perches on top of the natural, crystalline bedrock. Perching occurs because the leach application rate is several orders of magnitude higher than the hydraulic conductivity of the underlying crystalline bedrock (refer to Section 5.2.1). Perched PLS then follows the natural grade, northward, to leach collection facilities (Kimberly Pond and the Alum Sump PLS Pond) at the toe of the Stockpile. The Kimberly and the Alum Sump PLS ponds are located on private land. From the leach collection facilities, the PLS is pumped to the SX/EW plant in pipelines. The SX/EW plant recovers the metals from the PLS, producing copper cathodes. The process water is recycled as raffinate that is returned to the Stockpile to restart the process. Leaching facilities, including the Plan IX portion of the Stockpile, are subject to regulation by the APP as described in Section 1.7.2.2.

2.3 AIR QUALITY MANAGEMENT (MINE DUST CONTROL)

The fugitive dust emissions from open areas, roadways, storage piles, and material handling areas, including the Stockpile, proposed Stockpile extension, and haul roads, are regulated under the current Bagdad Mine air quality permit. The air quality permit requires:

[1] Standard dimension ratio is the ratio of the nominal outside diameter of a pipe to its nominal wall thickness.

- Opacity of emission from fugitive dust non-point sources must not exceed 40 percent; and
- Opacity of emission from fugitive dust point sources must not exceed 20 percent.

In addition, the air quality permit requires that FMBI use reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne, such as watering or applying approved dust suppressants or adhesive soil stabilizers to control visible emissions from haul roads and storage piles.

While water generally is applied for dust control, dust suppressants or adhesive soil stabilizers may be used on the Stockpile and proposed Stockpile extension. Dust suppressant products are designed to form a hard crust that can withstand vehicle traffic on unpaved roads or elevated winds on bulk storage piles. Surfactants are non-petroleum based organics which, when added to water, reduce surface tension for better water penetration into subsurface soil layers before or during active earthmoving. Adhesive soil stabilizers may include synthetic polymer or organic dust suppressants to bind soil particles together and generally can be used to form a firm, stabilizing crust. Typical dust suppressant products may include the following, or similar, products:

- Chem-Loc 101 (surfactant)
- Enviro RoadMoisture 2.5 (surfactant)
- Durasoil (synthetic organic)
- Jet-Dry (surfactant)
- Haul Road Dust Control (surfactant)
- EnviroKleen (synthetic polymer)

The air quality permit requires monthly, visual surveys of emissions by a certified observer and specifies sampling and reporting requirements. In addition, posted truck speeds are limited to 35 miles per hour, and trucks typically travel at substantially lower speeds, particularly when loaded and/or traveling uphill.

2.4 WATER MANAGEMENT PLAN

The existing Bagdad Mine has been engineered to minimize water use, control erosion and sedimentation, and manage surface water and groundwater. Surface water and groundwater quality and quantity will continue to be protected throughout the period of proposed activity and following closure, in accordance with the requirements of the APP, MSGP, and other applicable federal and state permits and regulations.

In general, the existing water management system practices will continue within the proposed limit of Stockpile extension. PLS collection system facilities (including Kimberly and the Alum Sump PLS ponds, discussed in Section 2.2.6) will continue to collect and convey process solutions to the Bagdad Mine process water management system and the SX/EW plant.

Stormwater on the Stockpile is allowed to infiltrate or is directed to the open pit. As discussed in Section 1.7.2.1.2, much of the Bagdad Mine is contained within a hydrologic boundary and does not discharge stormwater to downgradient, receiving waters. In these areas, stormwater is collected and used as process water or is left in the collection area and disposed through evaporation. As discussed in Section 2.1.1, the Stockpile extension is proposed at the top of the Burro Subbasin, and stormwater flows are directed northward to the open pit. Stormwater management facilities may be constructed and maintained at the toe of the Stockpile to prevent erosion and direct flows to collection facilities, but stormwater runoff from

the Stockpile and Stockpile extension does not have the potential to reach downgradient, receiving waters. Stormwater runoff from the Stockpile and proposed Stockpile extension will be captured by the passive containment capture zone.

In addition to the mine features associated with water management, the APP includes specific plans, controls, and monitoring of surface water and groundwater. The requirements of the APP are discussed in Section 1.7.2.2.

The management of surface water across the Bagdad Mine will continue to include the implementation of structural and non-structural controls and BMPs for pollution prevention. Controls will be selected for specific activities and potential pollutants will be identified, as outlined and required in the SWPPP, with consideration of the following:

- Preventing stormwater from coming into contact with polluting materials is generally more effective and less costly than trying to remove pollutants from stormwater.
- Using control measures in combination is more effective than using control measures in isolation for minimizing pollutants in the facility's stormwater discharge.
- Attenuating high discharge flows using control measures such as open vegetated swales and natural depressions to reduce in-channel impacts of erosive flows.
- Conserving and/or restoring riparian buffers will help protect streams from stormwater runoff and improve water quality.
- Using containment to intercept stormwater flows before they leave the site, such as directing flows to non-discharging areas (such as the open pit), or installing runoff containment.

Currently, the Bagdad Mine has access to sufficient water supplies to cover water use. The primary water demands at the mine include milling, dust control on roadways, and use as a constituent of the leach solution. No additional demand for water is expected as part of this MPO Modification; leach application rates would not change, and dust control needs and roadways lengths do not change appreciably.

2.4.1 Stormwater Management for the Proposed Stockpile Extension

Stormwater management for the proposed Stockpile extension will address runoff from 1) surfaces and benches and 2) upgradient, native ground.

Stormwater runoff from the surfaces and benches on the proposed Stockpile extension will be managed using the same techniques currently employed on the Stockpile, as described in the *Closure Plan – South Waste Rock Disposal Facility* (Titan Environmental Corporation, 1995). The proposed Stockpile extension will be graded to drain surface runoff towards the open pit by allowing stormwater to flow along roads and perimeter ditches to the west, east, and north. Stormwater retention structures are not anticipated on BLM-managed lands during operations or reclamation. Ditches and other conveyance structures will be designed to carry runoff generated from the 100-year, 24-hour design storm event (estimated as 4.8 inches of precipitation [Titan Environmental Corporation, 1995]).

Stormwater generated from the native ground lying upgradient of the proposed Stockpile extension will be allowed to follow existing, natural drainage pathways northward to the interface with the Stockpile. At the interface on the south side of the proposed Stockpile extension, stormwater flows may be detained

temporarily. Detained, or ponded, stormwater will drain under the proposed Stockpile extension and the existing Stockpile and will be captured in the Alum Sump PLS Pond and Kimberly Pond catchments; stormwater that is not captured in these catchments would flow to the open pit. Stormwater runoff from the Stockpile and proposed Stockpile extension does not have the potential to reach downgradient, receiving waters and will be captured by the passive containment capture zone.

Stormwater detention at the interface with native ground on the south side of the proposed Stockpile extension will occur at locations where natural drainage pathways are intercepted. The volume of stormwater generated and detained will decrease with Stockpile expansion, as the area contributing runoff decreases. The largest volume of stormwater generated from the upgradient, native ground occurs under current conditions.

A mass balance calculation was performed to estimate the maximum volume of stormwater detained and the time for the detained stormwater to drain beneath the Stockpile. The input to the detained area was estimated from the 100-year, 24-hour storm event (4.8 inches) for the largest subwatershed on the upgradient (south) side of the existing Stockpile using the SCS curve number method. Outflows (drainage of the detained stormwater under the Stockpile) were calculated based on Darcy's Law, modified for the large grain size and steep hydraulic gradients.

The approach predicts the maximum volume of stormwater detained to be approximately 1.7 acre-feet, with an approximate surface area of 0.2 acres at a maximum depth of approximately 8 feet. The areas of detained stormwater are estimated to essentially be dry within 48 hours after the storm event. Using the conceptual extent of Stockpile extension, the maximum volume of stormwater runoff generated from the upgradient, native ground would reduce to less than 0.05 acre-feet.

2.4.2 Stormwater Management for Distributed Facilities

The distributed facilities are anticipated to have a minimal, temporary water demand associated with construction. As individual distributed facilities are defined and planned, the SWPPP will be updated and the appropriate stormwater management controls and BMPs will be implemented as necessary.

2.5 SOLID WASTE MANAGEMENT

Because most maintenance, office, and managerial functions will not occur within the Stockpile or distributed facilities area, additional solid waste generation is anticipated to be negligible. Solid waste generated will be removed from the site and handled in accordance with applicable regulatory requirements and the FMBI waste management policy.

2.6 QUALITY ASSURANCE PLAN

In addition to water and rock management plans, FMBI maintains a number of quality assurance plans (QAPs) that contribute to the environmental quality of the operation and provide for environmental and safety monitoring and mitigation. The QAPs are summarized in Table 6.

Table 6 Quality Assurance Plans

Plan Type	Description
Code of Safe Practice	Mandates all employees and contract employees adhere to proven, safe practices that are common to FMBI operations
Water Quality Monitoring Plans	Plans for monitoring the quality of groundwater pursuant to APP requirements
Water Sample Collection QAP	Procedures for assuring the quality of water samples collected for monitoring the quality of groundwater
Ore and Waste Rock Control Sampling QAP	Procedures for assuring the quality of samples used to determine the content of copper at the working face
Laboratory Analytical Protocols	Procedures used to determine the quality of data generated by analyzing rock samples for ore and waste rock control
Equipment Preventative Maintenance Schedule	Schedule for conducting regular servicing for each piece of equipment used at FMBI
Environmental Management System	Identifies, monitors, and controls environmental aspects and manages compliance with internal procedures and regulatory obligations

The dimensions and configuration of the Stockpile are controlled and monitored through a combination of ground surveys and aerial mapping. FMBI survey crews use survey-grade GPS units to place coded stakes on the ground and measure and record the extent of disturbance. Equipment operators and crews are directed by shift supervisors where to place or move material. After placement, the survey crews verify the appropriate placement of materials. The same procedures will be extended to the proposed Stockpile extension. Upon closure, the Stockpile and proposed Stockpile extension will be reconfigured to accommodate a soil cover on the horizontal surfaces, and minor re-contouring will be performed to establish final stormwater routing. Similar methods of ground surveys and aerial mapping will be conducted to ensure that the final configuration adheres to the closure design.

Additionally, the Stockpile configuration must be monitored, inspected, documented, and reported under the terms of the APP. The current APP monitoring requirements for stability differ between the leached and non-leached portions of the Stockpile. For the Plan IX Leach portion of the Stockpile, visual inspections, and appropriate action, if necessary, are required on a quarterly basis or following precipitation events measuring at least 1 inch in a 24 hour period for:

- instability, including surface cracks, slides, sloughs or unusual differential settlement;
- excessive erosion in conveyances and diversions;
- excessive accumulation of debris in conveyances and diversions; and
- impairment of access.

For the eastern, South Waste Rock Stockpile portion of the facility, the APP mandates monthly visual inspections and appropriate action, if necessary, if there is evidence of dump or stockpile deformation, including surface cracks, slides, sloughs, or differential settlement affecting slope stability.

A log book of the inspections and measurements required by the APP must be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book must be

retained for ten years from the date of each inspection, and upon request, the APP permit and the log book must be made immediately available for review by ADEQ. The information in the log book shall include, but not be limited to, the following information, as applicable:

- Name of inspector;
- Date and shift inspection was conducted;
- Condition of applicable facility components;
- Any damage or malfunction, and the date and time any repairs were performed;
- Documentation of sampling date and time;
- Any other information required by the APP to be entered in the log book, and
- Monitoring records for each measurement shall comply with AAC R18-9-A206(B)(2).

In addition, FMBI maintains certification under the International Organization for Standardization (ISO) 14001. Through the application of this standard, FMBI has established and maintains an Environmental Management System (EMS) that 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. Furthermore, the EMS helps demonstrate FMBI's due diligence in complying with environmental regulations, and includes a number of plans, processes, and tools.

2.7 SPILL CONTINGENCY PLANS

FMBI maintains a number of spill contingency plans applicable to the Bagdad Mine, which detail procedures for prevention, response, and mitigation of releases to ensure protection of the environment. These plans work in tandem with the QAPs presented above and with state and federal permits and the requirements to protect surface water and groundwater. Briefly, the spill contingency plans include a SPCC Plan and an Emergency Preparedness, Contingency, and Response Plan (EPCR). Spill prevention and response procedures are also detailed in the SWPPP, and response protocols are mandated under APP P-105258 for unauthorized discharges, including immediate corrective actions to limit the discharge, oral and written regulatory notification, and a corrective action report detailing the actions taken to mitigate the discharge.

2.7.1 Spill Prevention, Control, and Countermeasure Plan

FMBI maintains a SPCC Plan pursuant to the requirements of 40 CFR Part 112, Oil Pollution Prevention. Under the rule, facilities that could reasonably be expected to discharge oil to navigable waters in quantities that may be harmful must develop and implement SPCC plans. As established in Section 1.7.2, there is no potential for discharge from the Stockpile, proposed Stockpile extension, or other areas within the passive containment capture zone established by the open pit. Nevertheless, the SPCC Plan includes oil-filled containers and equipment located within the open pit, the Stockpile and proposed Stockpile extension on a voluntary basis to identify the associated spill prevention and containment measures. Notably, the open pit provides secondary or tertiary containment as well as equivalent environmental protection in order to address other SPCC Plan requirements.

The SPCC Plan documents the required containment and countermeasures that will prevent oil discharges. The SPCC Plan also requires the implementation and regular review and revision of the plan,

employee training to carry out the plan to achieve the goal of preventing, preparing for, and responding to oil discharges. In addition, the SPCC Plan includes response procedures for a petroleum related product, instructions for the application of sorbent materials and other clean up measures, proper disposal of recovered materials, and notification procedures and requirements.

In addition to the proposed Stockpile extension being covered under the SPCC Plan on a voluntary basis, no modification to the SPCC would be required because no oil-filled containers or tanks are proposed and the same mobile equipment currently in use on the Stockpile will be used for the construction, operation, closure and post-closure of the proposed Stockpile extension.

If necessary, the SPCC Plan will be updated to reflect the final engineering of individual features of the distributed facilities proposed in this MPO Modification.

2.7.2 Emergency Preparedness, Contingency, and Response Plan

The EPCR Plan complies with 40 CFR Part 265 Subpart C – Preparedness and Prevention, 40 CFR Part 355 Subpart B – Emergency Planning, and 40 CFR Part 365 Subpart C – Emergency Release Notification. The intent of the EPCR Plan is to minimize the hazards to human health and the environment from fires, explosions, or unplanned sudden or non-sudden releases to the air, soil, or surface and groundwater associated with the transportation, storage, and use of hazardous materials and wastes at the Bagdad Mine. The EPCR Plan consists of:

- Description of facilities
- Description of hazardous materials
- Emergency response organization and responsibilities
- Emergency response equipment and capabilities
- Coordination with external response organizations
- Emergency response procedures
- Evacuation plans
- Training programs
- Emergency contact information

2.8 SCHEDULE OF OPERATIONS

The proposed Stockpile extension has an anticipated operational life of approximately 40 years. Features proposed within the area identified for distributed facilities would be anticipated for use over the same term, with the potential for continued use to support reclamation, closure and post-closure. FMBI plans to develop the proposed facilities in accordance with the following schedule:

- Anticipated completion of federal approvals – end of 2015
- Deposition within the Stockpile extension – ongoing after issuance of federal and state approvals
- Reclamation and closure of the Stockpile and distributed facilities – 2050 or later

The above schedule is subject to change depending on mine production rates, which are influenced by market conditions, development of new technologies, changes in state or federal regulations, and various other factors throughout the life of the operation.

2.9 SAFETY AND SECURITY

Operations at the Bagdad Mine are regulated by safety regulations promulgated by 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, FMBI 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. Gates are located on all access roads to the mine and are maintained, closed, and locked with access available only to mine personnel. Perimeter gates found damaged are immediately repaired.

FMBI maintains a contract with Williamson Valley/Bagdad Fire-Rescue, which has trained staff and mobile fire suppression equipment available to respond to fires or other emergencies, when requested.

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3.0 MONITORING PLAN

3.1 WATER QUALITY MONITORING

The area-wide APP P-105258 provides comprehensive regulation of the Bagdad Mine for the prevention of water pollution. The Bagdad Mine will continue to monitor groundwater quality in accordance with the terms, conditions, and requirements of the APP program. The requirements of the APP are discussed in Section 1.7.2.2, and a copy of the current APP is provided in Appendix B, which details the required monitoring.[1] The APP also mandates specific courses of action to be followed in the event of an adverse measurement or result.

As described in Section 1.7.2.1.2, the Stockpile and proposed Stockpile extension are situated such that stormwater is directed toward the open pit; therefore, the Stockpile and proposed Stockpile extension do not discharge to downgradient surface waters.

3.2 AIR QUALITY MONITORING

The Bagdad Mine will continue to monitor air quality in accordance with the terms, conditions, and requirements of the air quality permit, as described in Section 2.3. The air quality permit also mandates specific courses of action to be followed in the event of an adverse measurement or sample result.

3.3 SLOPE STABILITY

The Bagdad Mine will continue to monitor slope stability in accordance with the terms, conditions, and requirements of the APP program, as summarized in Section 2.6 of this MPO Modification and detailed in Appendix B.

3.4 CLOSURE AND POST-CLOSURE MONITORING

Monitoring and maintenance activities for the Stockpile and proposed Stockpile extension will be prescribed under the closure and post-closure requirements of the APP program. Required monitoring will initiate during reclamation and continue until clean closure is achieved and approved. These activities are described in Sections 1.7.2.2.4 and 6.1.6, and will be fully documented in the final closure plan.

Closure and post-closure monitoring for the distributed facilities are discussed in Section 6.2.

[1] Consistent with Sections 4.3.3.2.2 and 4.4.3.2 of the H-3809-1 Surface Management Handbook (BLM 2012), the monitoring plan outlined in this MPO Modification will be updated or appended so as to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available.

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4.0 INTERIM MANAGEMENT PLAN

This Section contains the Bagdad Mine's measures, procedures, plans, and provisions to prevent unnecessary or undue degradation of federal lands in the event of either a temporary closure; suspension of mining, production, or other operations; or placement into standby status.

The Bagdad Mine is currently in "operating" status and does not intend to move into permanent closure until the economic reserves, and associated operations, are exhausted. Nonetheless, the details of a plan in the event that an unforeseen circumstance or a substantial economic change would cause FMBI to place the mine (or any component parts thereof) on standby status include:

i. *Measures to stabilize excavations and workings*: This is accomplished in part by maintaining and utilizing key equipment for dust control and road maintenance, preventing stormwater erosion or runoff, and operation of a dewatering system (see Sections 2.3 and 2.4 of this MPO Modification).
ii. *Measures to isolate or control toxic or deleterious materials*: See Sections 1.7, 2.2, 2.4, 2.5, 2.6, and 2.7 of this MPO Modification.
iii. *Provisions for the storage or removal of equipment, supplies, and structures*: FMBI personnel would remain on-site to conduct inspections and maintenance activities.
iv. *Measures to maintain the project area in a safe and clean condition:* Considering personnel would remain on-site even during reduced, suspended, or standby status, compliance with MSHA's safety regulations also continue, including regular inspections by MSHA. Security measures described in Section 2.9 would remain in effect. In addition, existing environmental monitoring programs would be maintained and include, but are not limited to, ongoing inspections of equipment prior to the beginning of each shift, water quality sampling and reporting under the APP program, and management of stormwater to prevent runoff of pollutants.
v. *Plans for monitoring site conditions during periods of non-operation*: Monitoring, as described in Sections 2.6 and 3.0 of this MPO Modification, will continue even during reduced, suspended, or standby status.
vi. *A schedule of anticipated periods of temporary closure during which you would implement the interim management plan, including provisions for notifying the BLM of unplanned or extended temporary closures:* Scheduled temporary suspensions of operations are not expected, therefore a schedule for suspending operations cannot be generated. However, in the event of an unplanned or extended temporary suspension of operations, the BLM will be notified directly.

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5.0 BASELINE ENVIRONMENTAL INFORMATION

This section summarizes the baseline environmental information that has been collected within the Bagdad Mine area pertinent to the MPO Modification. The following sections include discussions of geologic resources, water resources, biological resources, and cultural resources.

5.1 GEOLOGIC RESOURCES

5.1.1 Area Geology

As described in Section 1.6.3, the Bagdad Mine lies in the Central Highlands transition zone physiographic province between the Colorado Plateau to the north and east and the Basin and Range physiographic province to the south and west. The Central Highlands physiographic province is characterized by rugged mountains of diverse geologic character, including igneous, metamorphic, and sedimentary rocks. Figure 10 displays the surficial geology underlying the elements proposed in this MPO Modification, and Table 7 describes the predominant rock units and their relative ages. This figure and the geologic information presented herein is based primarily upon the work done by Anderson, *et al.* (1955).

Within the area of the Stockpile and proposed Stockpile extension, the Mountain Spring Fault is readily identified in Figure 10. The north-striking Mountain Spring fault is a normal, west-dipping structure, with dips ranging from 70 to 75 degrees. The Mountain Spring Fault distinguishes between the predominance of the Bridle formation to the west and the Hillside mica schist to the east. This ancient fault structure is a Precambrian shear zone that apparently underwent several miles of right-lateral displacement. No evidence exists of recent movement or seismic activity along this fault, and no hydrologic or ground stability factors have been attributed to this fault that might impact the Stockpile or proposed Stockpile extension (FMBI, 1996a). No Quaternary or more recent faults have been mapped in the Bagdad area (SRK, 2009).

Both the Bridle formation and Hillside mica schist are identified as members of the Yavapai series, which are grouped along with the Butte Falls tuff, as the oldest of the metamorphic, Precambrian bedrock. The Bridle formation consists of metamorphosed igneous (andesitic and basaltic lava flows) and sedimentary (tuffaceous beds and terrigenous sediments) rocks. The Bridle formation is more than 3,000 feet thick. The Hillside mica schist is a unit consisting of metamorphosed sandstone and shale, with a total thickness of 3,000 to 4,000 feet.

This metamorphic terrain has been tightly folded on a large scale, resulting in structural and stratigraphic layering, dipping steeply to the northwest and trending northeastward. The structure of the Yavapai series is that of a syncline, with the western limb overturned in the southern part of the area. The folded structures were faulted and intruded by igneous rocks along the faulting, indicating folding and faulting of the Yavapai series occurred before the Precambrian intrusive activity.

Precambrian intrusions of the Yavapai series occurred by igneous rocks of diverse composition. The oldest of the igneous rocks is rhyolite – including the King Peak and Dick rhyolites – with observed occurrences underlying the Stockpile and proposed Stockpile extension (Figure 10). The rhyolite and the

rocks of the Yavapai series were then intruded by widespread masses of gabbro and related quartz diorite and diabase. A belt of intruded alaskite porphyry is also seen in Figure 10, representing the formation of mixed alaskite-gabbro rocks. East of the Mountain Spring Fault, the widespread Lawler Peak and Cheney Gulch granites also represent igneous intrusion; the granites were then intruded by dikes and masses of aplite-pegmatite during the closing episodes of the Precambrian age. Collectively, and as depicted in Figure 10, the surficial geology underlying the Stockpile and proposed Stockpile extension are almost exclusively representative of Precambrian, crystalline bedrock.

Across the Bagdad area, surficial expressions of rhyolitic tuffs of the late Cretaceous or early Tertiary overlie the Precambrian formations. The tuffs were intruded by rhyolitic dikes (and with small representation as dikes in the area of the Stockpile and proposed Stockpile extension), which were later intruded by stocks and plugs of quartz monzonite. The largest quartz monzonite stock in the area forms the primary ore body of the Bagdad Mine, appropriately centered at the open pit, north of the Stockpile.

During the more recent Quaternary epoch, Gila conglomerate and basaltic flows filled deep valleys. Basaltic flows (including the Sanders basalt) cap many of the mesas located north and east of open pit. Surficial mapping of Gila conglomerate occurs on the side slopes of many of these mesas. In some areas surrounding the Bagdad Mine, the basalt is separated from the underlying Gila conglomerate by a bed of rhyolite tuff. These rock types are generally mapped beyond the extents shown in Figure 10, but can overlie the quartz monzonite stock and mineralized zones of the Bagdad Mine.

As discussed in Section 2.2.4, materials generated from the open pit are placed in three categories: ore, mineralized waste rock, and un-mineralized overburden.

Table 7 Description and Relative Ages of Select Rock Units in the Bagdad Area

Age	Structure/ Unit	Description
Quaternary	Sanders basalt (QTs)	Holocrystalline subophitic olivine basalt flows, usually coarsely vesicular
Quaternary/ Late Tertiary	Gila conglomerate (QTg)	Valley-fill deposit of nonvolcanic sediment and rhyolitic tuff, largely composed of poorly indurated boulder to pebble gravel of local source, with interbeds of compacted sandstone and siltstone
Tertiary/ Late Cretaceous	Quartz monzonite porphyry (TKqmp)	Hydrothermally altered; contains orthoclase, plagioclase, and quartz phenocrysts; occurs as dikes and plugs
	Diorite porphyry (TKdp)	Occurs as dikes and plugs; includes some quartz diorite porphyry
	Quartz monzonite (TKqm)	Occurs as stocks and plugs, including the copper-bearing stock at Bagdad

Age	Structure/ Unit	Description
Precambrian	Aplite pegmatite (ap)	Occurs as dikes and masses
	Cheney Gulch granite (cg)	Fine-grained biotite granite that intrudes the Hillside mica schist and the gabbro; dikes intrude Lawler Peak granite
	Lawler Peak granite (lg)	Porphyritic muscovite-biotite granite with large orthoclase phenocrysts; occurs in smaller masses associated with rocks of the Yavapai series
	Alaskite porphyry	alp – alaskite porphyry with fine phanerocrystalline groundmass fal – alaskite porphyry with microcrystalline groundmass lal – alaskite porphyry and Lawler Peak granite cal – mixture of alaskite porphyry and older volcanic rocks
	Diabase (db)	Related to gabbro
	Gabbro (gb)	Gabbro, locally schistose
	Gabbro and Lawler Peak granite (gl)	Gabbro and Lawler Peak granite, mixed; typically dark with grains ranging in size from fine to coarse. Biotite is a common accessory mineral.
	Dick rhyolite (dr)	Quartz phenocrysts in a microcrystalline groundmass; forms intrusive masses
	King Peak rhyolite (kpr)	Non-porphyritic, forms intrusive masses
Precambrian – Yavapai series	Hillside mica schist (hms)	Includes quartz mica schist and muscovite quartzite
	Butte Falls tuff (bft)	Largely quartz-bearing tuffaceous sedimentary rocks recrystallized to schist; believed by Anderson *et al.* (1955) to represent tuffs and tuffaceous sediments that accumulated after the outpouring of the mafic lava of the Bridle formation.
	Bridle formation (bv)	Metamorphosed andesite and basalt flows with intercalated tuffs and sediments

Source: Anderson 1955 and SRK 2010

5.1.2 Mineral Occurrence

Various exploration programs have evaluated the areas proposed for disturbance in this MPO Modification for economic mineral occurrence. These data support the conclusion that the existing extent of the Stockpile lies at least one-half mile beyond the limit of economic mineralization exposed in the Bagdad Mine; the assay data from the Stockpile area averages less than 50 percent of the minimum grade currently being mined. The results of these exploration drilling programs document that the potential for economic mineral deposits in the area of the proposed Stockpile extension is low. Lists of FMBI's mill site claims underlying the Stockpile and proposed Stockpile extension are set forth in Appendix A.

The installation of individual distributed facilities will not impede access to geological resources should they be found in the future (which is unlikely).

5.2 WATER RESOURCES

5.2.1 Groundwater

Aquifers occurring in the region (in the Burro and Santa Maria subbasins and beyond [Figure 1]) generally consist of hydraulically connected basin fill aquifers (Gila conglomerate), recent (Quaternary) stream alluvium, and fractured or porous igneous (volcanic) rock. Much of the area is underlain by

consolidated, crystalline bedrock with limited potential for groundwater development. The regional groundwater flow direction is generally from northeast to southwest with variations in localized patterns. Groundwater recharges primarily from streambed infiltration and mountain front precipitation.

Groundwater flow proximate to Bagdad Mine is controlled primarily by geologic structure and formation hydraulic properties. In the area of the proposed Stockpile extension and future distributed facilities, the metamorphosed formation of the underlying Precambrian, crystalline bedrock has little primary porosity, corresponding to a low hydraulic conductivity. The faults present in the crystalline bedrock generally have been filled by the igneous intrusions (discussed in Section 5.1.1) and post-faulting mineralization, reducing the ability of faults to transmit groundwater due to filling of pore space. Therefore, the ability for the Precambrian, crystalline bedrock underlying the proposed Stockpile extension to transmit groundwater is restricted. Demonstration of the low hydraulic conductivity of the crystalline bedrock is one of the key points in the attaining compliance with the BADCT requirements of the APP (Section 1.7.2.2).

Figure 6 depicts the equipotential groundwater elevation contours and general groundwater gradient. The information presented in Figure 6 is based on the underlying geology and the preliminary results from the groundwater model review and update currently underway, as required by the APP P-105258 (refer also to Section 1.7.2.2). As shown by the figure, the Stockpile and proposed Stockpile extension lie within the inward hydraulic gradient created by the open pit. An inward hydraulic gradient is typical in a hard rock mining environment, where the dewatering of saturated bedrock around the open pit occurs in response to the excavation and removal of materials from the open pit. The inward hydraulic gradient is another key point in the demonstration of BADCT compliance and the passive containment capture zone under the APP (Section 1.7.2.2).

5.2.2 Surface Water

The regional surface water hydrology is outlined in Section 1.6.3 and displayed in Figure 1. According to the ADWR *Arizona Water Atlas, Volume 4 – Upper Colorado River Planning Area* (2009), Boulder Creek, Burro Creek, and a short reach of Bridle Creek (immediately upgradient of its confluence with the Santa Maria River) are considered intermittent streams. Portions of the Big Sandy, Santa Maria, and Bill Williams rivers and the portion of Burro Creek immediately upgradient of its confluence with the Big Sandy River are perennial streams.

The drainages in the project area are ephemeral, flowing solely in direct response to precipitation. The Stockpile and Stockpile extension are located within the same hydrologic basin (Burro Subbasin [HUC8 15030202]) as the Bagdad open pit (Figure 2). The natural topography underlying the Stockpile and proposed Stockpile extension slopes northward, toward the open pit. The Stockpile was constructed over the upper reaches of several ephemeral drainages; stormwater flows are generally directed to the open pit. Where necessary, stormwater is captured on the upgradient side of the Stockpile and routed through a series of underdrains to process ponds, stormwater impoundments, and/or the open pit. The northward sloping natural topography underlying the Stockpile and Stockpile extension is the third key point in the demonstration of BADCT compliance and the passive containment capture zone under the APP (Section 1.7.2.2).

South of the ridgeline that divides Burro Subbasin (HUC8 15030202) and Santa Maria Subbasin (HUC8 15030203), ephemeral drainages are generally directed southward toward Bridle Creek. Prior to ground disturbing activities within the area delineated for distributed facilities, FMBI will identify and incorporate the appropriate stormwater controls or management strategies into the design of the feature proposed, including updating the SWPPP, as appropriate.

5.3 BIOLOGICAL RESOURCES

Several biological flora and fauna surveys have been conducted in the area of Bagdad Mine. Existing vegetation and wildlife studies are summarized in the following sections.

5.3.1 Vegetation

Classification of biotic resource communities in the southwestern United States has been extensively researched and documented in previous studies (Brown *et al.*, 1979, 1980). The project area is comprised almost entirely of interior chaparral, with a small area of Arizona upland/Sonoran desertscrub mapped in the southeastern corner of the area proposed for future distributed facilities (Figure 11). Informal, on-site surveys of the project and surrounding area are consistent with these classifications. Riparian vegetation or habitat does not occur in the project area.

According to the 1995 Draft EIS (BLM), vegetation typical of the interior chaparral includes dominants such as one-seed juniper (*Juniperus monosperma*) and shrub live oak (*Quercus turbinella*). Common shrubs include the wait-a-minute bush (*Mimosa buincifera*), sumac (*Rhus* spp.), and crucifixion thorn (*Canotia holacantha*). Banana yucca (*Yucca baccata*) is also common. The understory is typically composed of three awn (*Aristida* spp.), gramas (*Bouteloua* spp.), filaree (*Erodium cicutarium*), penstemon (*Penstemon* spp.), and broom snakeweed (*Gutierrezia sarothrae*).

5.3.2 Wildlife

5.3.2.1 Mammals

Wildlife in the proposed project area is typical of Arizona upland and interior chaparral habitat types. Large mammals, including mule deer (*Odocoileus hemionus*), javelina (*Dicotyles tajacu*), and mountain lions (*Felis concolor*), are known to occur in the Bagdad area. Other large mammals associated with the habitat types in the greater Bagdad region include gray fox (*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and coyote (*Canis latrans*). Smaller mammals such as the desert cottontail (*Sylvilagus audubonii*), cactus mouse (*Peromyscus eremicus*), ground squirrels (*Ammospermophilus* spp.), kangaroo rats (*Dipodomys* spp.), and pocket mice (*Perognathus* spp.) are expected to occur in the proposed project area (BLM, 1995a).

Wild burros are known to occur in the Burro Creek area (BLM, 1993), west of the Bagdad Mine. The Big Sandy Herd Management Area includes lands along the Big Sandy River and Burro Creek, as depicted in Figure 11. The Wild and Free-Roaming Horse and Burro Act of 1971 authorizes BLM management of wild burros and wild horses on public lands.

5.3.2.2 Birds

Birds associated with areas of interior chaparral vegetation include scrub jays (*Aphelocoma* spp.), the black-chinned sparrow (*Spizella atrogularis*), canyon wren (*Catherpes mexicanus*), and towhees (*Pipilo* spp.). Species common to Arizona upland habitats of the Sonoran Desert which may occur in the area include the cactus wren (*Campylorhynchus brunneicapillus*), Gambel's quail (*Lophortyx gambelii*), Gila woodpecker (*Melanerpes uropygialis*), doves (*Zenaida* spp.), thrashers (*Toxostoma* spp.), roadrunner (*Geococcyx californianus*), verdin (*Auriparus flaviceps*), and gilded flicker (*Colaptes auratus*). Raptors including American kestrel (*Falco sparverius*), common black hawk (*Buteogallus anthracinus*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), and zone-tailed hawk (*Buteo albonotatus*) have also been observed in the proximity of the proposed project area. Bald eagles (*Haliaeetus leucocephalus*) are also known to nest on the adjacent Burro Creek drainage (BLM, 1995a).

5.3.2.3 Reptiles and Amphibians

Reptiles associated with areas of interior chaparral include the western rattlesnake (*Crotalus viridis*), glossy snake (*Arizona elegans*), Sonora mountain kingsnake (*Lampropeltis pyromelana*), fence lizards (*Sceloporus occidentalis*), and Arizona night lizard (*Xantusia arizonae*). In Arizona upland habitat, glossy snake, western shovelnose snake (*Chionactis occipitalis*), western diamondback rattlesnake (*Crotalus atrox*), sidewinder (*Crotalus cerastes*), desert tortoise (*Gopherus agassizii*), Gila monster (*Heloderma suspectum*), horned lizards (*Phrynosoma* spp.), whiptails (*Cnemidophorus* spp.), chuckwalla (*Sauromalus obesus*), desert spiny lizard (*Sceloporus magister*), and brush and tree lizards (*Urosaurus graciosus* and *U. ornatus*) may be expected to occur (BLM, 1995a).

5.3.3 Special Status Species

Collectively, "special status species" include those listed as endangered or threatened under either federal or state law, candidate species for protection under federal law, or other species of interest. An analysis of the state and federal special status species – including range, habitat, and potential for occurrence – can be found in Appendix E. The potential for special status species or their habitat to occur in the project area is assessed herein using the following summary descriptions:

- **None:** no suitable habitat is present or the species is not found within the elevation range of the Project site
- **Unlikely:** no documentation; low or marginal habitat quality; outside, but close to, currently known geographic or elevational distribution; species may pass/migrate through the project area
- **Possible:** no documentation but suitable habitat within range occurs
- **Present:** species have been documented to occur

Special status species include those species which are afforded special protection under federal guidelines in accordance with the Endangered Species Act of 1973 (ESA). Table 8 presents 24 species (one amphibian, five birds, eleven fish, one invertebrate, two mammals, one plant, three reptiles) which state and/or federal agencies consider to have a possible presence in Yavapai County and are listed or proposed for listing under the ESA as threatened, endangered, or candidate species. The table includes the compilation of species listed by the US Fish and Wildlife Service (USFWS) Environmental Conservation

Online System (2014), the USFWS Arizona Ecological Services Office (2013), and the Arizona Department of Game and Fish (AGFD; 2013).

Table 8 Federally Listed Threatened or Endangered Species in Yavapai County

Species Common Name	Scientific Name	Taxon	ESA Status	Potential for Occurrence
Chiricahua leopard frog	*Lithobates (Rana) chiricahuensis*	Amphibian	LT	None
California condor	*Gymnogyps californianus*	Bird	LE, XN	None
Mexican spotted owl	*Strix occidentalis lucida*	Bird	LT	None
Southwestern willow flycatcher	*Empidonax traillii extimus*	Bird	LE	None
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis (western population)*	Bird	PT	None
Yuma clapper rail	*Rallus longirostris yumanensis*	Bird	LE	None
Colorado pikeminnow	*Ptychocheilus lucius*	Fish	LE, XN	None
Desert pupfish	*Cyprinodon macularius*	Fish	LE	None
Gila chub	*Gila intermedia*	Fish	LE	None
Gila topminnow	*Poeciliopsis occidentalis*	Fish	LE	None
Gila trout	*Oncorhynchus gilae*	Fish	LT	None
Headwater chub	*Gila nigra*	Fish	C	None
Loach minnow	*Tiaroga cobitis*	Fish	LE	None
Razorback sucker	*Xyrauchen texanus*	Fish	LE	None
Roundtail chub	*Gila robusta*	Fish	C	None
Spikedace	*Meda fulgida*	Fish	LE	None
Woundfin	*Plagopterus argentissimus*	Fish	LE, XN	None
Page springsnail	*Pyrgulpsis morrisoni*	Invertebrate	C	None
Black-footed ferret	*Mustela nigripes*	Mammal	LE, XN	None
Hualapai Mexican vole	*Microtos mexicanus hualapaiensis*	Mammal	LE	Unlikely
Arizona cliffrose	*Purshia subintegra*	Plant	LE	None
Narrow-headed gartersnake	*Thamnophis rufipunctatus*	Reptile	PT	None
Northern Mexican gartersnake	*Thamnophis eques megalops*	Reptile	PT	None
Sonoran desert tortoise	*Gopherus morafkai*	Reptile	C	Possible

Status Key:

- LE Listed endangered
- LT Listed threatened
- PT Proposed threatened
- C Candidate – Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as endangered or threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.
- LE, XN Experimental/ nonessential population of a listed endangered species

Of the federally listed threatened or endangered species, the Hualapai Mexican vole would have an unlikely potential to occur in the project area. Also, the Sonoran desert tortoise is a candidate species and has a "possible" potential to occur in the project area, indicating the presence of suitable habitat. Sonoran desert tortoise habitat includes primarily rocky slopes and bajadas within Sonoran desertscrub communities and may include caliche caves in washes for shelter (AGFD, 2010). Take, possession, or harassment of wild desert tortoises is prohibited by state law. The AGFD has developed guidelines to reduce potential impacts on desert tortoises; *the Guidelines for Handling Sonoran Desert Tortoises*

Encountered on Development Projects (AGFD, 2007) is included in Appendix F, and construction of the elements proposed in this MPO Modification will adhere to these guidelines.

Critical habitat is an area designated for a threatened or endangered species under the ESA. A designation of critical habitat indicates that the area contains physical or biological features essential to the conservation of the species and may require special management considerations or protection. There is no designated critical habitat within the project vicinity.

In addition to species listed under the ESA, the AGFD, BLM, and USFWS maintain lists of sensitive species. Table 9 presents 21 species (seven birds, nine mammals, four plants, and one reptile) which have been designated as species of concern, sensitive, or wildlife of special concern by these agencies and have some potential for occurrence in the project area. Appendix E presents the analysis of range and habitat needs and conclusions regarding the potential for occurrence indicated in the summary table below.

Table 9 Special Status Species with Possible Presence in Project Area

Species Common Name	Scientific Name	Taxon	Status			Potential for Occurrence
			ESA	BLM	AZ	
American peregrine falcon	*Falco peregrinus anatum*	Bird	SC, R	S	WSC	Unlikely
American redstart	*Setophaga ruticilla*	Bird			WSC	Unlikely
Bald eagle	*Haliaeetus leucocephalus*	Bird	SC, R	S	WSC	Unlikely
Ferruginous hawk	*Buteo regalis*	Bird	SC	S	WSC	Unlikely
Golden eagle	*Aquilia chrysaetos*	Bird		S		Unlikely
Northern goshawk	*Accipiter gentilis atricapillus*	Bird	SC	S	S	Unlikely
Western burrowing owl	*Athene cunicularia hypugaea*	Bird	SC		S	Unlikely
Allen's lappet-browed bat	*Idionycteris phyllotis*	Mammal	SC	S		Unlikely
Big free-tailed bat	*Nyctinomops macrotis*	Mammal	SC			Unlikely
California leaf-nosed bat	*Macrotus californicus*	Mammal	SC	S	WSC	Unlikely
Cave myotis	*Myotis velifer incautus; brevis*	Mammal		S	S	Unlikely
Fringed myotis	*Myotis thysanodes*	Mammal		S	S	Possible
Long-legged myotis	*Myotis volans interior*	Mammal		S	S	Unlikely
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Mammal	SC	S		Possible
Spotted bat	*Euderma maculatum*	Mammal		T	S	Possible
Western small-footed myotis	*Myotis ciliolabrum*	Mammal	SC			Unlikely
Flannel bush	*Fremontodendron californicum*	Plant		S	SR	Possible
Mogollon fleabane	*Erigeron anchana*	Plant	SC			Possible
Pima Indian mallow	*Abutilon parishii*	Plant	SC	S	SR	Unlikely
Tonto Basin agave	*Agave delamateri*	Plant	SC		HS	Unlikely
Banded Gila monster	*Heloderma suspectum cinctum*	Reptile	SC			Unlikely

Status key:

- SC Species of Concern (USFWS)
- R Recovery (USFWS)
- T Threatened (BLM)
- S Sensitive (BLM or AGFD)
- WSC Wildlife of Special Concern (AGFD)
- SR Salvage restricted (Arizona Department of Agriculture)
- HS Highly sensitive (Arizona Department of Agriculture)

5.4 CULTURAL RESOURCES

The National Historic Preservation Act (NHPA) of 1966, as amended, and implementing regulations (36 CFR 800) provide statutory protection and guidelines for the evaluation of cultural resources. Cultural resources that meet the significance criteria are classified as eligible for nomination to the National Register of Historic Places (NRHP) and are termed "historic property(s)." Numerous archaeological investigations have been conducted throughout the area of potential effect and surrounding lands. As part of this MPO Modification, a Class III survey was conducted, and a report was submitted to the BLM for review in December 2013.

The 2013 Class III survey for the Stockpile extension totaled approximately 1,273 acres including 1,151 acres of BLM-managed lands and about 122 acres of patented mine claims owned by FMBI. Because of steep terrain, only 661 acres (including 622 acres of BLM-managed lands) could be intensively surveyed with regulatory spaced transects; however, an additional 182 acres were spot checked (including 133 acres of BLM-managed lands). The results of the Class III survey identified one previously recorded archaeological site, 23 new archaeological and historic sites, and 125 isolated occurrences. Four of the sites are prehistoric Ceramic period sites, 17 are historic Euro-American sites, and 3 have both prehistoric and historic components.

The Class III survey report recommends that three sites be considered eligible for listing on the NRHP for their potential to yield important information about the prehistory and history of the region.

5.5 PROTECTION OF SURVEY MONUMENTS

To the extent possible, FMBI will protect survey monuments, reference monuments, bearing trees, and other survey reference points during ground disturbing activities. Should it be necessary to remove a survey point during operations, FMBI will notify the appropriate BLM officer and adhere to the written requirements for the restoration or reestablishment of the survey point.

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6.0 RECLAMATION PLAN

The goals of the reclamation and closure plan are to promote a viable post-mining land use, reduce impacts to surface water and groundwater, and promote post-mining public safety. Reclamation activities are proposed to mitigate the disturbed areas and achieve compliance with state and federal regulations for mine reclamation and water quality protection. Generally, reclamation and closure intend to provide for the establishment of a self-sustaining ecosystem consistent with the life zone of the surrounding area, with consideration of the site-specific conditions that will exist at the Bagdad Mine at the time of closure. Monitoring and maintenance activities prescribed under the post-closure requirements of the APP program will follow reclamation and continue until clean closure is achieved and approved by the ADEQ.

Consistent with Sections 4.3.3.2.2 and 4.4.3.2 of the H-3809-1 Surface Management Handbook (BLM 2012), the reclamation plan outlined in this MPO Modification will be updated or appended so as to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available. While the general aspects of the proposed reclamation are outlined herein, the ADEQ closure strategy under APP P-105258 will continue to provide the detailed description of closure and reclamation requirements. Overall, reclamation of the features proposed in this MPO Modification will address the applicable elements of 40 CFR 3809.401(b)(3), as discussed herein.

In general, reclamation requirements for drill hole plugging, riparian management, and removal or stabilization of structures are not anticipated to apply to the elements proposed in this MPO Modification.

- Drill-hole plugging – The areas proposed for expansion are not known to contain drill holes. If existing drill holes are encountered on BLM lands, they will be plugged in accordance with BLM guidance, as set forth in the BLM Solid Materials Reclamation Handbook H-3042-1 (1992) and ADWR Well Abandonment Handbook (2008). If boreholes or wells are advanced in the future, their construction and closure would be mandated under APP P-105258 and would follow the same BLM guidelines.
- Riparian management – Riparian areas are not known to occur in the project area.
- Removal or stabilization of buildings, structures, and support facilities – Buildings or structures are not proposed in this MPO modification and are not known to exist in the project area. Removal or stabilization of support facilities is addressed below in Section 6.2.

6.1 STOCKPILE AND STOCKPILE EXTENSION

Reclamation and closure of the Stockpile and proposed Stockpile extension will include:

- Strategic regrading and contouring of the facility to control and divert surface water runoff from the Stockpile in order to minimize erosion and infiltration
- Covering the flat top surfaces and benches of the facility to limit precipitation infiltration and enhance revegetation
- Revegetating the covered surface to control erosion and minimize infiltration
- Construction of surface water run-off control and diversions channels with provision of appropriate erosion protection within the channels
- Maintenance and construction of underdrains for stormwater management

The relatively flat top and benches (constructed roughly every 250 to 300 feet of elevation for slope stability and to catch potential rockfall) of the Stockpile will be covered with approximately two feet of Gila conglomerate cover to minimize infiltration of stormwater. The covered areas will be prepared as a seedbed and revegetated with an appropriate seed mix. Revegetation of the surfaces will decrease runoff velocity, increase the erosion resistance of the cover, and further reduce infiltration through evapotranspiration. The relatively steep side slopes will facilitate stormwater runoff and minimize the potential for infiltration. Therefore, the side slopes will not be covered and revegetated. A portion of the area included within the proposed limit of Stockpile extension has been delineated to accommodate potential reclamation needs and disturbances such as slope reduction, grading, and/or gradual raveling of the Stockpile faces. Requirements for plan content related to reclamation of the proposed Stockpile extension (pursuant to 43 CFR 3809.401(b)(3)) are addressed in the following sections.

6.1.1 Regrading and Reshaping

The basic configuration and geometry of the Stockpile and proposed Stockpile extension is not proposed to change substantially during reclamation and closure; contouring the slopes and constructing the benches will be performed during development and operation of the Stockpile and generally will conform to the parameters for slope grade and bench spacing discussed in Section 2.1.1. A topographic map of the Stockpile configuration is provided in Figure 7, and Figure 8 depicts representative cross sections of the conceptual Stockpile configuration. During reclamation, crown chaining will be conducted on slope crests, where needed, to create a smooth transition from benches to slopes. In addition, two feet of soil cover material will be placed on the flat tops and benches of the Stockpile and proposed Stockpile extension.

Soil cover material is anticipated to be hauled from a borrow source of Gila conglomerate on the Sanders Mesa (Figure 2), as anticipated and reported in the *Closure Cost Estimate for BLM Lands Located at Bagdad* (EMC^2, 2012). Approximately 2.4 million cubic yards of soil cover material will be needed for the Stockpile and proposed Stockpile extension (based on a roughly estimated area of flat top surfaces and benches of approximately 730 acres and two feet of soil cover material); approximately half this amount, or roughly 1.2 million cubic yards of soil cover material, will be needed for BLM-managed lands (corresponding to roughly 370 acres of flat top surfaces and benches). Equipment for regrading and reshaping would generally be anticipated to involve the same equipment supporting Stockpile operations, including but not limited to:

- Traditional mine haul trucks (100-ton capacity CAT 777 or similar)
- Track and/or tire bulldozers (D8-D10 or similar)
- Front-end loaders (CAT 992 or similar)
- Motor graders (CAT 14M or similar)
- Water wagons (typically 8,000 gallon capacity)

Permanent, rock-armored water diversion channels will be constructed on the Stockpile and proposed Stockpile extension, generally aligned with the planned haul roads. Minor grading would be performed to direct water to the diversion channels.

6.1.2 Wildlife Habitat Rehabilitation

Covering the flat tops and benches with Gila conglomerate soil cover material and seeding with native vegetation should allow most of the disturbed area to reestablish suitable wildlife habitat. The rocky outslopes of the Stockpile and proposed Stockpile extension will provide new habitat and refuge for many types of small fauna.

6.1.3 Topsoil Handling

Generally, soil cover material will consist of Gila conglomerate. Gila conglomerate is suitable for use as a cover material due to its generally well-graded texture, the presence of both clay and silt sized particles (for water retention), and larger rock particle sizes, which enhance erosional stability. The Gila conglomerate is un-mineralized, with net acid neutralizing potential. As discussed in Section 2.2.4.1.3, calcium carbonate cementation of the Gila conglomerate is substantial, helping to neutralize acid when placed in contact or mixed with rocks of an acidic nature. Gila conglomerate is available at the quantities required within the Bagdad Mine. Additionally, Gila conglomerate has been shown through modeling to reduce the amount of stormwater infiltration into the underlying stockpile material. Due to the fact that little of the material will be actual topsoil, the Gila conglomerate does not have a high potential to harbor noxious weed seed, which reduces the risk of weed invasion of the cover.

Preliminarily, the material is proposed to be obtained from a borrow source on private lands near Sanders Mesa, on the northeast edge of the open pit. The average haul distance from the borrow source to the Stockpile is approximately 5.9 miles, one-way (EMC^2, 2012). The haul will be directly from the borrow site to placement on the proposed Stockpile extension.

6.1.4 Revegetation

The flat top and benches of the Stockpile and proposed Stockpile extension will be revegetated with an approved seed mix. Revegetation will occur after soil cover placement and at the appropriate time of the year for optimum seed germination and plant growth. Generally, the initial seedbed preparation will include ripping or discing the surface along the contours followed by the application of fertilizer or other soil amendment(s), if needed. Prior to implementation, studies and soil testing will be conducted, as needed, to optimize the potential for successful revegetation. A diverse plant community will be targeted through the definition of seed mixtures and application rates specified in the final APP closure plan.

6.1.5 Isolation and Control of Acid-forming, Toxic or Deleterious Materials

The Stockpile and proposed Stockpile extension (including relatively minor quantities of potentially acid-generating rock materials) are located within the hydrologic control of the passive containment capture zone of the open pit. Stormwater coming into contact with such materials will eventually drain to the open pit. Additionally, the closure of the Stockpile will cover stockpiled materials beneath the acid-neutralizing Gila conglomerate material. Further, revegetation and the water holding capacity of the Gila conglomerate will reduce the quantity of water available to contact stockpiled materials. Together, these factors serve to isolate and control potentially acid-forming, toxic, or deleterious materials.

6.1.6 Post-Closure Management

The closed facilities will be monitored and maintained in order to ensure the establishment of vegetation, review the integrity of surface water control structures, and evaluate cover erosion and geotechnical stability. Preliminarily, semi-annual vegetation monitoring and erosion control maintenance may be required for up to 5 years after closure, and monitoring and maintenance of stormwater controls may be required for up to 30 years (EMC^2, 2012).

6.2 DISTRIBUTED FACILITIES

Reclamation of surface disturbances for distributed facilities will be addressed at closure, as required by the ASMI and the mined land reclamation plan. Generally, the strategy for reclamation, closure, and post-closure monitoring will include:

- Removal of temporary instrumentation and equipment, utilities, and access roads
- Reclamation of disturbed surfaces by ripping and/or covering and reseeding

Some stormwater management and/or other dewatering facilities may remain post-closure. Utility poles, if present, may also be left in place as bird perches to support the post-mining land use.

6.3 RECLAMATION COST ESTIMATE

FMBI maintains financial assurances for the Bagdad Mine with state and federal agencies in accordance with the applicable permits. FMBI will submit an estimate of the cost to reclaim the features and facilities proposed in this MPO Modification in accordance with 43 CFR 3809.552 at the time specified by the BLM.

7.0 PREVENTION OF UNNECESSARY AND UNDUE DEGRADATION

Pursuant to 43 CFR 3809.415, FMBI will prevent unnecessary or undue degradation of public lands by:

(a) Complying with §3809.420, as applicable; the terms and conditions of the approved plan of operations; and other federal and state laws related to environmental protection and protection of cultural resources; and
(b) Assuring that operations are "reasonably incident" to prospecting, mining, or processing operations and uses.

The surface disturbances proposed in this MPO Modification do not include areas protected under specific laws such as the California Desert Conservation Area, Wild and Scenic Rivers, BLM-administered portions of the National Wilderness System, or BLM-administered National Monuments and National Conservation Areas.

7.1 PERFORMANCE STANDARDS

The construction, operation, closure, and post-closure of the features proposed in this MPO Modification will prevent unnecessary or undue degradation of public lands by complying with the performance standards found in 43 CFR 3809.420.[1] Table 10 summarizes the performance standards required under the current regulations and identifies where they are addressed in this document.

Table 10 Performance Standards

Performance Standard	Location in MPO Modification	
Technology and practices	Section 2.0	Stockpile Extension Modification to the Mine Plan of Operations
Sequence of operations	Section 2.8	Schedule of Operations
Land-use plans	Section 1.7.1.1 Section 6.0	BLM Surface Management Reclamation Plan
Mitigation	Section 2.4 Section 2.6 Section 5.0	Water Management Plan Quality Assurance Plan Baseline Environmental
Concurrent reclamation	Section 2.1.1 Section 6.0	Stockpile Extension Reclamation Plan
Compliance with other laws	Section 1.7	Permitting Information

[1] Since the Stockpile extension proposes to expand the existing Stockpile as a single, contiguous facility, FMBI has proposed a determination that the proposed extension is an "existing facility" under 43 CFR 3809.433(b) and has requested that 43 CFR 3809.420(b)(12)(ii), as follows, not apply to the proposed Stockpile extension.

(12) Leaching operations and impoundments.
(ii) You must construct a low-permeability liner or containment system that will minimize the release of leaching solutions to the environment. You must monitor to detect potential releases of contaminants from heaps, process ponds, tailings impoundments, and other structures and remediate environmental impacts if leakage occurs.

Table 10 Performance Standards

Performance Standard	Location in MPO Modification
Access roads	Section 2.1 Proposed Facilities and Features
Mining wastes	Section 2.2.4 Rock Management
Reclamation	Section 6.0 Reclamation Plan
Air quality	Section 1.7.3 Air Permit Section 2.3 Air Quality Management (Mine Dust Control)
Water quality	Section 1.7.2 Water Permits Section 2.4 Water Management Plan
Solid wastes	Section 2.5 Solid Waste Management
Fisheries, wildlife, and plant habitat	Section 5.3 Biological Resources Section 6.0 Reclamation Plan
Cultural and paleontological resources	Section 5.4 Cultural Resources
Protection of survey monuments	Section 5.5 Protection of Survey Monuments
Fire	Section 2.9 Safety and Security
Acid-forming, toxic, or other deleterious materials	Section 1.7.2.2 Aquifer Protection Permit Section 2.1 Proposed Facilities and Features Section 2.2.4 Rock Management Section 6.0 Reclamation Plan
Leaching operations and impoundments	Section 1.7.2.2 Permitting Information Section 2.1 Proposed Facilities and Features Section 2.2.4 Rock Management Section 6.0 Reclamation Plan
Maintenance and public safety	Section 2.9 Safety and Security

7.2 REASONABLY INCIDENT

Pursuant to 43 CFR 3809.415(b), FMBI will prevent unnecessary or undue degradation of public lands by assuring that operations are designed to be reasonably incident to the mining operations that will be carried out on lands managed by the BLM and private lands. Reasonably incident is defined in 43 CFR 3715.0-5 as activities, methods, and equipment by a person of ordinary prudence to prospect, mine or process a valuable mineral deposit (copper) using methods, structures and equipment appropriate to the geologic terrain, mineral deposit and stage of development. This means that there will be no activities, expenditure of labor or resources, or construction of structures that are not for the express purpose of defining, developing, mining, and processing the copper deposit on public and private lands.

The specific activities on public lands in which FMBI will be engaged are further described in Section 2.0 of this MPO Modification. As described, all aspects of the proposed operation and occupancy of public lands will involve mining. The disturbance to public lands will be only that which is required for the Stockpile extension and individual distributed facilities that are necessary to support ongoing operations and reclamation, and therefore would be considered reasonably incident.

8.0 USE AND OCCUPANCY

The purpose of the BLM regulations for use and occupancy of public lands under the Mining Laws is clarified under 43 CFR 7315.0-1, which states that the BLM will limit "use or occupancy to that which is reasonably incident" to the development of locatable mineral minerals.

43 CFR 3715.0-5 defines "occupancy" as:

> …full or part-time residence on the public lands. It also means activities that involve residence; the construction, presence, or maintenance of temporary or permanent structures that may be used for such purposes; or the use of a watchman or caretaker for the purpose of monitoring activities. Residence or structures include, but are not limited to, barriers to access, fences, tents, motor homes, trailers, cabins, houses, buildings, and storage of equipment or supplies.

The uses of public lands proposed herein are reasonably incident, as detailed in Section 7.2. Pursuant to 43 CFR 3715.1, the provision of 43 CFR 3715.4, 3715.5 and 3715.7 apply along with the applicable regulations in 43 CFR part 3800.

- *§3715.4 What if I have an existing use or occupancy?*
  BLM has approved a Plan of Operations and subsequent modifications and amendments and conducts routine site visits and inspections. FMBI's existing use and occupancy of public lands meet the applicable requirements of 43 CFR 3715 *et. seq.*
- *§3715.5 What standards apply to my use or occupancy?*
  The existing and proposed uses and occupancies of public lands administered by the BLM are reasonably incident; the existing and proposed uses and occupancies conform to all applicable federal and state environmental standards. FMBI has the required permits for current operations and will obtain necessary permits and/or permit amendments before initiating the uses proposed in this MPO Modification.
- *§3715.7 How will BLM inspect my use or occupancy and enforce this subpart?*
  The BLM routinely inspects the equipment, workings, uses, and occupancies located on public lands.

In accordance with 43 CFR 3715.2, 3715.2-1, and 3715.3-2, the following discussion is provided to the BLM for review and concurrence. The proposed Stockpile extension may include occupancy of public lands through the temporary storage of equipment or supplies on lifts during Stockpile construction and operation; structures, barriers to access, fences, or residences are not anticipated for the proposed Stockpile extension. As individual distributed facilities may be identified in the future (refer to Section 2.1.2), FMBI will evaluate the application of this section, prepare a written description of the proposed occupancy (if any), and provide supplemental items and/or materials that may be needed to support the specific request.

FMBI has completed substantial, regular work leading to the extraction and beneficiation of minerals at the Bagdad Mine. Additionally, any proposed occupancy will be temporary in nature; no features proposed under this MPO Modification would be anticipated to remain permanently (other than the reclaimed Stockpile itself). Similarly, any feature proposed in this MPO Modification would be

anticipated to meet the conditions specified in 43 CFR 3715.2 for occupancy, as demonstrated in Table 11 and summarized in the following sections. Any feature proposed under this MPO Modification would also be anticipated to meet one or more of the additional characteristics needed for a demonstration of occupancy, as listed in Table 12, pursuant to 43 CFR 3715.2-1. Finally, the requirements of 43 CFR 3715.3-2 are addressed in Table 13.

Table 11 Activities for Occupancy Demonstration

43 CFR 3715.2	Demonstration for Occupancy	Refer to Section
(a)	Be reasonably incident	Section 7.2 Reasonably Incident
(b)	Constitute substantially regular work	Section 8.1 Substantially Regular Work
(c)	Be reasonably calculated to lead to the extraction and beneficiation of minerals	Section 8.2 Reasonably Calculated to Lead to Extraction and Beneficiation of Minerals
(d)	Involve observable on-the-ground activity that BLM may verify under §3715.7, and	Section 8.3 Observable Activities
(e)	Use appropriate equipment that is presently operable, subject to the need for reasonable assembly, maintenance, repair or fabrication of replacement parts.	Section 8.4 Appropriate and Operable Equipment Section 8.5 Public Safety and Protection from Theft and Loss

Table 12 Additional Characteristics for Occupancy Demonstration

43 CFR 3715.2-1	Additional Characteristic(s) for Occupancy	Refer to Section
(a)	Protecting exposed, concentrated or otherwise accessible valuable minerals from theft or loss;	Section 8.5 Public Safety and Protection from Theft and Loss
(b)	Protecting from theft or loss appropriate, operable equipment which is regularly used, is not readily portable, and cannot be protected by means other than occupancy;	Section 8.5 Public Safety and Protection from Theft and Loss
(c)	Protecting the public from appropriate, operable equipment which is regularly used, is not readily portable, and if left unattended, creates a hazard to public safety;	Section 8.5 Public Safety and Protection from Theft and Loss
(d)	Protecting the public from surface uses, workings, or improvements which, if left unattended, create a hazard to public safety; or	Section 8.5 Public Safety and Protection from Theft and Loss
(e)	Being located in an area so isolated or lacking in physical access as to require the mining claimant, operator, or workers to remain on site in order to work a full shift of a usual and customary length. A full shift is ordinarily 8 hours and does not include travel time to the site from a community or area in which housing may be obtained.	Not anticipated to be applicable.

Table 13 Information Required for Occupancy Request

43 CFR 3715.3-2	Information Required for Occupancy Request	Refer to:
(a)	How the proposed occupancy is reasonably incident;	Section 7.2 Reasonably Incident
(b)	How the proposed occupancy meets the conditions specified in §3715.2 and §3715.2-1;	Table 11 Activities for Occupancy Demonstration Table 12 Additional Characteristics for Occupancy Demonstration
(c)	Where you will place temporary or permanent structures for occupancy;	Occupancy (temporary storage of equipment or supplies on lifts during Stockpile construction and operation) would occur within the proposed limit of Stockpile extension (Figure 4 and Figure 5).
(d)	The location of and reason you need enclosures, fences, gates, and signs intended to exclude the general public;	Enclosures, fences, gates, and signs are not anticipated. However, if such features become necessary, they would enhance public safety and protect materials from theft and loss, as discussed in Section 8.5.
(e)	The location of reasonable public passage or access routes through or around the area to adjacent public lands; and	Existing public access routes south of the proposed limit of Stockpile extension would be maintained, as depicted in Figure 3. Existing dirt roads within the proposed limit of Stockpile extension are dead ends; public passage/connectivity would not be obstructed through the construction of the Stockpile extension.
(f)	The estimated period of use of the structures, enclosures, fences, gates, and signs, as well as the schedule for removal and reclamation when operations end.	Section 2.8 Schedule of Operations

Future, potential occupancy requested under this MPO Modification related to the final engineering of individual distributed facilities would be accompanied by a written description of the proposed occupancy, if applicable. In such case, the items and materials required by 43 CFR 3715.3-2 and listed in Table 13 will be provided. FMBI would not begin occupancy related to the distributed facilities until the BLM approves this MPO Modification and:

- BLM reviews and authorizes the final engineering of individual features under 43 CFR 3809 and 3715, as applicable, and
- The federal, state and local mining, reclamation, and waste disposal permits, approvals, or other authorizations for the particular use or occupancy have been obtained.

8.1 SUBSTANTIALLY REGULAR WORK

Upon approval of this MPO Modification, FMBI will begin the operations as described in Section 2.0 related to the construction, operation, and reclamation of the proposed Stockpile extension. Activities will include hauling, unloading, leaching, and stockpiling of mineralized waste rock and overburden, as described in Section 2.1.1. According to the schedule of operations presented in Section 2.8, the work will be continuous, depending on prevailing economic conditions, potential interruptions, and other

factors. Mining is anticipated to continue through approximately 2054. Post-mining activities on public lands will include reclamation, as described in the state-approved reclamation plan (Closure Plan) and outlined in Section 6.0 of this MPO Modification.

8.2 REASONABLY CALCULATED TO LEAD TO EXTRACTION AND BENEFICIATION OF MINERALS

FMBI has determined, through exploration activities, that the mineral resources to be mined are economically recoverable. As this proposed MPO Modification includes the extension of an existing leach stockpile, there is a reasonable expectation that it will result in the extraction and beneficiation of copper. Recovery of minerals in accordance with this MPO Modification constitutes a major investment in equipment and resources and would not be undertaken without this expectation.

8.3 OBSERVABLE ACTIVITIES

In accordance with 43 CFR 3715.7, BLM field staff will be able to physically verify the activities described in this MPO Modification upon approval and commencement of the construction of the new and expanded facilities. The BLM will be allowed access to the site for a review of the activities on public lands.

8.4 APPROPRIATE AND OPERABLE EQUIPMENT

FMBI uses operable equipment at the Bagdad Mine that is appropriate, both in terms of physical requirements and cost effectiveness, for the job. Equipment is routinely maintained according to manufacturer's suggestions and industry standards. The appropriate equipment is presently operable and located at the mine site adjacent to the public lands proposed for mining in this MPO Modification. A description of equipment that will be used in the implementation of this MPO Modification is provided in Section 2.1.1. Mining activities are planned for two shifts per day, 365 days per year.

8.5 PUBLIC SAFETY AND PROTECTION FROM THEFT AND LOSS

Occupancy of public lands will protect valuable minerals from theft, protect the equipment from theft or loss, protect the public from this equipment, and protect the public from hazardous situations on public land. Existing security procedures protect the current operations by restricting public access to private lands at the mine site, including facilities and equipment. On private land, gates are located on access roads to the mine and are maintained, closed, and locked with access available only to mine personnel. Perimeter gates on private land found damaged are immediately repaired. This is for both the protection of the public and the mine assets. FMBI does not allow the public to cross the mine property to access public lands. In addition, FMBI has implemented supplementary safety programs to reflect corporate policies and site-specific considerations. All employees are trained to observe and report suspicious or unusual activity that threatens safety or security.

Mine employees and visitors to the mine are required to comply with a mine safety plan and must wear the required safety equipment. Visitors to the site are required to check in prior to entrance through the main gate, which includes a manned checkpoint. A safety briefing is provided to visitors prior to entrance onto the mine site.

9.0 REFERENCES

ADEQ (Arizona Department of Environmental Quality). 2005. *Arizona Mining BADCT Guidance Manual*: Phoenix, ADEQ, Publication # TB 04-01.

ADEQ. 2009a. *Air Quality Class II Synthetic Minor Permit, Freeport-McMoRan Bagdad Inc., Bagdad Mine, Permit #29846*. December.

ADEQ. 2009b. *Aquifer Protection Permit No. P-105258*, Place ID 9542: permit document prepared for Freeport-McMoRan Bagdad Inc. March 25.

ADEQ. 2013. *Aquifer Protection Permit No. P-105258 – Significant Amendment*, Place ID 1390, LTF 57247. August 28.

ADWR (Arizona Department of Water Resources). 2008. *Well Abandonment Handbook*. October 3.

ADWR. 2009. *Arizona Water Atlas, Volume 4 – Upper Colorado River Planning Area.* July.

AGFD (Arizona Game and Fish Department). 2007. *Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects.* Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ.

AGFD. 2010. *Gopherus agassizii*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 11 pp. Accessed February 2014, [web page] located at: http://www.azgfd.gov/w_c/edits/documents/Gophagas.fi_002.pdf.

AGFD. 2013. *Heritage Data Management System*. Retrieved January 2014, from Arizona Natural Heritage Program: http://www.azgfd.gov/w_c/edits/hdms_species_lists.shtml.

AGFD. 2014. Special Status Species by County, Taxon, Scientific Name. Revised January 6, 2014. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_species_lists.shtml.

AGFD. Plant and Animal Abstracts, Distribution Maps, & Illustrations. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml.

Anderson, C.A., E. Scholz, and J. Strobell, Jr. 1955. *Geology and Ore Deposits of the Bagdad Area, Yavapai County, Arizona.* USGS Professional Paper 278.

Aquionix, Inc. 2012. *Stormwater Pollution Prevention Plan*. Prepared for Freeport-McMoRan Bagdad Inc. Signed January 30.

Aquionix, Inc. 2013. *Spill Prevention, Control and Countermeasures Plan*. Prepared for Freeport-McMoRan Bagdad Inc. Revision dated December 13.

BLM (Bureau of Land Management). 1992. Solid Minerals Reclamation Handbook H-3042-1. April 8.

BLM. 1993. Kingman Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement; BLM/AZ/PL-93/009-4410. Kingman: U.S. Department of the Interior.

BLM. 1995a. *Cyprus Bagdad Copper Corporation Proposed Tailings and Waste Rock Storage Areas, Draft Environmental Impact Statement.* August.

BLM. 1995b. *Cyprus Bagdad Copper Corporation Proposed Tailings and Waste Rock Storage Areas, Final Environmental Impact Statement*. December.

BLM. 1996. *Record of Decision for the Cyprus Bagdad Copper Corporation, Proposed Waste Rock Tailings and Waste Rock Storage Areas, Final Environmental Impact Statement.* Mining Plan of Operations AZA-28639, BLM Arizona EIS No. BLM/AZ/PL-95/005. March 5, 1996.

BLM. 1997. EA-AZ-025-97-022 Administrative Determination. February.

BLM. 2005. *Decision – Mining Plan Approved and Documentation of Land Use Plan Conformance and NEPA Adequacy.* April.

BLM. 2012a. Surface Management Handbook H-3809-1: Revised Manual incorporates changes in policies resulting from revision of regulations in 43 CFR 3809. September 17.

BLM. 2012b. Decision Financial Guarantee Required. November.

Brown, D. and C. Lowe. 1980. Biotic Communities of the Southwest. USDA Forest Service General Technical Report RM-78 (map).

Brown, D., C. Lowe and C. Pase. 1979. A digitized classification system for the biotic communities of North America, with community (series) and association examples for the Southwest. Journal of the Arizona-Nevada Academy of Science 14, Suppl. 1: 1-16.

EMC^2. 2012. *Closure Cost Estimate for BLM Lands Located at Bagdad*. Freeport-McMoRan Bagdad Inc., Bagdad, Arizona. April 24.

EnviroNet Inc. 1997. *Cyprus Bagdad Copper Corporation Reclamation Plan*. Pursuant to the Arizona Mined Land Reclamation Act, ARS 27-901. State of Arizona Mine Inspectors Office. March.

FMBI (Freeport-McMoRan Bagdad Inc.). 1995. *Plan of Operations for Tailings Facility Expansion and South Waste Rock Disposal Facility (Revision No. 4).* July.

FMBI. 1996a. *Plan of Operations for Upper Mammoth Tailings & South Waste Rock Disposal Facilities [Revision No. 5]*. February.

FMBI. 1996b. *Amendment to the Existing Plan of Operations (AZA-28639) to Include Portions of the Plan 9 Dump*. December.

FMBI. 2004. *Addendum to the Existing Plan of Operations (Revision No. 8)*. November.

FMBI. 2011. *MSGP-2010 Stormwater Pollution Prevention Plan, Freeport-McMoRan Bagdad Inc., Bagdad, Arizona*. May.

FMBI. 2012. *Addendum to Plan of Operations for Plan IX Leach Stockpile and South Waste Rock Disposal Facilities*. November.

Freeport-McMoRan, 2014. Bagdad Mine. Website accessed February 2014 at: http://www.fcx.com/operations/USA_Arizona_Bagdad.htm.

SRK Consulting, Inc. 2009. *Request for Other Amendment to APP No. P-105258 – Plan IX Leach Dump Expansion and Life-of Mine Stability Analysis.* Submitted to ADEQ December 22.

SRK Consulting, Inc. 2010. *Request for Other Amendment to APP No. P-101353 – South Waste Rock Disposal Facility Expansion.* Submitted to ADEQ February 23.

Titan Environmental Corporation. 1995. *Closure Plan – South Waste Rock Disposal Facility*. Prepared for Cyprus Bagdad Copper Corporation. July.

URS Corporation. 2013. *Cultural Resource Overview and Survey for the Proposed Expansion of the Bagdad Mine Waste Rock Stockpile Area, Bagdad, Yavapai County, Arizona*. Prepared for Freeport-McMoRan Bagdad Incorporated. September.

US Fish and Wildlife Service (USFWS). 2013. Arizona Ecological Services Field Office. Listed and Sensitive Species in Yavapai County. Revised October 30. Retrieved from: http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Yavapai.pdf.

USFWS. 2014. Environmental Conservation Online System. Species by County Report: Yavapai County, AZ. Retrieved from: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=04025.

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FIGURES

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Mount Tipton
Red Lake Subbasin
Coconino County
Yavapai County
93
Kingman
40
Big Chino-Williamson Valley Subbasin
Mount Nutt Inholding
Big Sandy Subbasin
Trout Creek
Wabayuma Peak
Warm Springs
Mohave County
Yavapai County
Juniper Mesa Wilderness
Apache Creek Wilderness
Burro Subbasin
Sacramento Wash Subbasin
Big Sandy River
Upper Burro Creek
Boulder Creek
Bagdad Mine
Bagdad Townsite
Project Area
Lake Havasu City
Bill Williams Subbasin
Bridle Creek
Santa Maria Subbasin
Colorado River
Aubrey Peak
Parker Dam
Poachie Range
Arrastra Mountain
Santa Maria River
Alamo Lake
Imperial Reservoir Subbasin
La Paz County
Bill Williams River
Swansea
Gibratar Mountain
Rawhide Mountains
Alamo Dam
Tres Alamos
Date Creek
89
Cunningham Wash
East Cactus Plain
Harcuvar Mountains
Yavapai County
Maricopa County
Wickenburg
Bouse Wash Subbasin
60
Harquahala Mountains
Hassayampa Subbasin
Centennial Wash Subbasin
Tiger Wash
Coyote Wash
Arizona
Yuma County

Legend

- Project Area
- Bagdad Mine
- Subbasin (HUC8)

Land Status

- BLM Wilderness
- BLM Wilderness Study Area
- Bureau of Land Management (BLM)
- Bureau of Reclamation
- County
- Indian Lands
- Local or State Parks
- Military
- Private Land (No Color)
- State Trust Land
- State Wildlife Area
- US Forest Service (USFS)
- US Fish and Wildlife (USFWS)

N

0 10

SCALE IN MILES

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FIGURE 1
REGIONAL OVERVIEW
BAGDAD MINE

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Legend

- BLM Approved Disturbance Area
- Existing Extent of Stockpile
- Proposed Limit of Stockpile Extension
- Conceptual Extent of Stockpile
- Proposed Distributed Facilities
- Subbasin (HUC8)
- APP Point of Compliance Well

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

Burro Subbasin

Boulder Creek

609 610 611 020 283 803 613 810

Mulholland Tailings Impoundment

Mill & Processing Facilities

Existing Power Line

Alum Sump PLS Pond

Open Pit

Sanders Mesa

Mammoth Tailings Impoundment

Upper Mammoth Tailings Impoundment

Plan IX Leach Stockpile

Kimberly Pond

South Waste Rock Stockpile

Existing Power Line

Bagdad Town Site

Bagdad Creek

Santa Maria Subbasin

Existing Power Line ROW (by others)

T15N
T14N

R10W
R 9W

0 3,000
SCALE IN FEET

N

FIGURE 2
PROJECT VICINITY
BAGDAD MINE

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Legend

- BLM Approved Disturbance Area
- Existing Extent of Stockpile
- Existing Access Road
- Subbasin (HUC8)

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

Burro Subbasin

T15N
T14N

Open Pit

Upper Mammoth Tailings Impoundment

Existing Power Line

Existing Power Line ROW (by others)

Bridle Creek

Santa Maria Subbasin

R10W
R9W

0 2,000
SCALE IN FEET

FIGURE 3
APPROVED DISTURBANCE AND EXISTING FEATURES
BAGDAD MINE

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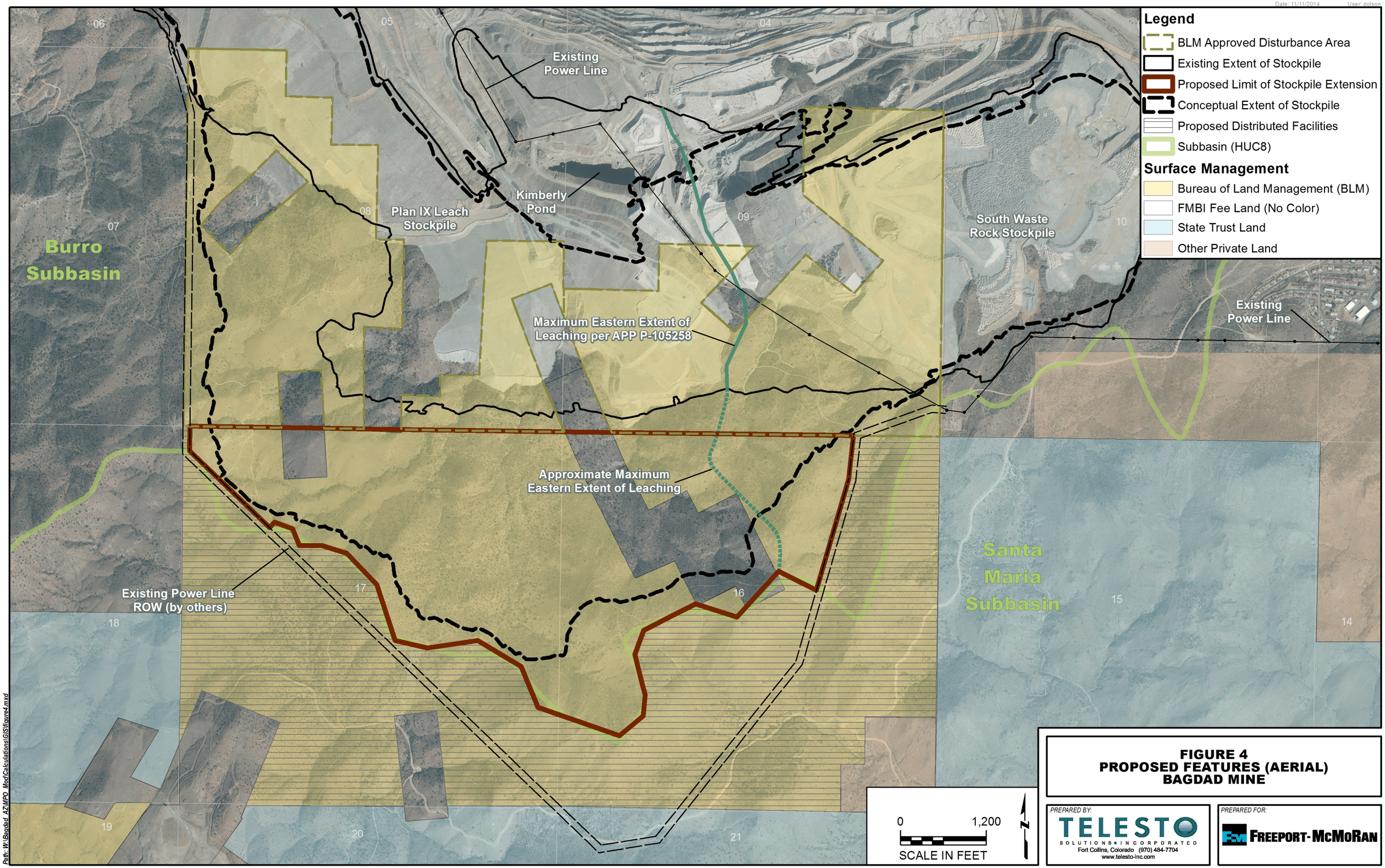

Legend

- BLM Approved Disturbance Area
- Existing Extent of Stockpile
- Proposed Limit of Stockpile Extension
- Conceptual Extent of Stockpile
- Proposed Distributed Facilities
- Subbasin (HUC8)

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

0 1,200

SCALE IN FEET

FIGURE 4
PROPOSED FEATURES (AERIAL)
BAGDAD MINE

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Kimberly Peak

Existing Power Line

Tailings Pond

Plan IX Leach Stockpile

Kimberly Pond

South Waste Rock Stockpile

Burro Subbasin

Maximum Eastern Extent of Leaching per APP P-105258

Existing Power Line

Approximate Maximum Eastern Extent of Leaching

Cowboy Peaks

Santa Maria Subbasin

Existing Power Line ROW (by others)

Legend

- BLM Approved Disturbance Area
- Existing Extent of Stockpile
- Proposed Limit of Stockpile Extension
- Conceptual Extent of Stockpile
- Proposed Distributed Facilities
- Subbasin (HUC8)

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

0 1,200

SCALE IN FEET

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FIGURE 5
PROPOSED FEATURES (TOPOGRAPHY)
BAGDAD MINE

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R10W R9W

T15N T14N

Burro Subbasin

Upper Mammoth Tailings Impoundment

Open Pit

2200 2600 2800 3200 3000 3600 3800

Legend

- BLM Approved Disturbance Area
- Existing Extent of Stockpile
- Proposed Limit of Stockpile Extension
- Approximate Groundwater Contour
- Groundwater Gradient
- Proposed Distributed Facilities
- Subbasin (HUC8)

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

Bridle Creek

Santa Maria Subbasin

Groundwater contours represent preliminary model results from model under development for compliance with APP P-105258 by Schlumberger Water Services (January 2014) and are subject to change. Refer to Figure 7 for surface contours representing the Conceptual Stockpile Configuration.

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SCALE IN FEET

FIGURE 6
GROUNDWATER ELEVATION AND GRADIENT
BAGDAD MINE

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Legend

- BLM Approved Disturbance Area
- Conceptual Extent of Stockpile
- Proposed Limit of Stockpile Extension

Surface Management

- Bureau of Land Management (BLM)
- FMBI Fee Land (No Color)
- State Trust Land
- Other Private Land

Maximum Eastern Extent of Leaching per APP P-105258

Approximate Maximum Eastern Extent of Leaching

A

A'

B

B'

C

C'

D

D'

0 1,200

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N

FIGURE 7
CONCEPTUAL STOCKPILE CONFIGURATION
BAGDAD MINE

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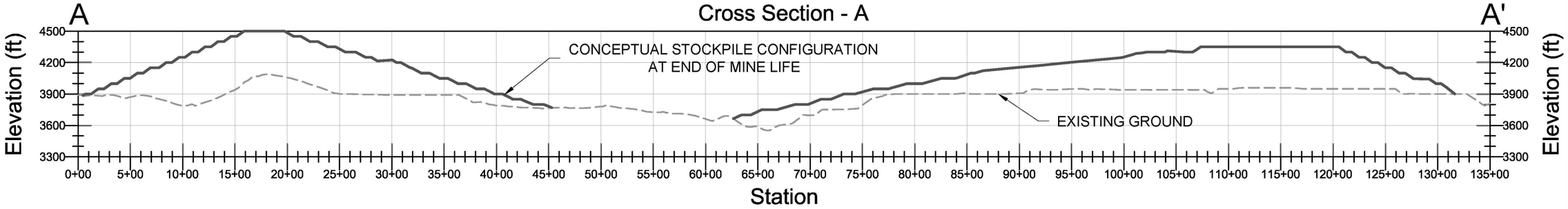

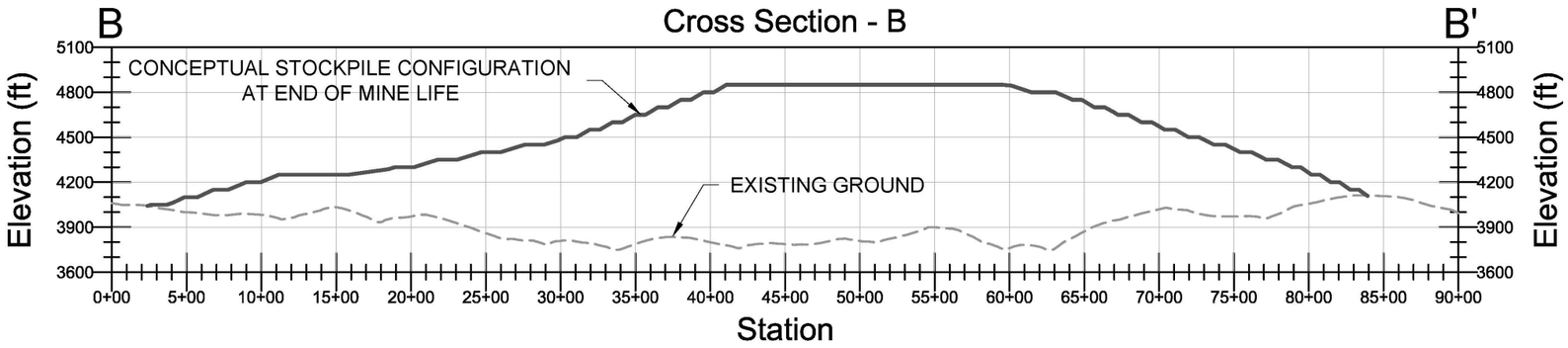

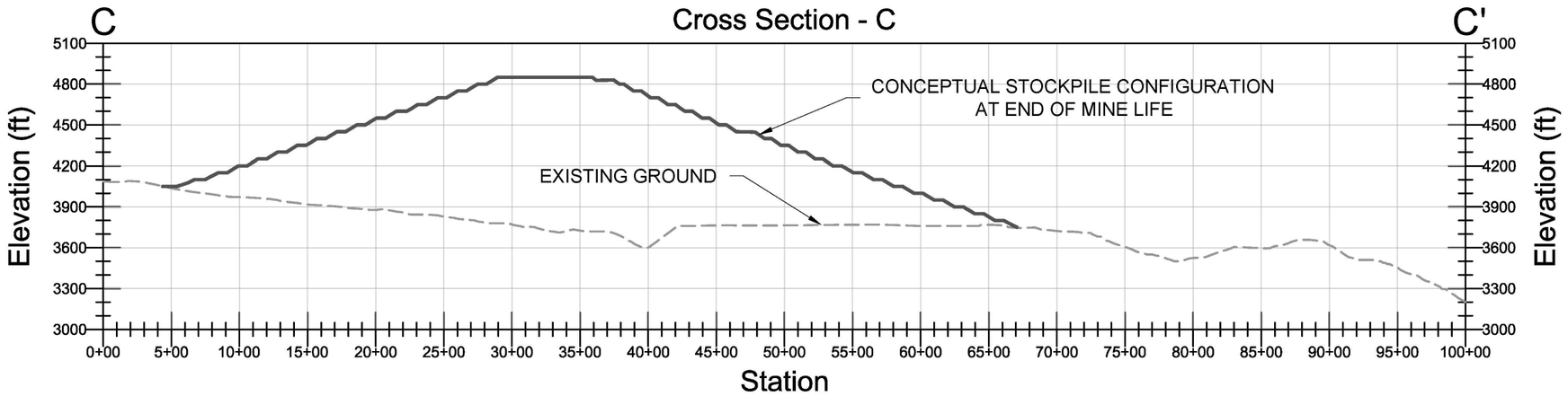

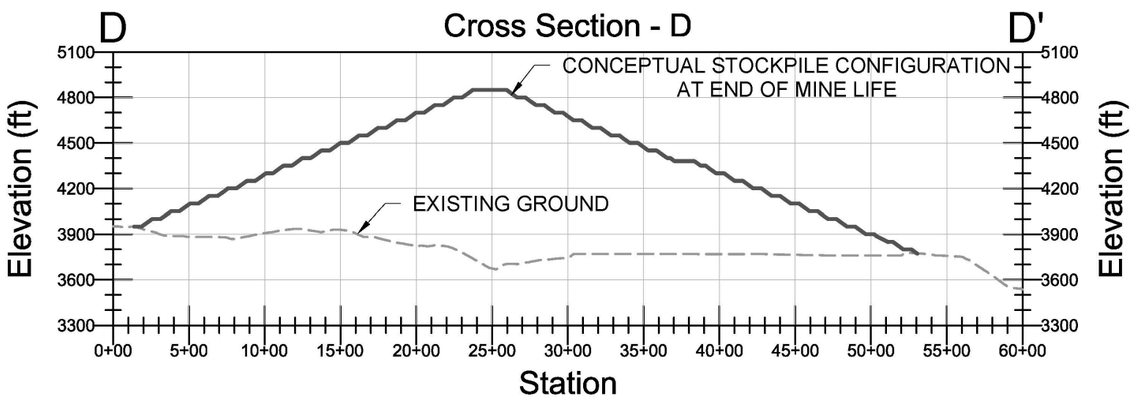

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FIGURE 8
CROSS SECTIONS OF CONCEPTUAL STOCKPILE CONFIGURATION
BAGDAD MINE

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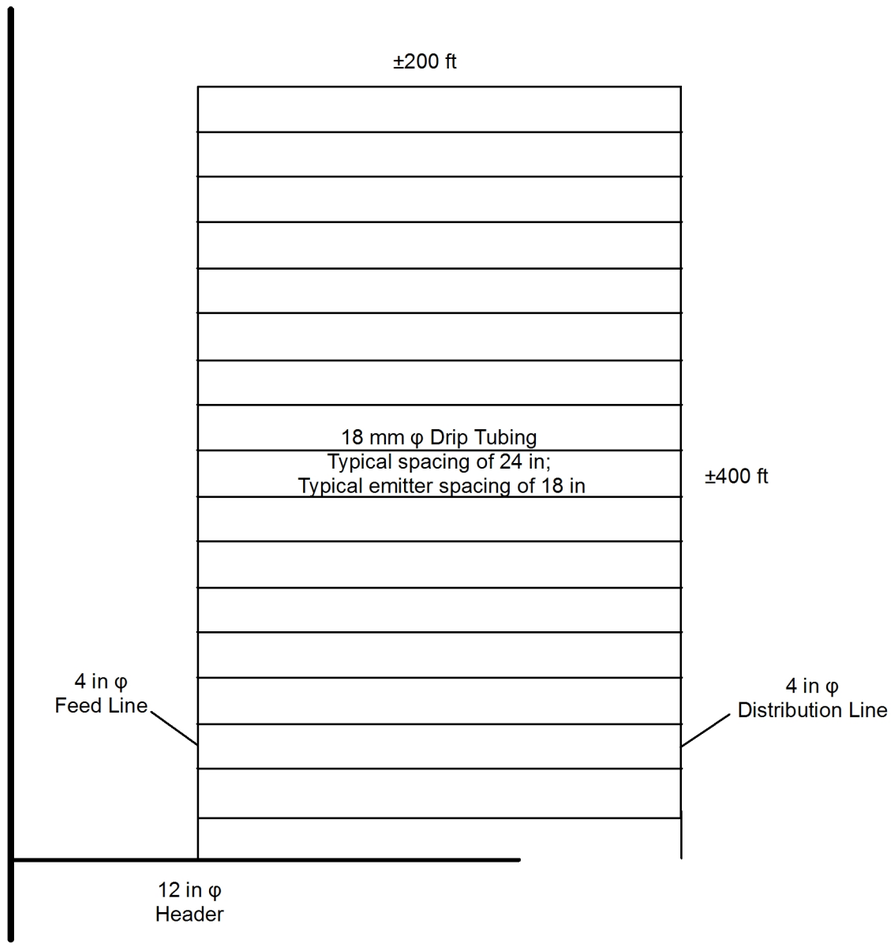

This figure represents the typical installation of raffinate distribution system piping on each lift of the Plan IX Leach portion of the Stockpile. Actual pipe sizes and layout may vary.

NOT TO SCALE

FIGURE 9
TYPICAL RAFFINATE DISTRIBUTION PIPING LAYOUT
BAGDAD MINE

PREPARED BY:
TELESTO SOLUTIONS INCORPORATED
Fort Collins, Colorado (970) 484-7704
www.telesto-inc.com

PREPARED FOR:
FREEPORT-McMoRan

Path: W:\Bagdad AZ\MPO_Mod\Calculations\GIS\figure9.mxd

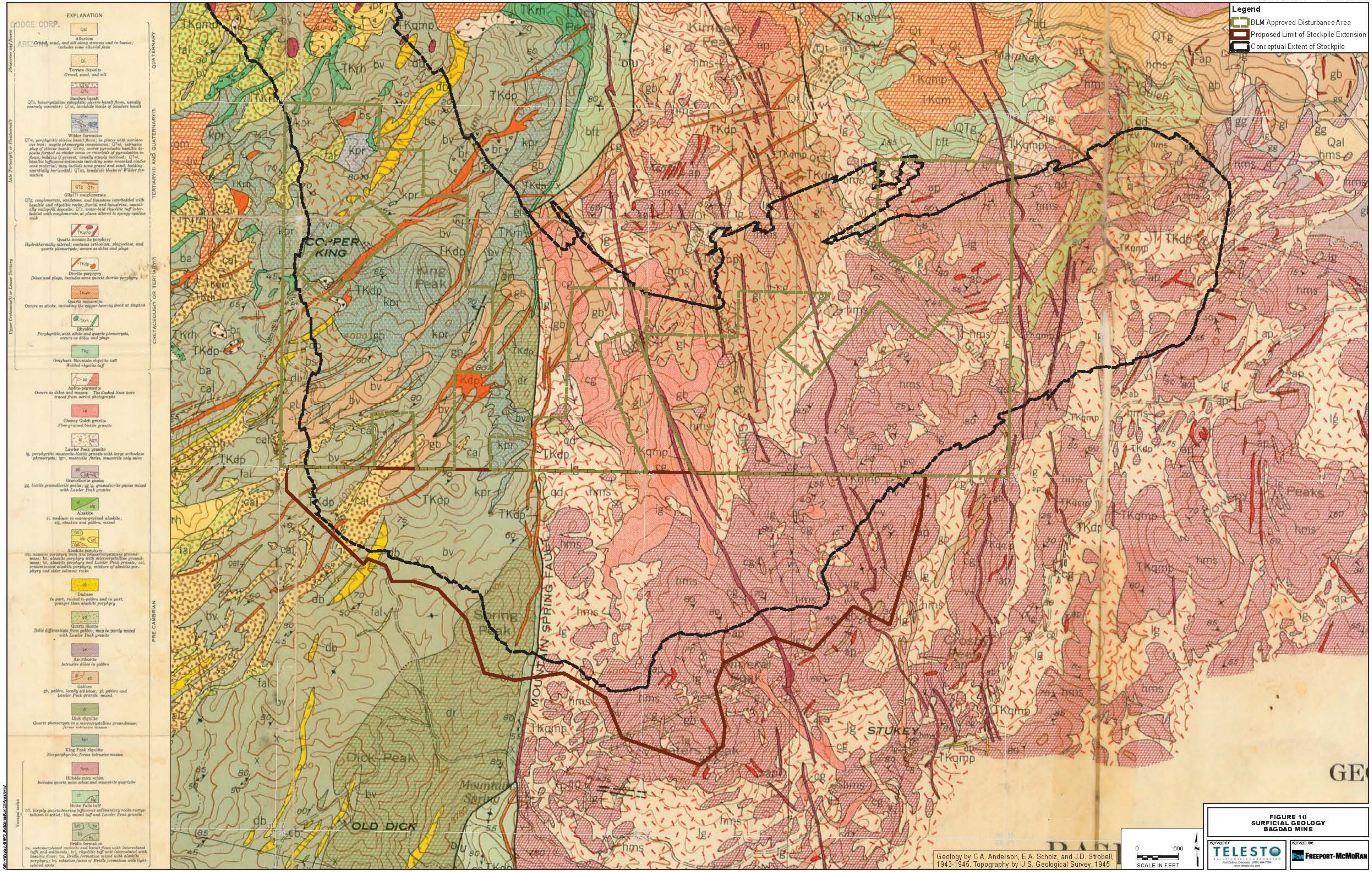

FIGURE 10
SURFICIAL GEOLOGY
BAGDAD MINE

Date: 11/11/2014 User: dolson

R11W R10W R9W R8W R7W

T16N T15N T14N T13N

BURRO CREEK ACEC

CLAY HILLS ACEC

BURRO CREEK ACEC

BIG SANDY HERD MANAGEMENT AREA

POACHIE ACEC

BIG SANDY HERD MANAGEMENT AREA

BIG SANDY HERD MANAGEMENT AREA

Sycamore Creek
Wilder Creek
Boulder Creek
Kaiser Spring Wash
Burro Creek
Bryce Creek
Little Shipp Wash
Big Shipp Wash
Smith Canyon
Tank Creek
Black Canyon
Santa Maria River
Kirkland Creek

97
93
96

Legend

- Project Area
- Area of Critical Environmental Concern (ACEC)
- Herd Management Area
- 10 mile radius

Biotic Communities

- Great Basin Conifer Woodland
- Interior Chaparral
- Semidesert Grassland
- Arizona Upland Subdivision - Sonoran Desertscrub

0 2.5
SCALE IN MILES

N

FIGURE 11
BIOLOGICAL RESOURCES
BAGDAD MINE

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Path: W:\Bagdad_AZ\MPO_Mod\Calculations\GIS\figure11.mxd

APPENDIX A UNPATENTED MINING AND MILL SITE CLAIMS

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Table A.1 Unpatented Mining and Mill Site Claims

Claim Name	BLM Serial No.	Claim Type
CYPRUS NO. 5	AMC 062897	Lode
CYPRUS #15	AMC 062907	Lode
PLYMOUTH	AMC 062915	Lode
COMBINE NO. 2	AMC 079989	Lode
JWH #24	AMC 308496	Lode
JWH #25	AMC 308497	Lode
JWH #33	AMC 308505	Lode
JWH #34	AMC 308506	Lode
JWH #44	AMC 308516	Lode
JWH #45	AMC 308517	Lode
KIM-31	AMC 362100	Mill Site
KIM-32	AMC 362101	Mill Site
KIM-33	AMC 362102	Mill Site
LTB-16	AMC 397209	Mill Site
LTB-17	AMC 397210	Mill Site
LTB-21	AMC 397214	Mill Site
LTB-27	AMC 397220	Mill Site
PMB 1	AMC 403441	Mill Site
PMB 2	AMC 403442	Mill Site
PMB 3	AMC 403443	Mill Site
PMB 4	AMC 403444	Mill Site
PMB 5	AMC 403445	Mill Site
PMB 6	AMC 403446	Mill Site
PMB 7	AMC 403447	Mill Site
PMB 8	AMC 403448	Mill Site
PMB 10	AMC 403450	Mill Site
PMB 11	AMC 403451	Mill Site
PMB 12	AMC 403452	Mill Site
PMB 13	AMC 403453	Mill Site
PMB 14	AMC 403454	Mill Site
PMB 15	AMC 403455	Mill Site
PMB 16	AMC 403456	Mill Site
PMB 17	AMC 403457	Mill Site
PMB 18	AMC 403458	Mill Site
PMB 19	AMC 403459	Mill Site
PMB 20	AMC 403460	Mill Site
PMB 21	AMC 403461	Mill Site
PMB 24	AMC 403464	Mill Site
PMB 25	AMC 403465	Mill Site
PMB 26	AMC 403466	Mill Site
PMB 27	AMC 403467	Mill Site
PMB 28	AMC 403468	Mill Site
PMB 29	AMC 403469	Mill Site
PMB 30	AMC 403470	Mill Site
PMB 31	AMC 403471	Mill Site
PMB 32	AMC 403472	Mill Site
PMB 37	AMC 403477	Mill Site
PMB 38	AMC 403478	Mill Site
PMB 39	AMC 403479	Mill Site
PMB 40	AMC 403480	Mill Site
PMB 41	AMC 403481	Mill Site
PMB 45	AMC 403485	Mill Site
PMB 46	AMC 403486	Mill Site
PMB 47	AMC 403487	Mill Site
MPC 1	AMC 413793	Mill Site
MPC 2	AMC 413794	Mill Site
MPC 3	AMC 413795	Mill Site
MPC 4	AMC 413796	Mill Site
MPC 5	AMC 413797	Mill Site
MPC 6	AMC 413798	Mill Site
MPC 7	AMC 413799	Mill Site
MPC 8	AMC 413800	Mill Site
MPC 9	AMC 413801	Mill Site
MPC 10	AMC 413802	Mill Site
MPC 11	AMC 413803	Mill Site
MPC 12	AMC 413804	Mill Site
MPC 13	AMC 413805	Mill Site
MPC 14	AMC 413806	Mill Site
MPC 15	AMC 413807	Mill Site
MPC 16	AMC 413808	Mill Site
MPC 17	AMC 413809	Mill Site
MPC 18	AMC 413810	Mill Site
MPC 19	AMC 413811	Mill Site
MPC 20	AMC 413812	Mill Site
MPC 21	AMC 413813	Mill Site
MPC 22	AMC 413814	Mill Site
MPC 23	AMC 413815	Mill Site
MPC 24	AMC 413816	Mill Site
MPC 25	AMC 413817	Mill Site
MPC 26	AMC 413818	Mill Site
MPC 27	AMC 413819	Mill Site
MPC 28	AMC 413820	Mill Site
MPC 29	AMC 413821	Mill Site
MPC 30	AMC 413822	Mill Site
MPC 31	AMC 413823	Mill Site
MPC 32	AMC 413824	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 33	AMC 413825	Mill Site
MPC 34	AMC 413826	Mill Site
MPC 35	AMC 413827	Mill Site
MPC 36	AMC 413828	Mill Site
MPC 37	AMC 413829	Mill Site
MPC 38	AMC 413830	Mill Site
MPC 39	AMC 413831	Mill Site
MPC 40	AMC 413832	Mill Site
MPC 41	AMC 413833	Mill Site
MPC 42	AMC 413834	Mill Site
MPC 43	AMC 413835	Mill Site
MPC 44	AMC 413836	Mill Site
MPC 45	AMC 413837	Mill Site
MPC 46	AMC 413838	Mill Site
MPC 47	AMC 413839	Mill Site
MPC 48	AMC 413840	Mill Site
MPC 49	AMC 413841	Mill Site
MPC 50	AMC 413842	Mill Site
MPC 51	AMC 413843	Mill Site
MPC 52	AMC 413844	Mill Site
MPC 53	AMC 413845	Mill Site
MPC 54	AMC 413846	Mill Site
MPC 55	AMC 413847	Mill Site
MPC 56	AMC 413848	Mill Site
MPC 57	AMC 413849	Mill Site
MPC 58	AMC 413850	Mill Site
MPC 59	AMC 413851	Mill Site
MPC 60	AMC 413852	Mill Site
MPC 61	AMC 413853	Mill Site
MPC 62	AMC 413854	Mill Site
MPC 63	AMC 413855	Mill Site
MPC 64	AMC 413856	Mill Site
MPC 65	AMC 413857	Mill Site
MPC 66	AMC 413858	Mill Site
MPC 67	AMC 413859	Mill Site
MPC 68	AMC 413860	Mill Site
MPC 69	AMC 413861	Mill Site
MPC 70	AMC 413862	Mill Site
MPC 71	AMC 413863	Mill Site
MPC 72	AMC 413864	Mill Site
MPC 73	AMC 413865	Mill Site
MPC 74	AMC 413866	Mill Site
MPC 75	AMC 413867	Mill Site
MPC 76	AMC 413868	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 77	AMC 413869	Mill Site
MPC 78	AMC 413870	Mill Site
MPC 79	AMC 413871	Mill Site
MPC 80	AMC 413872	Mill Site
MPC 81	AMC 413873	Mill Site
MPC 82	AMC 413874	Mill Site
MPC 83	AMC 413875	Mill Site
MPC 84	AMC 413876	Mill Site
MPC 85	AMC 413877	Mill Site
MPC 86	AMC 413878	Mill Site
MPC 87	AMC 413879	Mill Site
MPC 88	AMC 413880	Mill Site
MPC 89	AMC 413881	Mill Site
MPC 90	AMC 413882	Mill Site
MPC 91	AMC 413883	Mill Site
MPC 92	AMC 413884	Mill Site
MPC 93	AMC 413885	Mill Site
MPC 94	AMC 413886	Mill Site
MPC 95	AMC 413887	Mill Site
MPC 96	AMC 413888	Mill Site
MPC 97	AMC 413889	Mill Site
MPC 98	AMC 413890	Mill Site
MPC 99	AMC 413891	Mill Site
MPC 100	AMC 413892	Mill Site
MPC 101	AMC 413893	Mill Site
MPC 102	AMC 413894	Mill Site
MPC 103	AMC 413895	Mill Site
MPC 104	AMC 413896	Mill Site
MPC 105	AMC 413897	Mill Site
MPC 106	AMC 413898	Mill Site
MPC 107	AMC 413899	Mill Site
MPC 108	AMC 413900	Mill Site
MPC 109	AMC 413901	Mill Site
MPC 110	AMC 413902	Mill Site
MPC 111	AMC 413903	Mill Site
MPC 112	AMC 413904	Mill Site
MPC 113	AMC 413905	Mill Site
MPC 114	AMC 413906	Mill Site
MPC 115	AMC 413907	Mill Site
MPC 116	AMC 413908	Mill Site
MPC 117	AMC 413909	Mill Site
MPC 118	AMC 413910	Mill Site
MPC 119	AMC 413911	Mill Site
MPC 120	AMC 413912	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 121	AMC 413913	Mill Site
MPC 122	AMC 413914	Mill Site
MPC 123	AMC 413915	Mill Site
MPC 124	AMC 413916	Mill Site
MPC 125	AMC 413917	Mill Site
MPC 126	AMC 413918	Mill Site
BULL 028	AMC 423245	Mill Site
BULL 029	AMC 423246	Mill Site
BULL 030	AMC 423247	Mill Site
BULL 031	AMC 423248	Mill Site
BULL 032	AMC 423249	Mill Site
BULL 033	AMC 423250	Mill Site
BULL 034	AMC 423251	Mill Site
BULL 035	AMC 423252	Mill Site
BULL 036	AMC 423253	Mill Site
BULL 037	AMC 423254	Mill Site
BULL 038	AMC 423255	Mill Site
BULL 039	AMC 423256	Mill Site
BULL 040	AMC 423257	Mill Site
BULL 041	AMC 423258	Mill Site
BULL 042	AMC 423259	Mill Site
BULL 043	AMC 423260	Mill Site
BULL 044	AMC 423261	Mill Site
BULL 045	AMC 423262	Mill Site
BULL 046	AMC 423263	Mill Site
BULL 047	AMC 423264	Mill Site
BULL 048	AMC 423265	Mill Site
BULL 049	AMC 423266	Mill Site
BULL 050	AMC 423267	Mill Site
BULL 051	AMC 423268	Mill Site
BULL 052	AMC 423269	Mill Site
BULL 053	AMC 423270	Mill Site
BULL 054	AMC 423271	Mill Site
BULL 055	AMC 423272	Mill Site
BULL 056	AMC 423273	Mill Site
BULL 057	AMC 423274	Mill Site
BULL 058	AMC 423275	Mill Site
BULL 059	AMC 423276	Mill Site
BULL 060	AMC 423277	Mill Site
BULL 061	AMC 423278	Mill Site
BULL 062	AMC 423279	Mill Site
BULL 063	AMC 423280	Mill Site
BULL 064	AMC 423281	Mill Site
BULL 065	AMC 423282	Mill Site

Claim Name	BLM Serial No.	Claim Type
BULL 066	AMC 423283	Mill Site
BULL 067	AMC 423284	Mill Site
BULL 068	AMC 423285	Mill Site
BULL 069	AMC 423286	Mill Site
BULL 070	AMC 423287	Mill Site
BULL 071	AMC 423288	Mill Site
BULL 072	AMC 423289	Mill Site
BULL 073	AMC 423290	Mill Site
BULL 074	AMC 423291	Mill Site
BULL 075	AMC 423292	Mill Site
BULL 076	AMC 423293	Mill Site
BULL 077	AMC 423294	Mill Site
BULL 078	AMC 423295	Mill Site
BULL 079	AMC 423296	Mill Site
BULL 080	AMC 423297	Mill Site
BULL 081	AMC 423298	Mill Site
BULL 082	AMC 423299	Mill Site
BULL 083	AMC 423300	Mill Site
BULL 084	AMC 423301	Mill Site
BULL 085	AMC 423302	Mill Site
BULL 086	AMC 423303	Mill Site
BULL 087	AMC 423304	Mill Site
BULL 088	AMC 423305	Mill Site
BULL 089	AMC 423306	Mill Site
BULL 090	AMC 423307	Mill Site
BULL 091	AMC 423308	Mill Site
BULL 092	AMC 423309	Mill Site
BULL 093	AMC 423310	Mill Site
BULL 094	AMC 423311	Mill Site
BULL 095	AMC 423312	Mill Site
STEP 027	AMC 423339	Mill Site
STEP 028	AMC 423340	Mill Site
STEP 029	AMC 423341	Mill Site
STEP 030	AMC 423342	Mill Site
STEP 031	AMC 423343	Mill Site
STEP 032	AMC 423344	Mill Site
STEP 038	AMC 423350	Mill Site
STEP 039	AMC 423351	Mill Site
STEP 040	AMC 423352	Mill Site
STEP 041	AMC 423353	Mill Site
STEP 042	AMC 423354	Mill Site
STEP 043	AMC 423355	Mill Site
STEP 044	AMC 423356	Mill Site
STEP 051	AMC 423363	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 052	AMC 423364	Mill Site
STEP 053	AMC 423365	Mill Site
STEP 054	AMC 423366	Mill Site
STEP 055	AMC 423367	Mill Site
STEP 056	AMC 423368	Mill Site
STEP 057	AMC 423369	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 058	AMC 423370	Mill Site
STEP 059	AMC 423371	Mill Site
STEP 060	AMC 423372	Mill Site
STEP 061	AMC 423373	Mill Site

Table A.2 Unpatented Mining and Mill Site Claims

Claim Name	BLM Serial No.	Claim Type
BEV 1	AMC 305766	Mill Site
BEV 2	AMC 305767	Mill Site
BEV 3	AMC 305768	Mill Site
BEV 4	AMC 305769	Mill Site
BEV 5	AMC 305770	Mill Site
BEV 6	AMC 305771	Mill Site
BEV 7	AMC 305772	Mill Site
BEV 8	AMC 305773	Mill Site
BEV 9	AMC 305774	Mill Site
BEV 10	AMC 305775	Mill Site
BEV 11	AMC 305776	Mill Site
BEV 12	AMC 305777	Mill Site
BEV 13	AMC 305778	Mill Site
BEV 14	AMC 305779	Mill Site
BEV 15	AMC 305780	Mill Site
BEV 16	AMC 305781	Mill Site
BEV 17	AMC 305782	Mill Site
BEV 18	AMC 305783	Mill Site
BEV 19	AMC 305784	Mill Site
BEV 20	AMC 305785	Mill Site
BEV 21	AMC 305786	Mill Site
BEV 22	AMC 305787	Mill Site
BEV 23	AMC 305788	Mill Site
BEV 24	AMC 305789	Mill Site
BEV 25	AMC 305790	Mill Site
BEV 26	AMC 305791	Mill Site
BEV 27	AMC 305792	Mill Site
BEV 28	AMC 305793	Mill Site
BEV 29	AMC 305794	Mill Site
BEV 30	AMC 305795	Mill Site

Claim Name	BLM Serial No.	Claim Type
BEV 31	AMC 305796	Mill Site
BEV 32	AMC 305797	Mill Site
BEV 33	AMC 305798	Mill Site
BEV 34	AMC 305799	Mill Site
BEV 35	AMC 305800	Mill Site
BEV 36	AMC 305801	Mill Site
BEV 37	AMC 305802	Mill Site
BEV 38	AMC 305803	Mill Site
BEV 39	AMC 305804	Mill Site
BEV 40	AMC 305805	Mill Site
BEV 41	AMC 305806	Mill Site
BEV 42	AMC 305807	Mill Site
BEV 43	AMC 305808	Mill Site
BEV 44	AMC 305809	Mill Site
BEV 45	AMC 305810	Mill Site
BEV 46	AMC 305811	Mill Site
BEV 47	AMC 305812	Mill Site
BEV 48	AMC 305813	Mill Site
BEV 49	AMC 305814	Mill Site
BEV 50	AMC 305815	Mill Site
BEV 51	AMC 305816	Mill Site
BEV 52	AMC 305817	Mill Site
BEV 53	AMC 305818	Mill Site
BEV 54	AMC 305819	Mill Site
JWH #1	AMC 308473	Lode
JWH #4	AMC 308476	Lode
JWH #5	AMC 308477	Lode
JWH #10	AMC 308482	Lode
JWH #11	AMC 308483	Lode
JWH #16	AMC 308488	Lode

Claim Name	BLM Serial No.	Claim Type
JWH #17	AMC 308489	Lode
JWH 81	AMC 322632	Lode
JWH 83	AMC 322634	Lode
KIM-1	AMC 362070	Mill Site
KIM-2	AMC 362071	Mill Site
KIM-3	AMC 362072	Mill Site
KIM-4	AMC 362073	Mill Site
KIM-5	AMC 362074	Mill Site
KIM-6	AMC 362075	Mill Site
KIM-7	AMC 362076	Mill Site
KIM-8	AMC 362077	Mill Site
KIM-9	AMC 362078	Mill Site
KIM-10	AMC 362079	Mill Site
KIM-11	AMC 362080	Mill Site
KIM-12	AMC 362081	Mill Site
KIM-13	AMC 362082	Mill Site
KIM-14	AMC 362083	Mill Site
KIM-15	AMC 362084	Mill Site
KIM-16	AMC 362085	Mill Site
KIM-17	AMC 362086	Mill Site
KIM-18	AMC 362087	Mill Site
KIM-19	AMC 362088	Mill Site
KIM-20	AMC 362089	Mill Site
KIM-21	AMC 362090	Mill Site
KIM-24	AMC 362093	Mill Site
KIM-25	AMC 362094	Mill Site
KIM-26	AMC 362095	Mill Site
KIM-27	AMC 362096	Mill Site
KIM-28	AMC 362097	Mill Site
KIM-31	AMC 362100	Mill Site
KIM-32	AMC 362101	Mill Site
KIM-33	AMC 362102	Mill Site
WP-1	AMC 364582	Mill Site
WP-2	AMC 364583	Mill Site
WP-3	AMC 364584	Mill Site
WP-4	AMC 364585	Mill Site
WP-5	AMC 364586	Mill Site
WP-6	AMC 364587	Mill Site
WP-7	AMC 364588	Mill Site
WP-14	AMC 364595	Mill Site
WP-16	AMC 364597	Mill Site
WP-25	AMC 366984	Mill Site
WP-28	AMC 366987	Mill Site
LTB-7	AMC 397200	Mill Site

Claim Name	BLM Serial No.	Claim Type
LTB-9	AMC 397202	Mill Site
LTB-11	AMC 397204	Mill Site
LTB-12	AMC 397205	Mill Site
LTB-13	AMC 397206	Mill Site
LTB-14	AMC 397207	Mill Site
LTB-15	AMC 397208	Mill Site
LTB-16	AMC 397209	Mill Site
LTB-17	AMC 397210	Mill Site
PMB 47	AMC 403487	Mill Site
MPC 112	AMC 413904	Mill Site
MPC 113	AMC 413905	Mill Site
MPC 114	AMC 413906	Mill Site
MPC 115	AMC 413907	Mill Site
MPC 116	AMC 413908	Mill Site
MPC 117	AMC 413909	Mill Site
MPC 118	AMC 413910	Mill Site
MPC 119	AMC 413911	Mill Site
MPC 120	AMC 413912	Mill Site
MPC 121	AMC 413913	Mill Site
MPC 122	AMC 413914	Mill Site
MPC 123	AMC 413915	Mill Site
MPC 124	AMC 413916	Mill Site
MPC 125	AMC 413917	Mill Site
MPC 126	AMC 413918	Mill Site
GAP 1	AMC 418824	Mill Site
GAP 2	AMC 418825	Mill Site
GAP 3	AMC 418826	Mill Site
GAP 4	AMC 418827	Mill Site
BULL 001	AMC 423218	Mill Site
BULL 002	AMC 423219	Mill Site
BULL 003	AMC 423220	Mill Site
BULL 004	AMC 423221	Mill Site
BULL 005	AMC 423222	Mill Site
BULL 006	AMC 423223	Mill Site
BULL 007	AMC 423224	Mill Site
BULL 008	AMC 423225	Mill Site
BULL 009	AMC 423226	Mill Site
BULL 010	AMC 423227	Mill Site
BULL 011	AMC 423228	Mill Site
BULL 012	AMC 423229	Mill Site
BULL 013	AMC 423230	Mill Site
BULL 014	AMC 423231	Mill Site
BULL 015	AMC 423232	Mill Site
BULL 016	AMC 423233	Mill Site

Claim Name	BLM Serial No.	Claim Type
BULL 017	AMC 423234	Mill Site
BULL 018	AMC 423235	Mill Site
BULL 019	AMC 423236	Mill Site
BULL 020	AMC 423237	Mill Site
BULL 021	AMC 423238	Mill Site
BULL 022	AMC 423239	Mill Site
BULL 023	AMC 423240	Mill Site
BULL 024	AMC 423241	Mill Site
BULL 025	AMC 423242	Mill Site
BULL 026	AMC 423243	Mill Site
BULL 027	AMC 423244	Mill Site
STEP 011	AMC 423323	Mill Site
STEP 012	AMC 423324	Mill Site
STEP 013	AMC 423325	Mill Site
STEP 014	AMC 423326	Mill Site
STEP 015	AMC 423327	Mill Site
STEP 016	AMC 423328	Mill Site
STEP 017	AMC 423329	Mill Site
STEP 018	AMC 423330	Mill Site
STEP 019	AMC 423331	Mill Site
STEP 020	AMC 423332	Mill Site
STEP 021	AMC 423333	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 022	AMC 423334	Mill Site
STEP 023	AMC 423335	Mill Site
STEP 024	AMC 423336	Mill Site
STEP 025	AMC 423337	Mill Site
STEP 026	AMC 423338	Mill Site
STEP 032	AMC 423344	Mill Site
STEP 033	AMC 423345	Mill Site
STEP 034	AMC 423346	Mill Site
STEP 035	AMC 423347	Mill Site
STEP 036	AMC 423348	Mill Site
STEP 037	AMC 423349	Mill Site
STEP 038	AMC 423350	Mill Site
STEP 039	AMC 423351	Mill Site
STEP 044	AMC 423356	Mill Site
STEP 045	AMC 423357	Mill Site
STEP 046	AMC 423358	Mill Site
STEP 047	AMC 423359	Mill Site
STEP 048	AMC 423360	Mill Site
STEP 049	AMC 423361	Mill Site
STEP 050	AMC 423362	Mill Site
STEP 051	AMC 423363	Mill Site

APPENDIX B CURRENT AQUIFER PROTECTION PERMIT

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STATE OF ARIZONA
AQUIFER PROTECTION PERMIT NO. P-105258
SIGNIFICANT AMENDMENT
PLACE ID 1390, LTF 57247

1.0 AUTHORIZATION

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2 and 3, Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 1 and 2, A. A. C. Title 18, Chapter 11, Article 4 and amendments thereto, and the conditions set forth in this permit, Freeport-McMoRan Bagdad Inc. is hereby authorized to operate the discharging facilities located at the Freeport-McMoRan Bagdad Inc. Bagdad Mine near Bagdad, Yavapai County, Arizona, over groundwater of the Burro Creek groundwater basin, in Township 14 North, Range 9 West and 10 West; and Township 15 North, Range 9 West and 10 West of the Gila and Salt River Base Line and Meridian.

This permit becomes effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods), unless suspended or revoked pursuant to A.A.C. R18-9-A213. The permittee shall construct, operate and maintain the permitted facilities:

1. Following all the conditions of this permit including the design and operational information documented or referenced below, and
2. Such that Aquifer Water Quality Standards (AWQS) are not violated at the applicable point(s) of compliance (POC) set forth below, or if an AWQS for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant, and as determined at the applicable POC, occurs as a result of the discharge from the facility.

1.1 PERMITTEE INFORMATION

Facility Name: **Freeport-McMoRan Bagdad Inc.**

Permittee:	**Mailing Address:**	**Facility's Street Address:**
Freeport-McMoRan Bagdad Inc.	P.O. Box 245 Bagdad, AZ 86321	None

Facility Contact: Mike Sanders — Senior Environmental Engineer — (928) 633-3486

Emergency Telephone Number: (928) 633-3211

Latitude: 34° 35' 14" North **Longitude:** 113° 14' 10" West

Legal Description: Township 14 North, Range 9 West and 10 West; and Township 15 North, Range 9 West and 10 West of the Gila and Salt River Base Line and Meridian

1.2 AUTHORIZING SIGNATURE

Michael A. Fulton, Director
Water Quality Division
Arizona Department of Environmental Quality

Signed this 28th **day of** August **, 2013**

THIS AMENDMENT SUPERCEDES ALL PREVIOUS AMENDMENTS

2.0 SPECIFIC CONDITIONS [A.R.S. §§ 49-203(4), 49-241(A)]

2.1 Facility / Site Description [A.R.S. § 49-243(K)(8)]

The site includes the following permitted discharging facilities:

Table 2.1 Discharging Facilities

Copper Creek PLS Pond System (pond and conveyance channel) (D-10)	34° 36' 12" N	113° 13' 46" W
Boulder Flood Basin (D-11)	34° 36' 19" N	113° 13' 48" W
Raffinate Pond (D-13)	34° 36' 05" N	113° 13' 00" W
PLS Surge Pond (D-14)	34° 36' 04" N	113° 12' 58" W
Strong PLS Pond (D-20)	34° 35' 46" N	113° 14' 03" W
Upper Niagara Leach Dump (D-6)	34° 35' 04" N	113° 13' 53" W
Plan IX Leach Dump (D-15)	34° 34' 36" N	113° 13' 30" W
Mineral Creek Leach Dump (D-18)	34° 34' 30" N	113° 12' 52" W
Copper Creek Leach Dump (D-7)	34° 35' 56" N	113° 13' 31" W
Crystal Mountain Leach Dump (D-19)	34° 35' 48" N	113° 13' 42" W
Mulholland Tailings Pond (D-1)	34° 35' 34" N	113° 15' 11" W
Mulholland Seepage Collection Pond (D-2)	34° 35' 51" N	113° 15' 26" W
Last Chance Pond (D-3)	34° 35' 39" N	113° 14' 20" W
Mammoth Tailings Impoundment (D-23)	34° 35' 04" N	113° 16' 11" W

Upper Mammoth Tailings Impoundment (D-24)	34° 34' 10" N	113° 14' 41" W
Mammoth Tailings Seepage Collection Pond (D-25)	34° 35' 19" N	113° 17' 50" W
South Waste Rock Disposal Facility (D-26)	34° 34' 07" N	113° 12' 10" W
Catchments within the PCCZ (D-27)	See Table 4.1.1	See Table 4.1.1

The permit authorizes the operation of the discharging facilities described below:

2.1.1 Copper Creek PLS Pond System (D-10)(Process Solution Impoundment)
The facility is a process solution pond system consisting of an 80-mil HDPE-lined channel leading from the toe of the Copper Creek Leach Dump to the Copper Creek PLS Pond. The PLS pond system is constructed on Quaternary gravels of moderate hydraulic conductivity underlain by Precambrian granite. The pond has a design capacity of 4.5 million gallons, with a depth of 20 feet. Process solution from the pond is pumped to the SX-EW Plant for processing.

2.1.2 Boulder Flood Basin (D-11)(Non-stormwater Impoundment))
The facility is a double lined impoundment equipped with a Leak Collection and Removal System (LCRS) that receives stormwater run-off and contains process solution overflow due to process upsets in the Copper Creek leach system. T. The primary liner is an 80-mil HDPE geomembrane and the secondary liner consisting of a compacted, amended soil liner. The primary 80-mil HDPE liner is secured in an engineered anchor trench. The overflow ditch from the Copper Creek PLS Pond leading to the Boulder Flood Basin is lined with an 80-mil HDPE geomembrane. The impoundment is located in a Quaternary alluvium consisting of gravelly silts and clays partially underlain by Precambrian Alaskite Porphyry. The impoundment has a solution holding capacity of 37 million gallons. The impoundment has a 30 ft. deep by 12 ft. wide soil cutoff wall down gradient of the facility with an 80-mil HDPE lined face designed to intercept subsurface flows. The cutoff wall is equipped with a sump and pump-back system to capture any seepage from the cutoff wall. The impoundment receives stormwater run-off and contains process solution overflow due to process upsets in the Copper Creek leach system. The facility is designed with pumping system capability to divert solution to the Bagdad open pit, the Mulholland Tailings Pond, Mammoth Tailings Pond, or the Copper Creek PLS Pond System. Potential discharges from the Boulder Flood Basin to Boulder Creek are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

2.1.3 Raffinate Pond (D-13)(Process Solution Impoundment)
The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane is secured in an engineered anchor trench around the pond perimeter. The impoundment has a maximum solution holding capacity of approximately 0.5 million gallons, at a depth of approximately 6 feet. To avoid potential overflow, the impoundment is equipped with an automatic, high level alarm system. The raffinate solution is used in the leach process.

2.1.4 PLS Surge Pond (D-14)(Process Solution Impoundment)
The facility is a double-lined process solution impoundment equipped with LCRS. The liner system

consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane and the geonet/geotextile composite used in the LCRS are secured in an engineered anchor trench around the pond perimeter. The pond is constructed on non-mineralized material of the Mine Shop Overburden Dump. The pond has a maximum solution holding capacity of approximately 1.5 million gallons, with a depth of 8 feet. The pond receives process solution from various PLS collection facilities from where it is pumped to the SX-EW Plant for processing. To avoid potential overflow, the PLS Surge Pond is equipped with an automatic, high level alarm system.

2.1.5 Strong PLS Pond (D-20)(Process Solution Impoundment)

The facility is a double-lined impoundment equipped with LCRS. The double liner consists of a 60-mil HDPE primary and secondary liner, with a 200-mil HDPE geonet between the two liners for drainage. The lower liner is a composite liner underlain by a minimum of 6-inch minus low hydraulic conductivity compacted soil. The pond is designed to contain maximum fluid volume of 3.86 million gallons plus direct precipitation from the 100-year, 24-hour storm event while maintaining 2 feet of freeboard. The total depth of the pond is 26 feet.

2.1.6 Upper Niagara Leach Dump (D-6)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Upper Niagara PLS Pond (D-5).

2.1.7 Copper Creek Leach Dump (D-7)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the concrete cutoff wall constructed at the downstream toe of the dump and gravity flows to the Copper Creek PLS Pond System.

2.1.8 Plan IX Leach Dump (D-15)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Alum Sump PLS Pond, Mineral Creek Sump and Kimberly Pond. Diversion ditches located up gradient of the dump divert the stormwater run-on away from the facility.

2.1.9 Mineral Creek Leach Dump (D-18)(Leach Dump)

The facility is a low grade leach dump located within a well-defined canyon, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Mineral Creek Sump. Diversion ditches are located up gradient of the dump to divert stormwater run-on away from the facility.

2.1.10 Crystal Mountain Leach Dump (D-19)(Leach Dump)

This facility is located within the footprint of the existing Copper Creek Leach dump. The ore material (mixed sulfide and oxide ore) is placed over existing leached ore that is underlain by Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected by the Copper Creek PLS Pond System.

2.1.11 Mulholland Tailings Pond (D-1)(Tailings Impoundment)

The facility is a tailings dam used primarily as a recycled water storage facility for site-wide water

management purposes and, as needed, as a secondary tailings disposal impoundment. The facility is constructed employing centerline dam construction method, using a combination of spigotting and cycloning of tailings material. The impoundment is located over predominantly Precambrian crystalline rocks. The tailings dam and pond cover an area of approximately 500 acres and contain approximately 120 million dry tons of tailings. The water in the tailings pond has an alkaline pH, reflecting the large volume of alkaline tailings that are stored within the impoundment. The Mulholland Tailings Pond includes a saddle dam to the south of the primary tailings embankment. Drainage from the saddle dam reports to the Mammoth Tailings Pond. At times, Bagdad Pit water and stormwater runoff and process solutions from the Boulder flood Basin (D-11) that is transferred to the Bagdad Pit will be directed to the Mulholland Tailings Pond. Before being discharged, these waters, and any other potentially acidic waters, are tested and the pH is adjusted, as necessary, to ensure compatibility with the impoundment and for operational reuse of the water. Upset flows from the concentrator area are also discharged to the impoundment. The facility receives effluent from the Concentrator Waste Water Treatment Plant (WWTP) and Bagdad Townsite WWTP. Downstream of the tailings impoundment is a seepage collection pond and pumpback system.

2.1.12 Mulholland Tailings Seepage Collection Pond (D-2)(Non-stormwater Impoundment)

The facility is a lined impoundment formed by a seepage collection dam constructed adjacent to the downstream toe of the Mulholland tailings embankment. The dam is a compacted rock-fill dam with a reinforced gunnite facing on its entire surface and has a concrete lined basin. The seepage pond is located over predominantly Precambrian crystalline rocks. The impoundment has an approximate storage capacity of 531,000 gallons, with an average depth of approximately 6 feet. Collected seepage is pumped back to the Mulholland Tailings Pond using two vertical turbine pumps. Both pumps are equipped with automatic level controls and have a combined design capacity of 1,175 gpm. The impoundment receives seepage of approximately 300 to 400 gpm from the Mulholland Tailings Pond. Potential discharges from the Mulholland Seepage Pond to Mulholland Wash are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

2.1.13 Last Chance Pond (D-3)(Non-stormwater Impoundment)

The facility is a concrete-lined impoundment, located within the Mulholland Tailings Pond. The Mulholland Tailings Pond is located over predominantly Precambrian crystalline rocks (with minor Quaternary alluvium underlying Mulholland Impoundment). The pond solution is strongly alkaline (pH 11.1 SU), with a trace of metal concentrations and elevated sulfate. The pond is equipped with an automatic pumpback system to return solution to the concentrator circuit for re-use. The impoundment is used as a containment pond for runoff from the concentrator area and emergency process overflows from the concentrator circuit.

2.1.14 Mammoth Tailings Impoundment (D-23)(Tailings Storage Facility)

The facility is a tailing dam constructed using the centerline dam construction method, via a combination of spigotting and cycloning of tailings material. The maximum areal extent of the tailings impoundment is described in Figure 1 of the approved design plans provided in the July 18, 2007, *Site Characterization & Design Studies*. Process fluids include: water from the Freeport-McMoRan Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite Wastewater Treatment Plant (WWTP) and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act. The facility has a maximum capacity of 900,000,000 tons of tailings and a maximum permitted dam crest elevation of 3,600 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day.

2.1.15 Upper Mammoth Tailings Impoundment (D-24)(Tailings Storage Facility)

The facility is a tailing dam constructed using the centerline dam construction method, via a combination of spigotting and cycloning of tailings material. The maximum areal extent of the tailings impoundment is depicted in Figure 1 of the approved design plans provided in the July 18, 2007, *Site Characterization & Design Studies*. Process fluids include: water from the Freeport-McMoRan

Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite WWTP and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act. The facility has a maximum capacity of 600,000,000 tons of tailings and a maximum permitted dam crest elevation of 4,050 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day during ore processing.

2.1.16 Mammoth Tailings Seepage Collection Pond (D-25)(Non-stormwater Impoundment)

The facility is constructed with a gunite liner and has a normal operating capacity of approximately 350,000 gallons. The facility is located at an elevation of 2,740 feet above sea level. The dam, constructed upon crystalline bedrock, is a compacted rock fill dam with a 12-inch concrete facing on its entire surface. In addition, a seepage sump is located at an elevation of 2,730 feet above sea level immediately downstream from the dam. The seepage sump is a 1-foot-diameter well, extending to a depth of 11 feet in the gravels of Mammoth Wash. The seepage is pumped back to the Mammoth Tailings Impoundment.

2.1.17 South Waste Rock Disposal Facility (D-26)

The facility is a waste rock pile and has a maximum capacity of 660,000,000 tons of mining overburden. Maximum permitted elevation of the facility is 4,800 feet above mean sea level. The maximum areal extent of the waste rock disposal facility is described in Figure 4 of the revised Life of Mine (LOM) design plans provided in the February, 2010, *Request for Other Amendment to APP 101353 South Waste Rock Disposal Facility Expansion.*

2.1.18 Catchments within the PCCZ (D-27)

This group of facilities includes all existing (Upper Niagara Pond (D-4), Upper Niagara PLS Pond (D-5), Alum Sump PLS Pond (D-21), and Kimberly Pond (D-22)) and future collection and diversion points, including sumps and impoundments, for the process solution/stormwater within the passive containment capture zone (PCCZ) created by the mine open pit.

Upper Niagara Pond (D-4) (Process Solution Pond)

The facility is an impoundment located on top of the Upper Niagara Leach Dump (D-6) confined in a valley. The pond is lined with a 2-foot thick compacted clay liner, underlain by leach dump material placed on the Precambrian crystalline bedrock of relatively low hydraulic conductivity. The pond receives process solution and stormwater and has a design capacity of approximately 20 million gallons. Accumulated fluid in the impoundment is pumped back into the leach circuit. The pond is situated within the passive containment capture zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Upper Niagara PLS Pond (D-5) (Process Solution Pond)

The facility is an impoundment consisting of an earthen dam and 2-foot thick compacted clay liner underlain by Precambrian crystalline bedrock of relatively low hydraulic conductivity. The pond receives process solution and stormwater from the Upper Niagara Leach Dump which is conveyed by gravity through an HDPE pipeline to N5/N6 pumping station. Process solution from the N5/N6 pumping station is pumped to the SX/EW Plant, or when not actively leaching, residual flow can be diverted inot Copper Creek Leach Dump (D-19). The pond operating volume is approximately 10,000 gallons and the average operating depth is 3 feet. Excess solution overflow is contained within the Copper Creek Leach Dump. The pond is situated within the passive containment capture zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Alum Sump PLS Pond (D-21) (Process Solution Impoundment)

The facility is a lined impoundment designed to receive leachate from the Plan IX Leach Dump. The impoundment has a total solution capacity of approximately 774,000 gallons, including approximately 414,000 gallons at the normal operating level, and an approximate total depth of 12 feet, including 8 feet at the normal operating level. Accumulated process solution is pumped through an HDPE pipeline

to the SX-EW Plant. The pond is situated within the passive containment zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Kimberly Pond (D-22) (Process Solution Impoundment)
The facility receives leachate and stormwater runoff from the Plan IX leach stockpile. The base of Kimberly Pond is comprised of a 2-foot-thick layer of compacted Gila Conglomerate. The area is underlain by crystalline bedrock that is covered with approximately 150-feet of historic Kimberly tailings. The pond has an operating solution holding capacity of approximately 17.9-million gallons. The pond is protected from stormwater run-on by ditches and berms and is surrounded on all sides by leach stockpiles. A slope stability analysis for Kimberly Pond has determined acceptable factors of safety for both static and pseudostatic loading conditions. The pond is situated within the passive containment zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Annual Registration Fee [A.R.S. § 49-242]
The Annual Registration Fee for this permit is established by A.R.S. § 49-242 and is payable to ADEQ each year. The design flow is greater than 10,000,000 gallons per day.

Financial Capability [A.R.S. § 49-243(N) and A.A.C. R18-9-A203]
The permittee shall maintain financial capability throughout the life of the facility. The financial assurance mechanism was demonstrated through A.A.C. R18-9-A203(C)(8) using a corporate guarantee in the amount of $68,844,193 to cover the financial assurance obligations of APPs P-105258 (consolidated with P-101353 [$67,650,193]), P-102896 ($746,000), and P50007300A ($448,000) at the Bagdad mine site.

2.2 Best Available Demonstrated Control Technology [A.R.S. § 49-243(B) and A.A.C. R18-9-A202(A)(5)]

All of the discharging facilities listed in Table 2.1 employs the BADCT requirements as set forth in Arizona Revised Statutes (A.R.S.) § 49-243.B.1. All permitted facilities shall be constructed, operated, and maintained in accordance with BADCT requirements, as outlined in the application and permit Section 4.0, Table 4.1.1. The operational requirements for BADCT are presented in Table 4.2.1. The mine open pit passive containment capture zone (PCCZ) shall be evaluated every five years in accordance with permit Section 2.5.3.6.

2.2.1 Engineering Design

The facilities list, with BADCT descriptions, is included in Section 4, Table 4.1.1.

2.2.2 Site-specific Characteristics

Site-specific characteristics such as foundation rock of low hydraulic conductivity and within the PCCZ support the BADCT demonstration for several regulated facilities. The passive containment created by the Bagdad Mine Open Pit is used as an integral part of BADCT (A.R.S. § 49-243[G]) for the following facilities:

Catchments within PCCZ (D-27) currently consist of existing facilities (Kimberly Pond [D-22], Upper Niagara Pond [D-4], Upper Niagara PLS Pond [D-5], and Alum Sump PLS Pond [D-21]) and future facilities. These facilities have specific BADCT requirements. This permit allows catchments to be constructed and decommissioned in accordance with the following:

The proposed BADCT for new catchments includes:

- Catchments will be unlined excavations in foundation rock of low hydraulic conductivity;
- Catchments will be located within the PCCZ;
- An acceptable slope stability analysis (BADCT, Appendix E, embankments) of the pit walls, adjacent slopes, and stockpiles will be completed prior to the installation of a new catchment. A copy of the stability analysis will be provided to ADEQ in the biennial report.
- Slope stability of pit walls or stockpiles will be assessed prior to installation of each new

catchment. Construction will include such methods as waterstop sealing, keying into bedrock, etc., as necessary, to reduce the possibility for slope/berm failure;

- Catchments will be sized to accommodate the maximum flow that would occur if PLS flow from leaching activities were contained with the runoff from a 100-year, 24-hour storm event;
- Pumps will be installed in the catchments, as necessary, to maintain a controlled ponded surface elevation and minimize the risk of overtopping during storm events;
- Should overtopping occur for catchments within the pit area, the overflow solution will be contained within the confines of the mine pit (within the PCCZ); and
- For new catchments constructed outside the pit, but within the PCCZ, freeboard will be maintained to reduce the possibility of overflow. Pumps and piping will be on hand to direct excess PLS to the SX-EW plant, leach circuit, or other APP-regulated facility, as needed.

In addition to ongoing operational monitoring and maintenance, BADCT requirements for decommissioning will include:

- Reduction or cessation of inflow into the catchment;
- Routing of any remaining inflow to another facility regulated by the APP or allowing gravity flow over unfractured bedrock into the bottom of the pit for collection and recovery;
- Filling the catchment with rock material; and
- Conducting additional excavation at the bench for stabilization, as needed.

Other site-specific BADCT has been demonstrated for the following facilities within the PCCZ and incorporating additional controls to minimize discharge pursuant to A.R.S. § 49-243(G): South Waste Rock Disposal Facility (D-26); Upper Niagara Leach Dump (D-6); Plan IX Leach Dump (D-15); Mineral Creek Leach Dump (D-18); Raffinate Pond (D-13); and PLS Surge Pond (D-14).

2.2.3 Pre-operational Requirements

Not applicable

2.2.4 Operational Requirements

A description of required inspections and operational monitoring is included in Section 4, Table 4.2.1.

If damage is identified during an inspection that could cause or contribute to a discharge, proper repairs shall be promptly performed. A summary of the repairs, including a description of the procedures and materials used shall be maintained with the inspection records according to Section 2.7.2.

TABLE 2.2.4
Leak Collection and Removal System Monitoring

Note: The Action Leakage Rate (ALR) or Rapid and Large Leakage Rate (RLLR) is exceeded when the amount of leakage pumped from the sump for the pond is greater than the applicable quantity below. An exceedance of the ALR or the RLLR is not a violation of the permit unless the permittee fails to perform as required under Section 2.6.2.4 or Section 2.6.2.5, as applicable.

Raffinate Pond (D-13)	Liquid Pumped	223	670	Weekly
PLS Surge Pond (D-14)	"	279	836	Weekly
Strong PLS Pond (D-20)	"	515	1,545	Weekly

2.3 Discharge Limitations [A.R.S. §§ 49-201(14), 49-243 and A.A.C. R18-9-A205(B)]

The permittee shall operate and maintain all permitted facilities listed below to prevent unauthorized discharges pursuant to A.R.S. § 49-201(12) resulting from failure or bypassing of BADCT pollutant control technologies including liner failure[1], uncontrollable leakage, overtopping (e.g., exceeding the maximum storage capacity, defined as a fluid level exceeding the crest elevation of a permitted impoundment), berm breaches that result in an unexpected loss of fluid, accidental spills, or other unauthorized discharges. The discharge limitations in this section are not applicable to any discharge caused by precipitation in excess of a single 100-year, 24-hour storm event or process overflow during a power outage exceeding 24 hours in duration.

2.3.1 Leaching Facilities

The Leaching Facilities are designed and authorized for use in leaching ore. The Leaching Facilities shall be constructed and operated in accordance with the BADCT outlined in Section 4, Table 4.1.1, and the ultimate heights shall not exceed those set forth in the approved permit application and engineering study.

2.3.2 Pregnant Leach Solution Ponds and Impoundments

The Pregnant Leach Solution (PLS) Ponds and Impoundments are designed and authorized to receive pregnant leach solution, stormwater, process water and process upset events.

2.3.3 Non-stormwater Impoundments

The permitted non-stormwater impoundments are authorized to receive stormwater runoff and run-on, and process solutions as a result of storm events or process upset events.

2.4 Points of Compliance [A.R.S. § 49-244]

The POCs are established by the following monitoring location(s):

CMW-609	34° 36' 25" N	113° 13' 57" W	55-537609
CMW-610	34° 36' 25" N	113° 13' 56" W	55-537610
CMW-611	34° 35' 51" N	113° 15' 26" W	55-906854
020 (A01HB)	34° 35' 47" N	113° 16' 57" W	55-562020
803 (AH13HB)	34° 35' 41" N	113° 17" 08" W	55-543803
283	34° 35' 36" N	113° 17' 57" W	55-588283
613 (A22HB)	34° 35' 17" N	113° 17' 30" W	55-546613
810 (A10HB)	34° 34' 55" N	113° 17' 31" W	55-543810

Monitoring requirements for each POC are listed in Section 4, Tables 4.2.2 through 4.2.4.

The Director may amend this permit to designate additional POCs, if information on groundwater gradients or groundwater usage indicates the need.

2.5 Monitoring Requirements [A.R.S. § 49-243(K)(1), A.A.C. R18-9-A206(A)]

All monitoring required in this permit shall continue for the duration of the permit, regardless of the status of the facility. All sampling, preservation and holding times shall be in accordance with currently accepted standards of professional practice. Trip blanks, equipment blanks and duplicate samples shall also be obtained, and chain of custody procedures shall be followed, in accordance with currently accepted standards of professional practice. The permittee shall consult the most recent version of the ADEQ Quality Assurance Project Plan (QAPP) and EPA 40 CFR PART 136 for guidance in this regard. Copies of laboratory analyses and chain of

[1] Liner failure in a single-lined impoundment is any condition that would result in a leakage exceeding 550 gallons per acre per day.

custody forms shall be maintained at the permitted facility. Upon request these documents shall be made immediately available for review by ADEQ personnel.

2.5.1 Discharge Monitoring
Not applicable for this permit.

2.5.2 Facility / Operational Monitoring
The operational monitoring requirements for the facilities referenced in Section 4, Table 4.1.1 are listed in Section 4, Table 4.2.1.

2.5.3 Groundwater Monitoring and Sampling Protocols
Static water levels shall be measured and recorded prior to sampling. Wells shall be purged of at least three borehole volumes (as calculated using the static water level) or until field parameters (pH, temperature, conductivity) are stable, whichever represents the greater volume. If evacuation results in the well going dry, the well shall be allowed to recover to 80% of the original borehole volume, or for 24 hours, whichever is shorter, prior to sampling. If after 24 hours there is not sufficient water for sampling, the well shall be recorded as "dry" for the monitoring event. An explanation for reduced pumping volumes, a record of the volume pumped, and modified sampling procedures shall be reported and submitted with the Self-monitoring Report Form (SMRF).

Alternatively, the permittee may conduct sampling using the low-flow purging method as described in the ASTM International Standard D 6771-02, and EPA Groundwater Issue 540/S-95/504 Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures. The well must be purged until indicator parameters stabilize. Indicator parameters shall include pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen and turbidity.

2.5.3.1 POC Well Replacement
In the event that one or more of the designated POC wells should become unusable or inaccessible due to damage, insufficient water in the well for more than two (2) sampling events, or any other event, a replacement POC well shall be constructed and installed upon approval by ADEQ. If the replacement well is 50 feet or less from the original well, the ALs and/or AQLs calculated for the designated POC well shall apply to the replacement well. Otherwise, the ALs and/or AQLs shall be set following the provisions in Section 2.5.3.4 and Section 2.5.3.5 of this permit.

2.5.3.2 Ambient Groundwater Quality Monitoring for POC Wells
Ambient monitoring requirements for new or replacement POC wells are detailed in Section 4, Table 4.2.2. The ambient monitoring program for all POC wells currently located at the facility has been completed.

2.5.3.3 Alert Levels for POC Wells
The AQLs and ALs shall be established and calculated by the following formula or another valid statistical method submitted to the Groundwater Section (GWS) in writing and approved for this permit by the GWS:

$AL = M + K\Phi$

Where M = mean, Φ = standard deviation, and K = one-sided normal tolerance interval with a 95% confidence level (Lieberman, G.J. (1958) Tables for One-sided Statistical Tolerance Limits: Industrial Quality Control, Vol. XIV, No. 10). Obvious outliers should be excluded from the data used in the AL calculation.

The following criteria shall be met in establishing ALs in the permit:

1. The AL shall be calculated for a parameter using the analyses from eight (8) consecutive sample rounds.
2. Any data where the PQL exceeds 80% of the AWQS shall not be included in the AL calculation.
3. If a parameter is below the detection limit, the permittee must report the value as "less than" the numeric value for the PQL or detection limit for the parameter, not just as "non-detect". For those parameters, the permittee shall use a value of one-half the reported detection limit for the AL calculation.
4. If the analytical results from more than 50% of the samples for a specific parameter are non-detect, then the AL shall be set at 80% of the AWQS.
5. If the calculated AL for a specific constituent and well is less than 80% of the AWQS, the AL shall be set at 80% of the AWQS for that constituent in that well.

2.5.3.4 Aquifer Quality Limits for POC Well

For each of the monitored analytes for which a numeric AWQS has been adopted, the AQL shall be established as follows:

1. If the calculated AL is less than the AWQS, then the AQL shall be set equal to the AWQS.
2. If the calculated AL is greater than the AWQS, then the AQL shall be set equal to the calculated AL value, and no AL shall be set for that constituent at that monitoring point.

2.5.3.5 Compliance Groundwater Quality Monitoring for POC Wells

For quarterly compliance monitoring, the permittee shall analyze groundwater samples for the parameters listed in Section 4, Table 4.2.3. In addition to quarterly compliance groundwater monitoring, every 2 years (biennial) the permittee shall analyze samples from the POC wells for an expanded list of parameters listed in Section 4, Table 4.2.4. The biennial sampling event shall replace the regularly scheduled quarterly sampling event. The permittee may submit a written request to GWS to modify, reduce, or delete a monitoring parameter in the quarterly or biennial compliance groundwater monitoring tables (Section 4, Tables 4.2.3 and 4.2.4)..

2.5.3.6 Passive Containment Demonstration

Based on supporting documentation provided in the Application, the permittee has satisfactorily predicted that the Bagdad open pit mine will create a "passive containment capture zone" (PCCZ), as per A.R.S. § 49-243(G). The water balance in the numerical model for the Bagdad open pit predicts that static equilibrium will be maintained in the pit lake following closure at a maximum elevation of 2410 feet above mean sea level (amsl). Passive containment of the hydraulic capture zone will be maintained if the pit lake elevation remains below 2750 feet amsl. The model estimates that static equilibrium in the pit lake will not be reached for approximately 500 years. Demonstration of passive containment shall be based solely on natural or engineered topographical, geological or hydrological control measures that can operate without continuous maintenance.

A post-audit of the approved groundwater flow model shall be conducted 5 years from the effective date of this permit. Every 5 years thereafter, the permittee shall compare the current groundwater data to the previous model predictions. Factors to be evaluated in the post-audit include groundwater inflow, the estimated static water level in the pit, the estimated time to reach static water level, and any potential for the water level in the pit to rise to an elevation where the hydraulic gradient reverses and the pit ceases to function as a passive containment. The assumptions about mine development and infiltration shall be revised in terms of the actual changes in the pit configuration, leaching areas, leach rates, sump locations, water balance, annual precipitation and storm events. The resulting compilation shall be compared to predictions provided by the groundwater flow model for the previous calibration period.

A report summarizing the original passive containment demonstration and the revisions made to the model shall be submitted to the GWS for review. The report shall include a table listing groundwater elevations from piezometer and monitor wells current at the time of the post-audit used to demonstrate the configuration of the hydraulic containment, and a potentiometric contour map based on groundwater elevations used in the post-audit demonstration. ADEQ will determine whether a full model recalibration is required. If a recalibration is necessary, a report describing the model output and the revisions and/or changes to the model shall be submitted to the GWS.

2.5.4 Surface Water Monitoring and Sampling Protocols
Not applicable for this permit.

2.5.5 Analytical Methodology
All samples collected for compliance monitoring shall be analyzed using Arizona state approved methods. If no state approved method exists, then any appropriate EPA approved method shall be used. Regardless of the method used, the detection limits must be sufficient to determine compliance with the regulatory limits of the parameters specified in this permit. Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods. A list of Arizona-State certified laboratories can be obtained at the address below:

Arizona Department of Health Services
Office of Laboratory Licensure and Certification
250 North 17th Avenue
Phoenix, AZ 85007
Phone: (602) 364-0720

2.5.6 Installation and Maintenance of Monitoring Equipment
Monitoring equipment required by this permit shall be installed and maintained so that representative samples required by the permit can be collected. If new groundwater wells are determined to be necessary, the construction details shall be submitted to the ADEQ GWS for approval prior to installation and the permit shall be amended to include any new points.

2.6 Contingency Plan Requirements
[A.R.S. § 49-243(K)(3), (K)(7) and A.A.C. R18-9-A204 and R18-9-A205]

2.6.1 General Contingency Plan Requirements
At least one copy of the approved contingency and emergency response plan(s) submitted in response to the Compliance Schedule, Section 3, shall be maintained at the location where day-to-day decisions regarding the operation of the facility are made. The permittee shall be aware of and follow the contingency and emergency plans.

Any alert level (AL) that is exceeded or any violation of an aquifer quality limit (AQL), discharge limit (DL), or other permit condition shall be reported to ADEQ following the reporting requirements in Section 2.7.3.

Some contingency actions involve verification sampling. Verification sampling shall consist of the first follow-up sample collected from a location that previously indicated a violation or the exceedance of an AL. Collection and analysis of the verification sample shall use the same protocols and test methods to analyze for the pollutant or pollutants that exceeded an AL or violated an AQL. The permittee is subject to enforcement action for the failure to comply with any contingency actions in this permit. Where verification sampling is specified in this permit, it is the option of the permittee to

perform such sampling. If verification sampling is not conducted within the timeframe allotted, ADEQ and the permittee shall presume the initial sampling result to be confirmed as if verification sampling has been conducted. The permittee is responsible for compliance with contingency plans relating to the exceedance of an AL or violation of a DL, AQL or any other permit condition.

2.6.2 Exceeding of Alert Levels/Performance Levels

2.6.2.1 Exceeding of Performance Levels Set for Operational Conditions

1. Performance Levels Set for Freeboard

In the event that freeboard performance levels in a surface impoundment are not maintained, the permittee shall:

a. As soon as practicable, cease or reduce discharging to the impoundment to prevent overtopping. Remove and properly dispose or recycle to other operations the excess fluid in the reservoir until the water level is restored at or below the permitted freeboard limit.

b. Within 5 days of discovery, evaluate the cause of the incident and adjust operational conditions as necessary to avoid future occurrences.

c. Record in the facility log, the amount of fluid removed, a description of the removal method, and the disposal arrangements. The facility log shall be maintained according to Section 2.7.2 (Operational Inspection / Log Book Recordkeeping).

d. The facility is no longer on alert status once the operational indicator no longer indicates that the freeboard performance level is being exceeded. The permittee shall, however, complete all tasks necessary to return the facility to its pre-alert operating condition.

2. Performance Levels, Other Than Freeboard

a. If an operational performance level (PL) listed in Section 4, Table 4.2.1 has been observed or noted during required inspection and operational monitoring, such that the result could cause or contribute to an unauthorized discharge, the permittee shall immediately investigate to determine the cause of the condition. The investigation shall include the following:

i. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the operational performance condition.

ii. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences.

b. The PL exceedance, results of the investigation, and any corrective action taken shall be reported to the Water Quality Compliance Section (WQCS), within 30 days of the discovery of the condition. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.

c. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5 and any specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to a PL being exceeded. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6.

2.6.2.2 Exceeding of Alert Levels Set for Discharge Monitoring

Not applicable for this permit.

2.6.2.3 Exceeding of Alert Levels in Groundwater Monitoring

2.6.2.3.1 Alert Levels for Indicator Parameters

Not applicable for this permit.

2.6.2.3.2 Alert Levels for Pollutants with Numeric Aquifer Water Quality Standards

1. If an AL for a pollutant set in Section 4, Tables 4.2.3, or 4.2.4 has been exceeded, the permittee may conduct verification sampling within 5 days of becoming aware of an AL being exceeded. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms the AL being exceeded or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring to monthly. In addition, the permittee shall immediately initiate an investigation of the cause of the AL being exceeded, including inspection of all discharging units and all related pollution control devices, review of any operational and maintenance practices that might have resulted in an unexpected discharge, and hydrologic review of groundwater conditions including upgradient water quality.
3. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to an AL being exceeded. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6. Alternatively, the permittee may submit a technical demonstration, subject to written approval by the GWS, that although an AL is exceeded, pollutants are not reasonably expected to cause a violation of an AQL. The demonstration may propose a revised AL or monitoring frequency for approval in writing by the GWS.
4. Within 30 days after confirmation of an AL being exceeded, the permittee shall submit the laboratory results to the WQCS along with a summary of the findings of the investigation, the cause of the AL being exceeded, and actions taken to resolve the problem.
5. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
6. The increased monitoring required as a result of ALs being exceeded may be reduced to the regularly scheduled frequency if the results of 3 monthly sequential sampling events demonstrate that no parameters exceed the AL.
7. If the increased monitoring required as a result of an AL exceedance continues for more than three sequential sampling events, the permittee shall submit a second report documenting an investigation of the continued AL exceedance within 30 days of the receipt of laboratory results of the third sampling event.

2.6.2.3.3 Alert Levels to Protect Downgradient Users from Pollutants Without Numeric Aquifer Water Quality Standards

Not applicable for this permit.

2.6.2.4 Exceedance of Action Leakage Rate (ALR)

If an ALR as specified in Table 2.2.4, has been exceeded, the permittee shall take the following actions:

1. Within 5 days of discovery, determine if the fluid in the LCRS is operational/process solution from the impoundment by measuring the pH and conductivity of fluids in the impoundment and in the LCRS to allow direct comparison of solution characteristics.
2. Within 15 days, assess the condition of the liner system using visual methods for visible

portions of the liner.
3. Repair all identified areas of leakage within 90 days of discovery.
4. Assess the potential for migration of liquids out of the containment system.
5. Within 30 days of discovery of exceeding an ALR, submit the results of the liner assessment, the suspected cause of the exceedance and actions taken or planned to resolve the exceedance in a report to the ADEQ WQCS.

2.6.2.5 Exceedance of Rapid and Large Leakage Rate (RLLR)

If an RLLR as specified in Table 2.2.4, has been exceeded, the permittee shall:

1. As soon as practicable, cease all discharge to the impoundment.
2. Within 24 hours of becoming aware of the exceedance, determine if the fluid in the LCRS is operational/process solution from the impoundment by measuring the pH and conductivity of fluids in the impoundment and in the LCRS to allow direct comparison of solution characteristics.
3. Within 24 hours of becoming aware of the exceedance, notify ADEQ's WQCS and include an assessment regarding the type of solution in the LCRS.
4. Within 15 days, assess the condition of the liner system using visual methods for visible portions of the liner.
5. Repair all identified areas of leakage within 90 days of discovery. Discharges to the impoundment shall not be re-initiated until the leak(s) have been identified and repaired.
6. Within 30 days of discovery of exceeding an RLLR, submit the results of the liner assessment, the suspected cause of the exceedance and actions taken or planned to resolve the exceedance in a report to the ADEQ WQCS. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. If the RLLR continues to be exceeded following completion of repairs, submit for approval to ADEQ, a corrective action plan including a re-assessment of liner system integrity and a schedule to complete the corrective actions to address all problems identified from the assessment of the liner system within 60 days of completion of repairs conducted in response to Item No. 5 above. Upon ADEQ's approval, the permittee shall implement the approved plan and schedule of corrective actions.
8. Within 30 days of completion of corrective actions initiated from Item No. 7, submit to ADEQ, a written report as specified in Section 2.6.6 (Corrective Actions).

2.6.3 Discharge Limitations Violations

2.6.3.1 Liner Failure, Containment Structure Failure, or Unexpected Loss of Fluid

In the event of liner failure, containment structure failure, or unexpected loss of fluid as described in Section 2.3, the permittee shall take the following actions:

1. As soon as practicable, cease all discharges to the surface impoundment as necessary to prevent any further releases to the environment.
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days of discovery of a failure that resulted in a release to the subsurface, collect representative samples of the fluid remaining in the surface impoundment. Samples shall be analyzed for the parameters specified in Section 4, Table 4.2.3. Within 30 days of the incident, submit a copy of the analytical results to ADEQ WQCS.
4. Within 15 days of discovery, initiate an evaluation to determine the cause for the incident. Identify the circumstances that resulted in the failure and assess the condition of the surface impoundment and liner system. Implement corrective actions as necessary to resolve the problems identified in the evaluation. Initiate repairs to any failed liner, system, structure, or other component as needed to restore proper functioning of the surface impoundment. The permittee shall not resume discharging to the surface impoundment until repairs of any failed liner or structure are performed. Repair procedures, methods, and materials used to restore the system(s) to proper operating

condition shall be described in the facility log/recordkeeping file and available for ADEQ review.

5. As soon as practicable, remove fluid remaining in the surface impoundment as necessary to prevent further releases to the subsurface and/or to perform repairs. Record in the facility log/recordkeeping file the amount of fluid removed, a description of the removal method, and other disposal arrangements. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).
6. Within 30 days of discovery of the incident, submit a report to ADEQ as specified in Section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ, for approval, a corrective action plan to address such impacts, including identification of remedial actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, the permittee shall implement the approved plan.
8. Within 30 days of completion of corrective actions, submit to ADEQ, a written report as specified in section 2.6.6 (Corrective Actions). Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.2 Overtopping of a Surface Impoundment

If overtopping of fluid from a permitted surface impoundment occurs, and results in a discharge pursuant to A.R.S. §§ 49-201(12), the permittee shall:

1. As soon as practicable, cease all discharges to the surface impoundment to prevent any further releases to the environment.
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days, collect representative samples of the fluid contained in the surface impoundment. Samples shall be analyzed for the parameters specified in Section 4, Table 4.2.3. Within 30 days of the incident, submit a copy of the analytical results to ADEQ WQCS.
4. As soon as practicable, remove and properly dispose of excess water in the impoundment until the water level is restored at or below the appropriate freeboard as described in Table 4.2.1. Record in the facility log, the amount of fluid removed, a description of the removal method, and the disposal arrangements. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).
5. Within 30 days of discovery, evaluate the cause of the overtopping and identify the circumstances that resulted in the incident. Implement corrective actions and adjust operational conditions as necessary to resolve the problems identified in the evaluation. Repair any systems as necessary to prevent future occurrences of overtopping.
6. Within 30 days of discovery of overtopping, submit a report to ADEQ as specified in section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, and based on sampling in Subsection 3 above, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident.
8. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ for approval, a corrective action plan to address such impacts, including identification of remedial

actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, the permittee shall implement the approved plan.

9. Within 30 days of completion of corrective actions, submit to ADEQ, a written report as specified in Section 2.6.6 (Corrective Actions). Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.3 Inflows of Unexpected Materials to a Surface Impoundment

The types of materials that are expected to be placed in the permitted surface impoundments are specified in Section 2.3 (Discharge Limitations). If any unexpected materials flow to a permitted surface impoundment, the permittee shall:

1. As soon as practicable, cease all unexpected inflows to the surface impoundment(s).
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days of the incident, identify the source of the material and determine the cause for the inflow. Characterize the unexpected material and contents of the affected impoundment, and evaluate the volume and concentration of the material to determine if it is compatible with the surface impoundment liner. Based on the evaluation of the incident, repair any systems or equipment and/or adjust operations, as necessary to prevent future occurrences of inflows of unexpected materials.
4. Within 30 days of an inflow of unexpected materials, submit a report to ADEQ as specified in section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 3 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
5. Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.4 Aquifer Quality Limit Violation

1. If an AQL set in Section 4, Tables 4.2.3 or 4.2.4 has been exceeded, the permittee may conduct verification sampling within 5 days of becoming aware of an AQL being exceeded. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms that the AQL is violated for any parameter or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring to monthly. In addition, the permittee shall immediately initiate an evaluation for the cause of the violation, including inspection of all discharging units and all related pollution control devices, and review of any operational and maintenance practices that might have resulted in unexpected discharge.

   The permittee also shall submit a report according to Section 2.7.3, which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. A verified exceedance of an AQL will be considered a violation unless the permittee demonstrates within 30 days that the exceedance was not caused or contributed to by pollutants discharged from the facility. Unless the permittee has demonstrated that the exceedance was not caused or contributed to by pollutants discharged from the facility, the permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water or groundwater, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ approved contingency plan, or separately approved according to Section 2.6.6.
3. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
4. The permittee shall notify any downstream or downgradient users who may be directly affected by

the discharge.

5. The permittee shall continue monitoring at the increased frequency until the contaminant(s) is below the AQL and AL for three consecutive months.

2.6.5 Emergency Response and Contingency Requirements for Unauthorized Discharges pursuant to A.R.S. §49-201(12) and pursuant to A.R.S. § 49-241

2.6.5.1 Duty to Respond

The permittee shall act immediately to correct any condition resulting from a discharge pursuant to A.R.S. § 49-201(12) if that condition could pose an imminent and substantial endangerment to public health or the environment.

2.6.5.2 Discharge of Hazardous Substances or Toxic Pollutants

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of suspected hazardous substances (A.R.S. § 49-201(19)) or toxic pollutants (A.R.S. § 49-243(I)) on the facility site, the permittee shall promptly isolate the area and attempt to identify the discharged material. The permittee shall record information, including name, nature of exposure and follow-up medical treatment, if necessary, on persons who may have been exposed during the incident. The permittee shall notify the ADEQ WQCS at (602) 771-4497 and Northern Regional Office (NRO) at (928) 779-0313 within 24-hours upon discovering the discharge of hazardous material which: a) has the potential to cause an AWQS or AQL to be exceeded; or b) could pose an endangerment to public health or the environment.

2.6.5.3 Discharge of Non-hazardous Materials

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of non-hazardous materials from the facility, the permittee shall promptly attempt to cease the discharge and isolate the discharged material. Discharged material shall be removed and the site cleaned up as soon as possible. The permittee shall notify the ADEQ WQCS at (602) 771-4497 within 24-hours upon discovering the discharge of non-hazardous material which: a) has the potential to cause an AQL to be exceeded; or b) could pose an endangerment to public health or the environment.

2.6.5.4 Reporting Requirements

The permittee shall submit a written report for any unauthorized discharges reported under Sections 2.6.5.2 and 2.6.5.3 to ADEQ WQCS within thirty days of the discharge or as required by subsequent ADEQ action. The report shall summarize the event, including any human exposure, and facility response activities and include all information specified in Section 2.7.3. If a notice is issued by ADEQ subsequent to the discharge notification, any additional information requested in the notice shall also be submitted within the time frame specified in that notice. Upon review of the submitted report, ADEQ may require additional monitoring or corrective actions.

A post-audit report regarding the passive containment demonstration is required within five years of the effective date of this permit, and every five years thereafter, in accordance with Section 2.5.3.6 of this permit.

2.6.6 Corrective Actions

Specific contingency measures identified in Section 2.6 and actions identified in the approved contingency plan referenced in Section 5.0 have already been approved by ADEQ and do not require written approval to implement.

With the exception of emergency response actions taken under Section 2.6.5, the permittee shall obtain written approval from the GWS prior to implementing a corrective action to accomplish any of the following goals in response to exceeding an AL or violation of an AQL, DL, or other permit condition:

1. Control of the source of an unauthorized discharge;

2. Soil cleanup;
3. Cleanup of affected surface waters;
4. Cleanup of affected parts of the aquifer;
5. Mitigation to limit the impact of pollutants on existing uses of the aquifer.

Within 30 days of completion of any corrective action, the operator shall submit to the ADEQ WQCS, a written report describing the causes, impacts, and actions taken to resolve the problem.

2.7 Reporting and Recordkeeping Requirements [A.R.S. § 49-243(K)(2) and A.A.C. R18-9-A206(B) and R18-9-A207]

2.7.1 Self-monitoring Report Form

1. The permittee shall complete the SMRFs provided by ADEQ, and submit them to the WQCS, Data Unit.
2. The permittee shall complete the SMRF to the extent that the information reported may be entered on the form. If no information is required during a quarter, the permittee shall enter "not required" on the SMRF and submit the report to ADEQ. The permittee shall use the format devised by ADEQ.
3. Tables 4.2.2, 4.2.3 and, 4.2.4 list the parameters to be monitored and the frequency for reporting results for groundwater compliance monitoring. Analytical methods shall be recorded on the SMRFs.

2.7.2 Operation Inspection / Log Book Recordkeeping

A signed copy of this permit shall be maintained at all times at the location where day-to-day decisions regarding the operation of the facility are made. A log book (paper copies, forms or electronic data) of the inspections and measurements required by this permit shall be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book shall be retained for ten years from the date of each inspection, and upon request, the permit and the log book shall be made immediately available for review by ADEQ personnel. The information in the log book shall include, but not be limited to, the following information as applicable:

1. Name of inspector;
2. Date and shift inspection was conducted;
3. Condition of applicable facility components;
4. Any damage or malfunction, and the date and time any repairs were performed;
5. Documentation of sampling date and time;
6. Any other information required by this permit to be entered in the log book, and
7. Monitoring records for each measurement shall comply with R18-9-A206(B)(2).

2.7.3 Permit Violation and Alert Level Status Reporting

1. The permittee shall notify the WQCS in writing within five days (except as provided in Section 2.6.5) of becoming aware of a violation of any permit condition, discharge limitation or of an Alert Level being exceeded.
2. The permittee shall submit a written report to the WQCS within 30 days of becoming aware of the violation of any permit condition or discharge limitation. The report shall document all of the following:
   a. Identification and description of the permit condition for which there has been a violation and a description of its cause.
   b. The period of violation including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue.
   c. Any corrective action taken or planned to mitigate the effects of the violation, or to eliminate or prevent a recurrence of the violation.
   d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an Aquifer Water Quality Standard.
   e. Proposed changes to the monitoring which include changes in constituents or increased

frequency of monitoring.

f. Description of any malfunction or failure of pollution control devices or other equipment or processes.

2.7.4 Operational, Other or Miscellaneous Reporting

The permittee shall, upon completion of the biennial sampling described in Table 4.2.4, submit a monitoring summary report to the GWS. This report shall be due at the same time as the SMRF form for the biennial sampling event. The report shall include, but not be limited to the following:

1. A description of any deviations from standard sampling protocols during the reporting period.
2. A summary of all exceedances of ALs, AQLs, Action Levels, or operational limits that occurred during the reporting period.
3 Graphical time versus concentration plots of field pH, sulfate, total dissolved solids, and any parameter which exceeded an applicable AL or AQL in the past eight quarters at each POC well, and tabulated sampling data for all wells required to be sampled by this permit during the last eight quarters.
4. An updated table of all monitor wells and piezometers in the Discharge Impact Area including, but not limited to, location of well, depth of well, depth to water, and water level elevation.
5. A summary of any groundwater monitor wells replaced in the reporting period including, but not limited to, location of well, depth of well, depth to water, water level elevation, and screened interval.
6. A list of any new sumps, impoundments, or vehicle washes constructed within the passive containment, unless exempt or covered by a general APP.
7. A summary of new Catchments within PCCZ (D-27) including location, and a description of the BADCT/installation.
8. A list of any catchments within the PCCZ decommissioned during the past 2 years.

2.7.5 Reporting Location

All SMRFs shall be submitted to:

Arizona Department of Environmental Quality
Water Quality Compliance Section, Data Unit
Mail Code: 5415B-1
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4513

All documents required by this permit to be submitted to the WQCS shall be directed to:

Arizona Department of Environmental Quality
Water Quality Compliance Section
Mail Code: 5415B-1
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4497

All documents required by this permit to be submitted to the GWS shall be directed to:

Arizona Department of Environmental Quality
Groundwater Section
Mail Code: 5415B-3
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4428

2.7.6 Reporting Deadline
The following table lists the quarterly report due dates:

January-March	April 30
April-June	July 30
July-September	October 30
October-December	January 30

January-December	January 30 of the following year
PCCZ post-audit every 5 years from the date of permit issuance (March 25, 2009)	30 days after the end of each 5 year cycle

2.7.7 Changes to Facility Information in Section 1.0
The GWS and WQCS shall be notified within 10 days of any change of facility information including Facility Name, Permittee Name, Mailing or Street Address, Facility Contact Person or Emergency Telephone Number.

2.8 Temporary Cessation [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A209(A)]
The permittee shall give written notice to the WQCS before ceasing operation of the facility for a period of 60 days or greater. At the time of notification the permittee shall submit for ADEQ approval a plan for maintenance of discharge control systems and for monitoring during the period of temporary cessation. Immediately following ADEQ's approval, the permittee shall implement the approved plan. If necessary, ADEQ shall amend permit conditions to incorporate conditions to address temporary cessation. During the period of temporary cessation, the permittee shall provide written notice to the WQCS of the operational status of the facility every three years. If the permittee intends to permanently cease operation of any facility, the permittee shall submit closure notification, as set forth in Section 2.9 below.

2.9 Closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(B)]
For a facility addressed under this permit, the permittee shall give written notice of closure to the WQCS of the permittee's intent to cease operation without resuming activity for which the facility was designed or operated. Notice of decommissioning of Catchments within the PCCZ (D-27) shall comply with the requirements of Section 2.7.4.

2.9.1 Closure Plan
Within 90 days following notification of closure, the permittee shall submit for approval to the GWS, a Closure Plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3).
If the closure plan achieves clean closure immediately, ADEQ shall issue a letter of approval to the permittee. If the closure plan contains a schedule for bringing the facility to a clean closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

2.9.2 Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the GWS indicating that the approved Closure Plan has been implemented fully and providing supporting documentation to demonstrate that clean closure has been achieved (soil sample results, verification sampling results, groundwater data, as applicable). If clean closure has been achieved, ADEQ shall issue a letter of approval to the permittee at that time. If any of the following conditions apply, the permittee shall follow the terms of post-closure stated in this permit:

1. Clean closure cannot be achieved at the time of closure notification or within one year thereafter under a diligent schedule of closure actions;
2. Further action is necessary to keep the facility in compliance with aquifer water quality standards at the applicable point of compliance;
3. Continued action is required to verify that the closure design has eliminated discharge to the extent intended;
4. Remedial or mitigative measures are necessary to achieve compliance with Title 49, Ch. 2;
5. Further action is necessary to meet property use restrictions.

2.9.3 Decommissioned Facilities

The following facilities were originally listed in the APP, issued March 25, 2009. They have been decommissioned, and closure shall be addressed at final mine closure.

Tucker Pond	34° 35' 35" N	113° 13' 44" W
EW Catchment Basin	34° 36' 10" N	113° 12' 57" W
Mineral Creek Sump	34° 34' 39" N	113° 12' 58" W

2.10 Post-closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(C)]

Post-closure requirements shall be established based on a review of facility closure actions and will be subject to review and approval by the GWS.

In the event clean closure cannot be achieved pursuant to A.R.S. § 49-252, the permittee shall submit for approval to the GWS a Post-closure Plan that addresses post-closure maintenance and monitoring actions at the facility. The Post-closure Plan shall meet all requirements of A.R.S. §§ 49-201(30) and 49-252 and A.A.C. R18-9-A209(C). Upon approval of the Post-closure Plan, this permit shall be amended or a new permit shall be issued to incorporate all post-closure controls and monitoring activities of the Post-closure Plan.

2.10.1 Post-closure Plan

Reserved

2.10.2 Post-closure Completion

Reserved

3.0 COMPLIANCE SCHEDULE [A.R.S. § 49-243(K)(5) and A.A.C. R18-9-A208]

For each compliance schedule item listed below, the permittee shall submit the required information, including a cover letter that lists the compliance schedule items, to the GWS. A copy of the cover letter must also be submitted to the WQCS.

COMPLIANCE SCHEDULE		
ITEM DESCRIPTION	**COMPLETION/SUBMITTAL DATE**	**REQUIREMENTS**
COPPER CREEK POINT OF COMPLIANCE (POC) AREA		
Tucker Pond (D-9) Copper Creek PLS Pond System (PLS Pond and Conveyance Channel) (D-10) Boulder Flood Basin (D-11)	**Received 3/25/2011** (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
BLACK MESA POINT OF COMPLIANCE (POC) AREA		
EW Catchment Basin (D-12)	**Received 3/25/2011** (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade, for review and comments. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
MULHOLLAND TAILINGS POINT OF COMPLIANCE (POC) AREA		
Mulholland Tailings Pond (D-1)	**Received 3/25/2011** (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual. Submit also two copies of stability analysis -- static and pseudostatic, based on facility's final configuration. The analysis shall define a minimum beach distance between the outer edge of the ponded water and the adjacent tailings embankment to ensure safe operation of the tailings impoundment. The results of the stability analysis shall be consistent with the Arizona Mining BADCT Guidance Manual, Appendix E.

Mulholland Seepage Pond (D-2)	**Received 3/25/2011** (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
Last Chance Pond (D-3)	**Received 3/26/2012**	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
Mineral Creek Sump (D-8)	**Received 12/3/12**	Submit an other amendment application to remove the decommissioned Mineral Creek Sump from the list of discharging facilities.

For additional details on existing facilities BADCT demonstration, refer to Arizona Mining BADCT Guidance Manual.

4.0 TABLES OF MONITORING REQUIREMENTS

4.1 FACILITY AND POC TABLES

Table 4.1.1 Permitted Facilities and BADCT

4.2 COMPLIANCE AND OPERATIONAL MONITORING TABLES

Table 4.2.1 Required Inspections and Operational Monitoring
Table 4.2.2 Parameters for Ambient Groundwater Monitoring for All POC Wells
Table 4.2.3 Quarterly Compliance Groundwater Monitoring Requirements for POC Wells
Table 4.2.4 Biennial Compliance Groundwater Monitoring Requirements for POC Wells

TABLE 4.1.1
FACILITIES LIST AND BADCT

Facility Name (#)	Lat./Long.	Facility BADCT
PROCESS SOLUTION IMPOUNDMENTS:		
Catchments within PCCZ (D-27)	N/A	**Individual BADCT:** These facilities consist of existing (Upper Niagara Pond (D-4), Upper Niagara PLS Pond (D-5), Alum Sump PLS Pond (D-21), and Kimberly Pond (D-22)) and future collection and diversion points including catchments, sumps and impoundments, for process solution/stormwater within the PCCZ. This permit allows catchments within the PCCZ to be constructed, operated, maintained, and decommissioned without requiring any permit amendments in accordance with the following: The facilities will be equipped with pumps, as necessary, to maintain a controlled ponded surface elevation and minimize the risk of overtopping during storm events. Should overtopping occur for catchments within the pit area, the overflow solution will be contained within the confines of the mine pit (within the PCCZ). For new catchments constructed outside the pit, but within the PCCZ, freeboard will be maintained to reduce the possibility of overflow. Pumps and piping will be on hand to direct excess PLS to the SX-EW plant, leach circuit, or other APP-regulated facility, as needed. The slope stability of pit walls and stockpiles shall be assessed for new catchments prior to installation. Facilities will be decommissioned by (1) reducing or ceasing inflow, (2) routing of remaining inflow to another facility regulated by the APP or allowing gravity flow over unfractured bedrock into the bottom of the pit for collection and recovery, and (3) filling with rock material.
Copper Creek PLS Pond System (PLS pond and conveyance channel) (D-10)	34 ° 36' 12" N 113 ° 13' 46" W	The facility is a process solution pond system consisting of an 80-mil HDPE-lined channel leading from the toe of the Copper Creek Leach Dump to the Copper Creek PLS Pond. The PLS pond system is constructed on Quaternary gravels of moderate hydraulic conductivity underlain by Precambrian granite. The pond has a design capacity of 4.5 million gallons, with a depth of 20 feet. Process solution from the pond is pumped to the SX-EW Plant for processing. During process upset or severe storm events, overflow shall report to Boulder Flood Basin (D-11) via a lined overflow channel.
Boulder Flood Basin (D-11)	34 ° 36' 19" N 113 ° 13' 48" W	The facility is a double-lined, impoundment equipped with a Leak Collection and Removal System (LCRS). The primary liner is an 80-mil HDPE geomembrane, secured in an engineered anchor trench, and a secondary liner consisting of a compacted, amended soil liner. The overflow channel from the Copper Creek PLS Pond leading to the Boulder Flood Basin is lined with an 80-mil HDPE geomembrane. The impoundment has a solution holding capacity of 37 million gallons. The impoundment receives stormwater runoff and contains process solution overflow due to process upsets in the Copper Creek leach system. The facility is designed with pumping system capability to divert solution to the Bagdad open pit, the Mulholland Tailings Pond, Mammoth Tailings Pond, or the Copper Creek PLS Pond System. Potential discharges from the Boulder Flood Basin to Boulder Creek are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

Raffinate Pond (D-13)	34 ° 36' 05" N 113 ° 13' 00" W	Facility is located within the passive containment zone of the open pit. The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane is secured in an engineered anchor trench around the pond perimeter. The impoundment has a maximum solution holding capacity of approximately 0.5 million gallons, at a depth of approximately 6 feet. To avoid potential overflow, the impoundment is equipped with an automatic, high-level alarm system. The raffinate solution is used in the leach process. To minimize the potential for discharge, surface water run-on is diverted away from the facility. The ALR and RLLR for the pond are established at 223 gpd and 670 gpd respectively. During process upset or severe storm events, the piped overflow reports to the Copper Creek Leach Dump.
PLS Surge Pond (D-14)	34 ° 36' 04" N 113 ° 12' 58" W	Facility is located within the passive containment zone of the open pit. The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane and the geonet/geotextile composite used in the LCRS are secured in an engineered anchor trench around the pond perimeter. The pond is constructed on non-mineralized material of the Mine Shop Overburden Dump. The pond has a maximum solution holding capacity of approximately 1.5 million gallons, with a depth of 8 feet. The pond receives process solution from various PLS collection facilities from where it is pumped to the SX-EW Plant for processing. To avoid potential overflow, the PLS Surge Pond is equipped with an automatic, high-level alarm system. To minimize the potential for discharge, surface water run-on is diverted away from the facility. The ALR and RLLR for the pond are established at 279 gpd and 836 gpd respectively.
Strong PLS Pond (D-20)	34 ° 35' 46" N 113 ° 14' 03" W	**Prescriptive BADCT:** The facility (D20) is a double-lined impoundment equipped with a leak detection and removal system (LCRS). The double liner consists of a 60-mil HDPE primary and secondary liner, with a 200-mil HDPE geonet between the two liners for drainage. The lower liner is a composite liner underlain by a minimum of 6-inch minus low permeability soil compacted to achieve a saturated hydraulic conductivity of no greater than 1×10^{-6} cm/sec. The pond is designed to contain maximum fluid volume of 3.86 million gallons plus direct precipitation from the 100-year, 24-hour storm event while maintaining 2 feet of freeboard. The total depth of the pond is 26 feet. Berms and diversion channels are designed to prevent surface stormwater from entering the pond. The ALR and RLLR for the pond are established at 515 gpd and 1,545 gpd, respectively (Ref. Area-wide APP Application Addendum, July 2002).
LEACH DUMPS:		
Upper Niagara Leach Dump (D-6)	34 ° 35' 04" N 113 ° 13' 53" W	Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted away from the facility.

Plan IX Leach Dump (D-15)	34 ° 34' 36" N 113 ° 13' 30" W	Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted away from the facility
Mineral Creek Leach Dump (D-18)	34 ° 34' 30" N 113 ° 12' 52" W	Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted into the open pit.
Copper Creek Leach Dump (D-7)	34 ° 35' 56" N 113 ° 13' 31" W	The stability analysis, water balance and aquifer loading analysis, as well as solution, ore and waste characterization, sighting considerations, design, construction and operational measures received in submittals dated March 25, 2010 and July 1, 2010 have satisfied the requirements of A.R.S. 49-243 and R-18-9-A202
Crystal Mountain Leach Dump (D-19)	34 ° 35' 48" N 113 ° 13' 42" W	The stability analysis, water balance and aquifer loading analysis, as well as solution, ore and waste characterization, sighting considerations, design, construction and operational measures received in submittals dated March 25, 2010 and July 1, 2010 have satisfied the requirements of A.R.S. 49-243 and R-18-9-A202.
TAILINGS IMPOUNDMENTS:		
Mulholland Tailings Pond (D-1)	34 ° 35' 34" N 113 ° 15' 11" W	The facility is a tailings dam used primarily as a recycled water storage facility for site-wide water management purposes and, as needed, as a secondary tailings disposal impoundment. The facility is constructed employing centerline dam construction method, using a combination of spigotting and cycloning of tailings material. The impoundment is located over predominantly Precambrian crystalline rocks. The tailings dam and pond cover an area of approximately 500 acres and contain approximately 120 million dry tons of tailings.
Mulholland Seepage Pond (D-2)	34 ° 35' 51" N 113 ° 15' 26" W	The facility is a lined impoundment formed by a seepage collection dam constructed adjacent to the downstream toe of the Mulholland tailings embankment. The dam is a compacted rock-fill dam with a reinforced gunnite facing on its entire surface and has a concrete lined basin. The impoundment has an approximate storage capacity of 531,000 gallons, with an average depth of approximately 6 feet. Collected seepage is pumped back to the Mulholland Tailings Pond using two vertical turbine pumps. Both pumps are turbine pumps. Both pumps are equipped with automatic level controls and have a combined design capacity of 1,175 gpm. Potential discharges from the Mulholland Seepage Pond to Mulholland Wash are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).
Mammoth Tailings Impoundment (D-23)	34° 35' 04" N 113° 16' 11" W	The facility has a maximum capacity of 900,000,000 tons of tailings and a maximum permitted dam crest elevation of 3,600 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day. Process fluids include: water from the Freeport-McMoRan Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite Wastewater Treatment Plant (WWTP) and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act.

Mammoth Tailings Seepage Collection Pond (D-24)	34° 35' 19" N 113° 17' 50" W	The tailings seepage collection pond (SCP) is constructed with a gunite liner and has a normal operating capacity of 350,000 with a minimum freeboard of 1 foot The facility is located at an elevation of 2,740 feet above sea level. The pump-back dam, constructed upon crystalline bedrock, is a compacted rock fill dam with a 12-inch concrete facing on its entire surface. In addition, a seepage sump (SS) is located at an elevation of 2,730 feet above sea level immediately downstream from the facility. The SS is a 1-foot-diameter well, extending to a depth of 11 feet in the gravels of Mammoth Wash, immediately downstream from the SCP.
Upper Mammoth Tailings Impoundment (D-24)	34° 34' 10" N 113° 14' 41" W	The Upper Mammoth Tailings Impoundment shall be constructed, operated, and maintained according to Plans and Specifications provided in the March 24, 1995 titled *Site Characterization & Design Studies,* the December 2010 Upper Mammoth Tailing Feasibility Level Design, and amendments and supplements referenced in Section 5 of this Permit. The Upper Mammoth Tailings impoundment has a maximum capacity of 600,000,000 tons of tailings. The maximum permitted dam crest elevation shall not exceed 4,050 feet above mean sea level, and the maximum areal extent of the tailings impoundment shall not exceed the footprint shown in Figure 1 of the approved design plans provided in the July 18, 2007, *Site Characterization & Design Studies.* Tailings shall be delivered to the tailings impoundment at a rate not to exceed 200,000 dry tons per day during ore processing.
Last Chance Pond (D-3)	34 ° 35' 39" N 113 ° 14' 20" W	Facility BADCT shall be determined by the Compliance Schedule (see Section 3.0 Compliance Schedule).
WASTE ROCK STORAGE FACILITY		
South Waste Rock Storage Facility (D-26)	34° 34' 07" N 113° 12' 10" W	The South Waste Rock Disposal Facility has a maximum capacity of 660,000,000 tons of mining overburden with a maximum permitted elevation of 4,800 feet above mean sea level. Maximum areal extent of the waste rock disposal facility shall not exceed the footprint shown in Figure 4 of the revised Life of Mine (LOM) design plans provided in the February, 2010, *Request for Other Amendment to APP 101353 South Waste Rock Disposal Facility Expansion.* The facility shall consist of angle of repose slopes interrupted approximately every 300 feet in elevation by an approximately 115-foot wide bench. This configuration shall be documented as required in Section 2.7.4 of this Permit.

Notes:

1. Prescriptive BADCT design involves a prescribed engineering approach that utilizes pre-approved discharge control technologies or engineering equivalents to meet the requirements of A.R.S. 49-243(B)(1).
2. Individual BADCT requirements are described in the ADEQ Arizona Mining BADCT Guidance Manual. For existing facilities, consideration of additional factors as listed in A.R.S. §§ 49-243(B)(1)(a) through (h) and 49-243(G) apply.
3. Abbreviations:

BADCT	Best Available Demonstrated Control Technology	ALR	Action Leakage Rate
HDPE	High-density Polyethylene	RLLR	Rapid and Large Leakage Rate

TABLE 4.2.1
REQUIRED INSPECTIONS AND OPERATIONAL MONITORING

Facility Name (#)	Operational Requirements
LEACH DUMPS	
Upper Niagara Leach Dump (D-6) Copper Creek Leach Dump (D-7) Plan IX Leach Dump (D-15) Mineral Creek Leach Dump (D-18) Crystal Mountain Leach Dump (D-19)	**Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; OUTSIDE THE PCCZ	
Boulder Flood Basin (D-11) Strong PLS Pond (D-20)	**Daily:** Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures Visually inspect and maintain applicable freeboard in impoundment – Strong PLS Pond – 2 feet **Weekly:** **Strong PLS Pond** Measure flow rate in the LCRS: confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than the specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.

	At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.
PROCESS SOLUTION IMPOUNDMENTS – LINED; OUTSIDE THE PCCZ	
Copper Creek PLS Pond System (PLS Pond and Conveyance Channel (D-10))	**Daily:** Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures or conveyance channel. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear of damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.
TAILINGS IMPOUNDMENTS	
Mulholland Tailings Pond (D-1)	**Daily:** Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures or conveyance channel. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear of damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.

PROCESS SOLUTION IMPOUNDMENTS WITHIN THE PCCZ	
Catchments within PCCZ (D-27)	**Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.

TABLE 4.2.1
REQUIRED INSPECTIONS AND OPERATIONAL MONITORING

Facility Name (#)	**Operational Requirements**
LEACH DUMPS	
Upper Niagara Leach Dump (D-6) Copper Creek Leach Dump (D-7) Plan IX Leach Dump (D-15) Mineral Creek Leach Dump (D-18) Crystal Mountain Leach Dump (D-19)	**Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.
PROCESS SOLUTION IMPOUNDMENTS WITHIN THE PCCZ	
Catchments within PCCZ (D-27)	**Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions;

	-excessive accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; OUTSIDE THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
Boulder Flood Basin (D-11) Strong PLS Pond (D-20)	**Daily:** Check and take appropriate action if any evidence of: -blockages of overflow pipes/spillway structures. Visually inspect and maintain applicable freeboard in impoundment: -Strong PLS Pond - 2 feet **Weekly:** **Strong PLS Pond** Measure flow rate in the LCRS; confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear or damaged liner and impairment of anchor trench integrity; -impairment of embankment integrity; - excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; WITHIN THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
Raffinate Pond (D-13)	**Daily:** Check and take appropriate action if any evidence of: -blockages of overflow pipes/spillway structures.

PLS Surge Pond (D-14)	**Weekly:** **Raffinate Pond and PLS Surge Pond** Measure flow rate in the LCRS; confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear or damaged liner and impairment of anchor trench integrity; -impairment of embankment integrity; - excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.
PROCESS SOLUTION IMPOUNDMENT –LINED; OUTSIDE THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
Copper Creek PLS Pond System (PLS Pond and Conveyance Channel) (D-10)	**Daily:** Check and take appropriate action if any evidence of: -blockages of overflow pipes/spillway structures or Conveyance Channel. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: - perforated cut, tear or damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; - excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access. At pump locations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.

TAILINGS IMPOUNDMENTS	
Mulholland Tailings Pond (D-1)	**Daily during operational use (disposal of tailings, recycled water or process solution during upset conditions), and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and maintain a minimum of 4 feet of freeboard. **Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -tailings dam deformation, including surface cracks, slides, sloughs, seeps, erosion features or differential settlement -affecting dam stability; - excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; At pump installations, inspect pumps, valves and structures for pump operation and structural integrity. **<u>REQUIREMENTS SPECIFIC TO WATER QUALITY</u>** Insure that the pH of all potentially acidic waters directed to the Mulholland Tailings Pond shall be tested and adjusted upward as needed to a pH greater than 4.5 SU before being discharged to the impoundment.
Mammoth Tailings Impoundment (D-23)	**Daily:** Tailings Dam(s) Integrity- -Check for erosion beyond that due to normal deposition -Check for evidence of unexpected seepage, header damage, or excessive construction water flows
Upper Mammoth Tailings Impoundment (D-24)	Tailings Impoundments- - Check tailing water reclaim pumps - Check for minimum ten feet of freeboard
NON STORM WATER IMPOUNDMENTS	
Mulholland Seepage Collection Pond (D-2)	**Weekly:** Visually inspect and take appropriate action if: -seepage from the Mulholland Tailings Pond into the seepage pond exceeds the pumping capacity of 1,175 gpm **Monthly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks or unusual differential settlement;

	-seepage through surface cracks along the embankment; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; At pump installations, inspect pumps, valves and structures for pump operation and structural integrity.
Last Chance Pond (D-3)	**Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period:** (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; At pump installations, inspect pumps, valves and structures for pump operation and structural integrity. **Annually:** Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.
Mammoth Tailings Seepage Collection Pond (D-25)	**Daily:** Visually inspect and take appropriate action if any evidence of: -visible leaks or seepage -Check seepage return pumps for proper function -Check for water level below weir -Check for minimum 1 foot of freeboard -Check for evidence of seepage -Inspect Seepage Collection Pumpback Dam for visible leaks or structural failure -Inspect Seepage Sump (below Pumpback dam) for overflow and check down-hole pump operation
WASTE ROCK STORAGE FACILITY	
South Waste Rock Disposal Facility (D-26)	**Monthly:** Visually inspect and take appropriate action if any evidence of: -dump or stockpile deformation, including surface cracks, slides, sloughs, or differential settlement affecting slope stability.

TABLE 4.2.2
PARAMETERS FOR AMBIENT GROUNDWATER MONITORING FOR ALL POC WELLS[4]

Depth to Water Level (feet)	Potassium [1]	Nickel [1]
Water Level Elevation (feet amsl)	Sodium [1]	Selenium [1]
Temperature – field (^{0}F)	Iron [1]	Thallium [1]
pH – field and lab (S.U.)	Aluminum [1]	Zinc [1]
Field Specific Conductance (µmhos/cm)	Antimony [1]	Free Cyanide
Total Dissolved Solids – lab	Arsenic [1]	Adjusted Gross Alpha Activity (pCi/L) [3]
Total Alkalinity	Barium [1]	Radium 226 (pCi/L)
Bicarbonate	Beryllium [1]	Radium 228 (pCi/L)
Carbonate	Cadmium [1]	Uranium (mg/L) [1]
Hydroxide	Chromium [1]	Carbon Disulfide
Sulfate	Cobalt [1]	Benzene
Chloride	Copper [1]	Toluene
Fluoride	Lead [1]	Ethylbenzene
Nitrate+Nitrite	Manganese [1]	Total Xylenes
Calcium [1]	Mercury [1]	TPH
Magnesium [1]	Molybdenum [1]	

1. Metals must be analyzed as dissolved metals.

2. All parameters are in milligrams per liter (mg/L) unless otherwise noted.

3. The adjusted gross alpha particle activity is the gross alpha particle activity, including radium 226, minus radon and total uranium activity (the sum of the uranium 238, uranium 235 and uranium 234 isotopes).

4. This table is being provided in the event that it becomes necessary to install additional POC wells

TABLE 4.2.3
QUARTERLY COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS FOR POC WELLS

PARAMETER	CMW-609		CMW-610		CMW-611		020	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Level Elevation (in feet amsl)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field pH (S.U.)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field Specific Conductance (µmhos/cm)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Temperature – field (^{0}F)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Dissolved Solids	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sulfate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Fluoride	6.0	None	7.45	None	4.0	3.2	4.0	3.2
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Arsenic	0.050	0.040	0.360	None	0.050	0.040	0.050	0.040
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.40	None	0.10	0.08	0.10	0.08
Copper	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Nickel	0.10	0.08	1.58	None	0.10	0.08	0.10	0.08
Selenium	0.05	0.04	0.05	0.04	0.05.	0.04	0.05.	0.04
Zinc	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor

Monitor = Monitoring is required, but no AQL or AL is established in the permit.
AQL = Aquifer Quality Limit
AL = Alert Level

All concentrations are in milligrams per liter (mg/L) unless otherwise specified.

Metals will be analyzed as dissolved metals

Use Table 4.2.4 parameter list for biennial sampling events.

TABLE 4.2.3
QUARTERLY COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS FOR POC WELLS (CONTINUED)

PARAMETER	803		283		613		810	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Level Elevation (in feet amsl)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field pH (S.U.)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field Specific Conductance (µmhos/cm)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Temperature – field (^{0}F)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Dissolved Solids	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sulfate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Fluoride	4.0	3.2	4.0	3.2	4.0	3.2	4.0	3.2
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Arsenic	0.050	0.040	0.050	0.04	0.050	0.040	0.050	0.040
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08
Copper	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Nickel	0.10	0.08	0.10	0.08	0.10	0.08	0.12	None
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Zinc	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor

Monitor = Monitoring is required, but no AQL or AL is established in the permit.
AQL = Aquifer Quality Limit
AL = Alert Level

All concentrations are in milligrams per liter (mg/L) unless otherwise specified.

Metals will be analyzed as dissolved metals

Use Table 4.2.4 parameter list for biennial sampling events.

Table 4.2.4
BIENNIAL COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS FOR POC WELLS

PARAMETER	CMW-609		CMW-610		CMW-611		020	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Level Elevation (feet amsl)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field pH (S.U.)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field Specific Conductance (µmhos/cm)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Temperature (^{0}F)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Dissolved Solids	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Alkalinity	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Bicarbonate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Carbonate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Hydroxide	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Chloride	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sulfate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sodium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Potassium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Calcium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Magnesium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Fluoride	6.00	None	7.45	None	4.0	3.2	4.0	3.2
Aluminum	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Antimony	0.006	0.0048	0.006	0.0048	0.006	0.0048	0.006	0.0048
Arsenic	0.050	0.040	0.360	None	0.050	0.040	0.050	0.040
Barium	2.0	1.6	2.0	1.6	2.0	1.6	2.0	1.6
Beryllium	0.004	0.0032	0.004	0.0032	0.004	0.0032	0.004	0.0032
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.40	None	0.10.	0.08	0.10.	0.08
Iron	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Lead	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Mercury	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Nickel	0.10	0.08	1.58	None	0.10	0.08	0.10	0.08
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Thallium	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Copper	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Cobalt	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Manganese	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Molybdenum	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Zinc	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Adjusted Gross Alpha Activity (pCi/L)	15	12	15	14	15	12	15	12

Radium226+Radium228 (pCi/L)	6.72	None	5.0	4.07	5.0	4.74	5.0	4.17
Uranium (mg/L)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Free Cyanide	0.2	0.16	0.2	0.16	0.2	0.16	0.2	0.16
Carbon Disulfide	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
TPH	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Benzene	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Toluene	1	0.8	1	0.8	1	0.8	1	0.8
Ethylbenzene	0.7	0.56	0.7	0.56	0.7	0.56	0.7	0.56
Total Xylenes	10	8	10	8	10	8	10	8

Monitor = Analysis required but no AQL or AL established in the permit.
AQL = Aquifer Quality Limit
AL = Alert Level
All concentrations are in milligrams per liter (mg/L) unless otherwise specified.
Metals will be analyzed as dissolved metals.

If the gross alpha particle activity is greater than the AL or AQL, then test for and report adjusted gross alpha particle activity. The adjusted gross alpha particle activity is the gross alpha particle activity including radium226, minus radon and total uranium (the sum of the uranium 238, 235 and 234 isotopes).

Use Table 4.2.3 parameters for quarterly sampling events between biennial events.

Table 4.2.4
BIENNIAL COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS FOR POC WELLS (CONTINUED)

PARAMETER	803		283		613		810	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Level Elevation (feet amsl)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field pH (S.U.)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Field Specific Conductance (µmhos/cm)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Temperature (^{0}F)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Dissolved Solids	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Total Alkalinity	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Bicarbonate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Carbonate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Hydroxide	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Chloride	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sulfate	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Sodium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Potassium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor

Calcium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Magnesium	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Fluoride	4.0	3.2	4.0	3.2	4.0	3.2	4.0	3.2
Aluminum	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Antimony	0.006	0.0048	0.006	0.0048	0.006	0.0048	0.006	0.0048
Arsenic	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Barium	2.0	1.6	2.0	1.6	2.0	1.6	2.0	1.6
Beryllium	0.004	0.0032	0.004	0.0032	0.004	0.0032	0.004	0.0032
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.10	0.08	0.10.	0.08	0.10.	0.08
Iron	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Lead	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Mercury	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Nickel	0.10	0.08	0.10	0.08	0.10	0.08	0.12	None
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Thallium	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Copper	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Cobalt	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Manganese	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Molybdenum	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Zinc	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Adjusted Gross Alpha Activity (pCi/L)	15	12	20.4	None	28.7	None	42.1	None
Radium226+Radium228 (pCi/L)	5.0	4.0	5.0	4.0	5.0	4.0	5.2	None
Uranium (mg/L)	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Free Cyanide	0.2	0.16	0.2	0.16	0.2	0.16	0.2	0.16
Carbon Disulfide	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
TPH	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Benzene	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Toluene	1	0.8	1	0.8	1	0.8	1	0.8
Ethylbenzene	0.7	0.56	0.7	0.56	0.7	0.56	0.7	0.56
Total Xylenes	10	8	10	8	10	8	10	8

Monitor = Analysis required but no AQL or AL established in the permit.
AQL = Aquifer Quality Limit
AL = Alert Level
All concentrations are in milligrams per liter (mg/L) unless otherwise specified.
Metals will be analyzed as dissolved metals.

If the gross alpha particle activity is greater than the AL or AQL, then test for and report adjusted gross alpha particle activity. The adjusted gross alpha particle activity is the gross alpha particle activity including radium226, minus radon and total uranium (the sum of the uranium 238, 235 and 234 isotopes).
Use Table 4.2.3 parameters for quarterly sampling events between biennial events.

5.0 REFERENCES AND PERTINENT INFORMATION

The terms and conditions set forth in this permit have been developed based upon the information contained in the following, which are on file with the Department:

APP P-105258

1. APP Application dated November 1, 1993.
2. Public Notice, dated March 23, 2006.
3. Responsiveness Summary, dated July 2006.
4. Aquifer Protection Permit file, Inventory Numbers 101353 and 105258.
5. Permit Issuance, dated March 25, 2009
6. Minor Amendment, dated April 30, 2009.
7. Other Amendment, dated October 1, 2010 (LTF-51739).
8. Other Amendment, dated November 19, 2010 (LTF-52305).
9. Other Amendment application, dated June 23, 2009 (LTF-50325).
10. Other Amendment application, dated March 25, 2011 (LTF-53994).
11. Other Amendment application, dated March 26, 2012.

APP P-101353

1. APP Application dated July 7, 1993.
2. Public Notice, dated April 7, 1996.
3. Inventory File No. 101353 including all correspondence, maps, drawings, engineering reviews, hydrologic reviews and compliance schedule submittals.
4. Previous Amendments to the APP:
   Minor Amendment to the APP; May, 1997.
   Significant Amendment to the APP; January, 2001.
   Other Amendment to the APP; August, 2001.
   Significant Amendment to the APP; November, 2001.
   Other Amendment to the APP, June 2009.
5. Other Amendment Application received March 2, 2010.
6. Other Amendment Application received August 9, 2011.

6.0 NOTIFICATION PROVISIONS

6.1 Annual Registration Fees

The permittee is notified of the obligation to pay an Annual Registration Fee to ADEQ. The Annual Registration Fee is based upon the amount of daily influent or discharge of pollutants in gallons per day as established by A.R.S. § 49-242.

6.2 Duty to Comply [A.R.S. §§ 49-221 through 49-263]

The permittee is notified of the obligation to comply with all conditions of this permit and all applicable provisions of Title 49, Chapter 2, Articles 1, 2 and 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Articles 1 through 4, and Title 18, Chapter 11, Article 4 of the Arizona Administrative Code. Any permit non-compliance constitutes a violation and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit amendment, suspension, or revocation.

6.3 Duty to Provide Information [A.R.S. §§ 49-243(K)(2) and 49-243(K)(8)]

The permittee shall furnish to the Director, or an authorized representative, within a time specified, any information which the Director may request to determine whether cause exists for amending or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

6.4 Compliance with Aquifer Water Quality Standards [A.R.S. §§ 49-243(B)(2) and 49-243(B)(3)]

The permittee shall not cause or contribute to a violation of an aquifer water quality standard at the applicable point of compliance for the facility. Where, at the time of issuance of the permit, an aquifer already exceeds an aquifer water quality standard for a pollutant, the permittee shall not discharge that pollutant so as to further degrade, at the applicable point of compliance for the facility, the water quality of any aquifer for that pollutant.

6.5 Technical and Financial Capability

[A.R.S. §§ 49-243(K)(8) and 49-243(N) and A.A.C. R18-9-A202(B) and R18-9-A203(E) and (F)]

The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, trust fund, or other financial assurance mechanism provided as a demonstration of financial capability in the permit application, pursuant to A.A.C. R18-9-A203(D), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

6.6 Reporting of Bankruptcy or Environmental Enforcement [A.A.C. R18-9-A207(C)]

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. The filing of bankruptcy by the permittee.
2. The entry of any order or judgment not issued by the Director against the permittee for the enforcement of any environmental protection statute or rule.

6.7 Monitoring and Records [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A206]

The permittee shall conduct any monitoring activity necessary to assure compliance with this permit, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223 and §§ 49-241 through 49-252.

6.8 Inspection and Entry [A.R.S. §§ 41-1009, 49-203(B) and 49-243(K)(8)]

In accordance with A.R.S. §§ 41-1009 and 49-203(B), the permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to enter and inspect the facility as reasonably necessary to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, and Title 18, Chapter 9, Articles 1 through 4 of the Arizona Administrative Code and the terms and conditions of this permit.

6.9 Duty to Modify [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A211]

The permittee shall apply for and receive a written amendment before deviating from any of the designs or

operational practices specified by this permit.

6.10 Permit Action: Amendment, Transfer, Suspension & Revocation
[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]
This permit may be amended, transferred, renewed, or revoked for cause, under the rules of the Department.

The permittee shall notify the Groundwater Section in writing within 15 days after any change in the owner or operator of the facility. The notification shall state the permit number, the name of the facility, the date of property transfer, and the name, address, and phone number where the new owner or operator can be reached. The operator shall advise the new owner or operators of the terms of this permit and the need for permit transfer in accordance with the rules.

7.0 ADDITIONAL PERMIT CONDITIONS

7.1 Other Information [A.R.S. § 49-243(K)(8)]
Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit the correct facts or information.

7.2 Severability
[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]
The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby. The filing of a request by the permittee for a permit action does not stay or suspend the effectiveness of any existing permit condition.

7.3 Permit Transfer
This permit may not be transferred to any other person except after notice to and approval of the transfer by the Department. No transfer shall be approved until the applicant complies with all transfer requirements as specified in A.A.C. R18-9-A212(B) and (C).

APPENDIX C TYPICAL CONFIGURATION OF DISTRIBUTED FACILITIES

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The distributed facilities proposed in this MPO Modification fulfill the need for future, support facilities that are typically associated with mining operations to meet safety, environmental, operational, closure, and post-closure requirements. The basic description and typical configuration of possible distributed facilities are summarized in Table C-1. In addition to the conceptual configuration of power lines and access roadways/pipelines presented in Figures C-1 and C-2, Figures C-3 and C-4 present the conceptual configuration of drill sites and geotechnical/slope stability monitoring equipment. Typically, pipelines would parallel access roadways, but segments of a pipeline may run independently. Access roadways may or may not be accompanied by a pipeline.

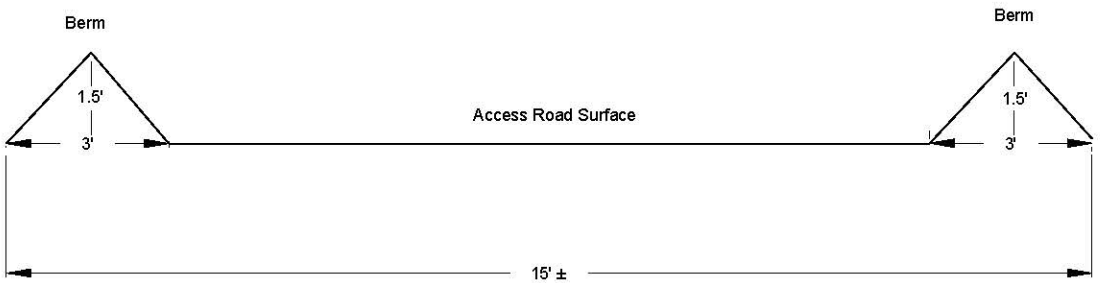
FMBI anticipates that a condition of the approval of this MPO would require the submittal of final engineering plans to the BLM prior to ground disturbing activities related to the distributed facilities.

Table C-1 Typical Distributed Facilities

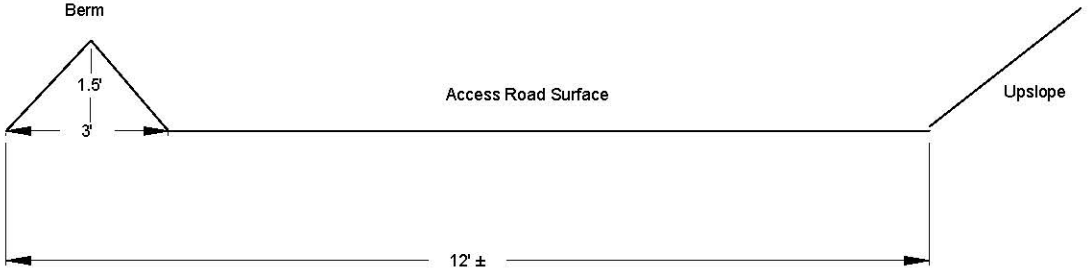
Description of Surface Disturbing Activity	Anticipated Number of Items	Anticipated Size of Items[1]	Anticipated Surface Disturbance[1]
Future power line and associated access roads (Figure C-1)	Up to one power line in addition to the APS power line (by others); multiple road segments	Approximately 20,000 linear feet of power line and roughly 24,000 linear feet of new access roads have been proposed in association with the APS power line; minimal additional access roads may be required for construction of a second power line.	Approximately 20 to 30 acres of disturbance for APS power line access and maintenance roads may be anticipated; minimal additional disturbance area may be required for construction of a second power line.
Future pipeline (water or process fluid; Figure C-2)	0 to 5 ±	Pipe diameter may range from approximately 4 to 48 inches, reflecting the range of pipe sizes currently in use at the Bagdad Mine.	Unknown
Future pipeline (gas; Figure C-2)	None anticipated	Unknown	None anticipated
Future access roads (Figure C-2)	Multiple segments possible, generally associated with other proposed disturbance	Access roads would accommodate passenger vehicles/ light-duty trucks; If possible, new access roads would be planned for the minimum width needed and would follow natural contours where practicable to minimize cut and fill. Anticipated up to approximately 20' wide, including dual berms.	Unknown
Monitoring wells/ drill sites (Figure C-3)	0 to 10 ±	Each site may be anticipated to be up to roughly 200 feet by 200 feet.	Each site would be anticipated to be less than an acre of disturbance
Communications equipment and apparatus	None anticipated	Generally less than 15'x15' footprint.	Generally less than 0.01 acre per location

Description of Surface Disturbing Activity	Anticipated Number of Items	Anticipated Size of Items[1]	Anticipated Surface Disturbance[1]
Water management facilities	Multiple possible, generally associated with other proposed disturbance	May include erosion control measures/BMPs such as waddles, hay bales, vegetated swales, erosion control blankets, silt fences, *etc.*	Minimal
Wildlife monitoring stations	None anticipated	If needed, may consist of a camera strapped to a tree or similar.	Minimal
Signage, barriers, or berms	None anticipated		Minimal
Scientific monitoring equipment	0 to 2 ±	May include such equipment as a weather station; generally less than 15'x15' footprint.	Generally less than 0.01 acre per location
Geotechnical/slope stability monitoring equipment (Figure C-4)	0 to 5 ±	May include such equipment as total station monument or temporary robot shacks; generally less than 15'x15' footprint.	Generally less than 0.01 acre per location

[1] Lengths and areas delineated within Sections 16 and 17 of Township 14 North, Range 9 West of the GSRB&M. Distributed facilities may also be located within the proposed limit of Stockpile extension.



Dual Berm



Single Berm

Note: This figure represents a typical access road.
Actual configuration may vary.

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FIGURE C-1
TYPICAL ACCESS ROAD - NTS

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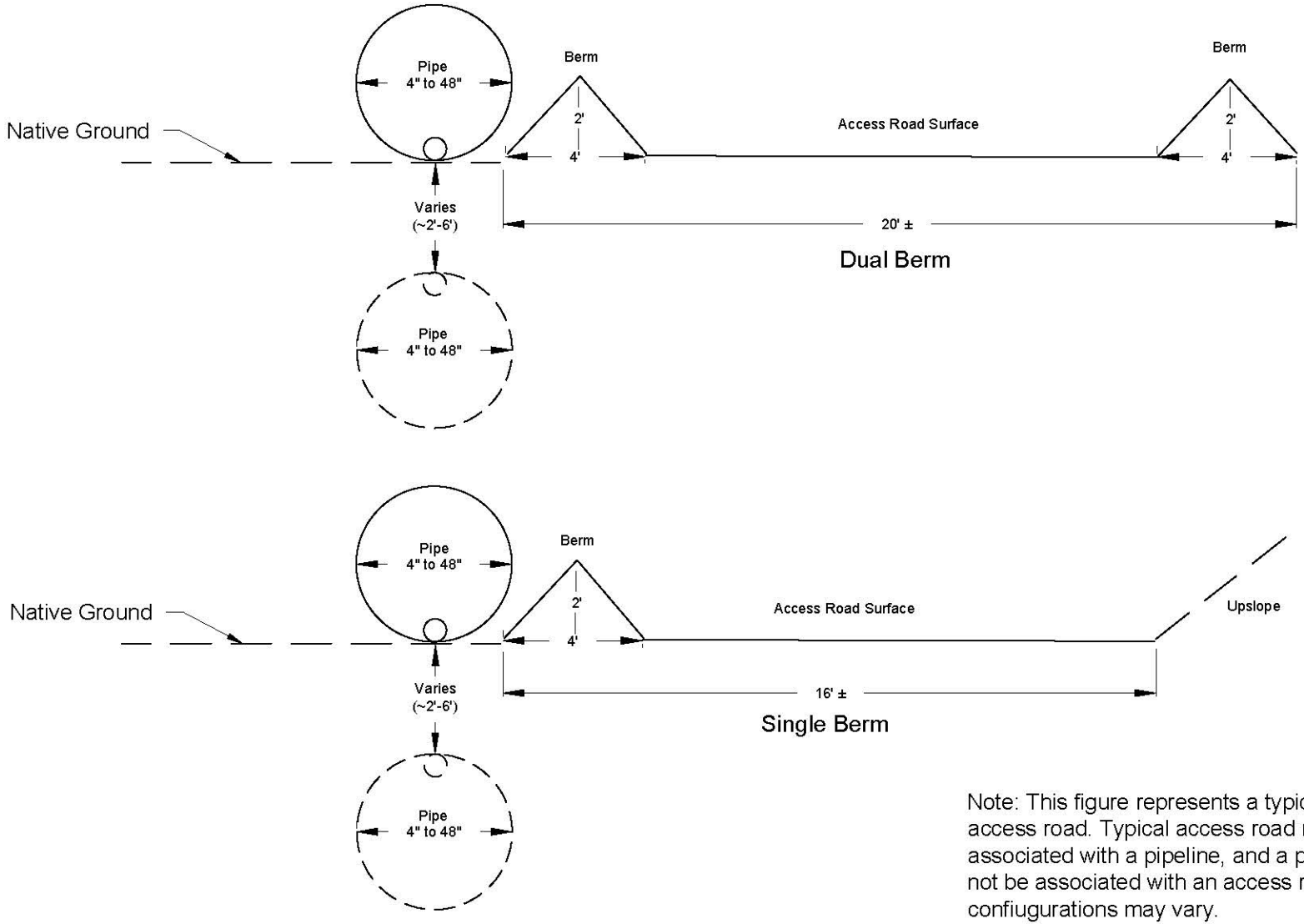


Note: This figure represents a typical pipeline with an access road. Typical access road may or may not be associated with a pipeline, and a pipeline may or may not be associated with an access road. Actual confiugurations may vary.

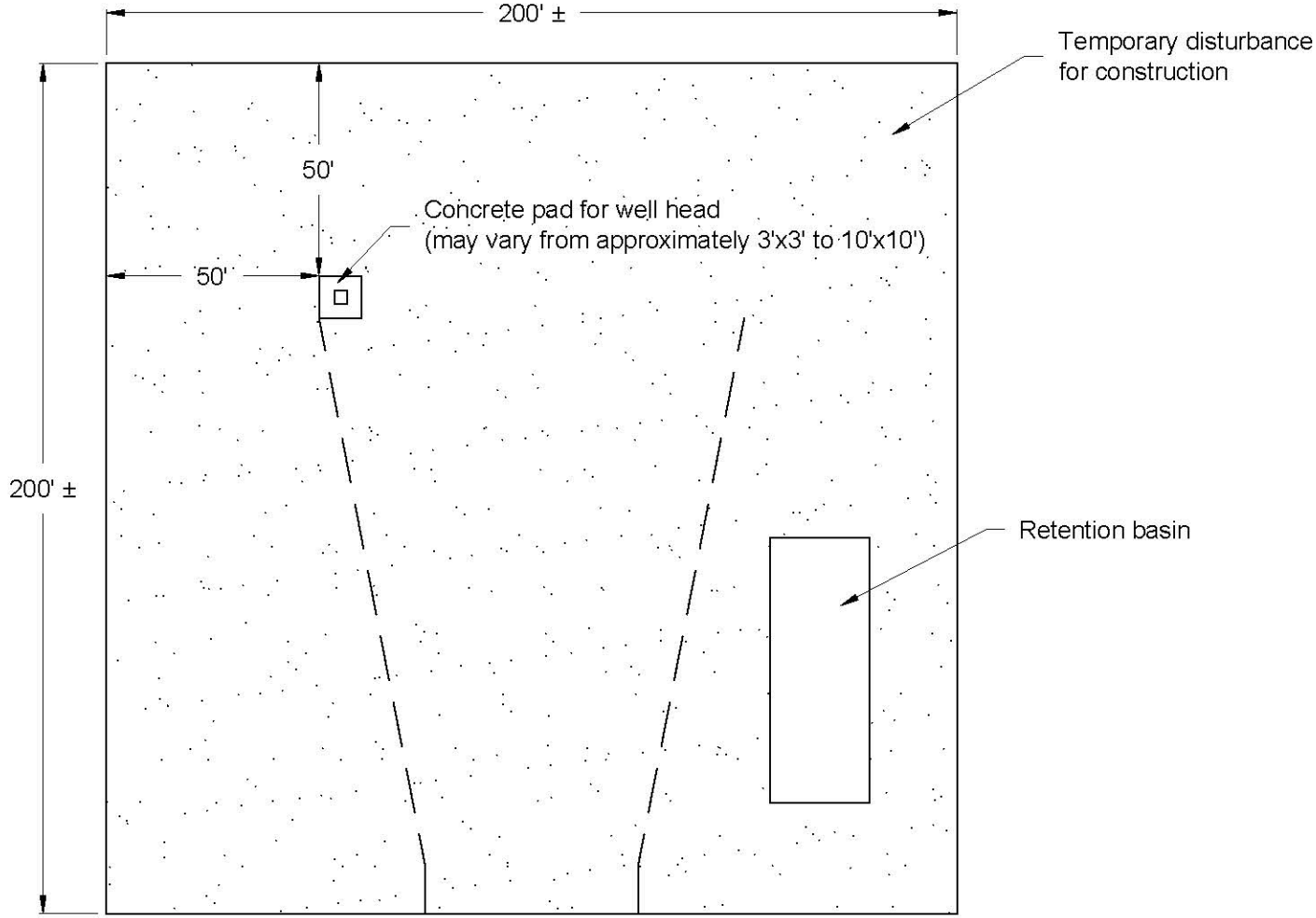
4/22/2014 W:\Bagdad_AZ\MPO_Mod\Calculations\AutoCad\typical_drawings.dwg

PROJECT: 210204 | TASK:

PREPARED BY: TELESTO SOLUTIONS INCORPORATED

FIGURE C-2
TYPICAL ACCESS ROAD AND PIPELINE - NTS

PREPARED FOR: FREEPORT-McMoRan COPPER & GOLD



Note: This figure represents a typical monitoring well site or drill site. Actual configuration may vary.

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PROJECT: 210204	TASK:
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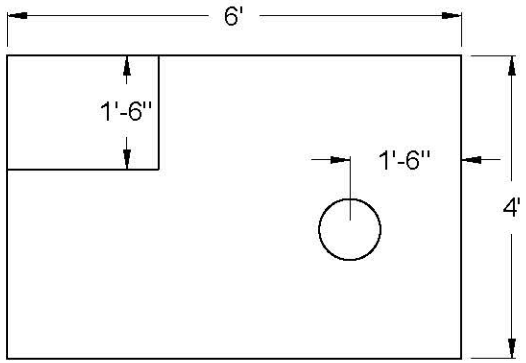
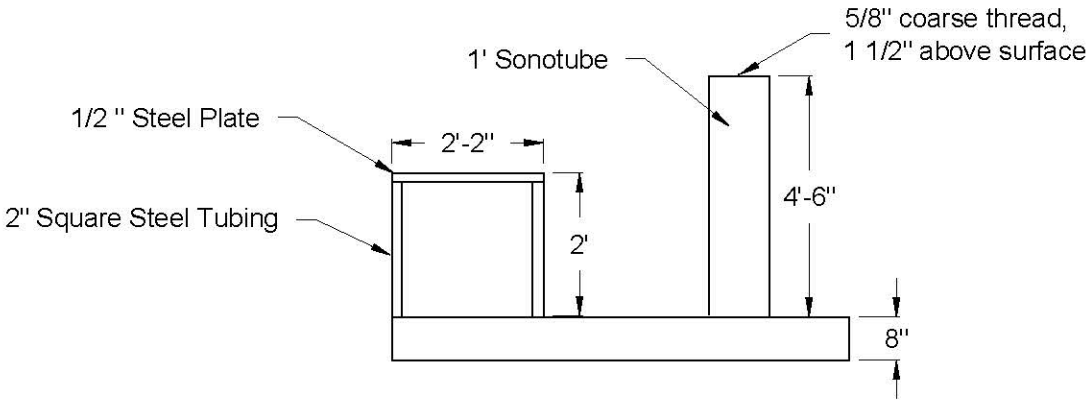
FIGURE C-3
TYPICAL DESIGN OF MONITORING WELLS/DRILL SITES
PLAN VIEW - NTS

PREPARED FOR: FREEPORT-McMoRan COPPER & GOLD





Note: This figure represents a typical pre-cast total station monument as one type of geotechnical/slope stability monitoring equipment. Actual configuration or equipment type may vary.

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PROJECT: 210204	TASK:
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE C-4
TYPICAL GEOTECHNICAL/SLOPE STABILITY MONITORING EQUIPMENT
PRE-CAST TOTAL STATION MONUMENT - NTS

PREPARED FOR: FREEPORT-McMoRan COPPER & GOLD

APPENDIX D ACID-GENERATING POTENTIAL ANALYSIS FROM 1995 CLOSURE PLAN

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3.2.2 Acid-Generating Potential Evaluation

The purpose of the evaluation of acid-generating potential of the waste rock was to ascertain whether rock samples representative of the material to be placed in the SWRDF exhibit characteristics that may generate ARD. The evaluation is summarized in Tables 3 and 4. Some of the rock to be placed in the SWRDF exhibit uncertain or possible acid- generating potential. Table 3 presents the most conservative evaluation based on total sulfur content. Table 4 presents the evaluation based on pyritic sulfur. Appendix C presents the existing database of acid-generating potential evaluations performed on numerous waste rock and pit area samples.

Acid Base Accounting (ABA) results were used to evaluate the ARD potential of representative waste rock samples based on empirical guidelines presented in the EPA's Technical Document on Acid Mine Drainage Prediction (EPA, 1994). ABA analyses use data on total and pyritic sulfur content, neutralization potential (NP) and acid potential (AP) of the rock sample. NP and AP are

then compared to determine whether a material is likely to generate acid. A summary of both the data and analyses performed is presented in Tables 3 and 4.

In addition to the ABA analysis, a limited number of humidity cell tests have been performed on some of the local waste rock types. These test results are presented in Appendix C. Humidity cell tests attempt to estimate the long-term chemical weathering of the waste rock in a seven day period. The humidity cell testing process involves crushing the rock to a diameter less than 2.38 millimeters. The sample is then placed in a container and inoculated with bacteria. Dry air is passed through the closed container for the first three days, followed by humidified air for the next three days. On the seventh day, the sample is rinsed with distilled water. The rinseate is then analyzed for pH, acidity, alkalinity, specific conductance, sulfate and dissolved metals. The rate of acid-generating potential is approximated from the results produced by these analyses. More than half of the CBCC samples tested exhibited characteristics of material likely to generate acid.

The humidity cell test is extremely aggressive and is, therefore, a very conservative means of evaluating ARD potential. The particle size used in testing is considerably smaller than that of the waste rock that will be deposited in the SWRDF. Therefore, the surface area to volume ratio of the sample is high. The resulting leachate quality data generated by the humidity cell test are enhanced due to increased surface area exposed to the water and air.

The steep slope configuration of the SWRDF which encourages runoff rather than infiltration, and capping of the top and benches where most infiltration would otherwise occur, will limit the potential for ARD-impacted water. Seepage that does occur will flow through the toe of the SWRDF on the north side of the facility due to the natural slope and lower permeability of the soils and rock below the SWRDF. Seepage will be collected in existing or new surface water diversion channels and directed to surface water retention ponds or the open pit. If retention ponds are used, water will either evaporate or infiltrate and flow toward the open pit where it will be contained permanently. Therefore, no ARD-impacted water potentially generated by the SWRDF will leave the mine site.

Table 3
Acid Generating Potential of Waste Rock (1)
Total Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

		Total Sulfur							
Sample No.	Rock Type	Total Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)	Status (7)	Status (8)
AO1QM	Quartz Monzonite	1.19	2.4	24	37.19	13	1	uncertain	potentially
AO2QM	Quartz Monzonite	0.37	3.5	35	11.56	23	3	non-generating	non-generating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	288	922	non-generating	non-generating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	157	502	non-generating	non-generating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	64	205	non-generating	non-generating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	53	170	non-generating	non-generating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	30	96	non-generating	non-generating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	67	214	non-generating	non-generating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	38	122	non-generating	non-generating
CBCC-D-4	Upper Mine Shop Dump	0.07	0.2	2	2.19	1	1	uncertain	potentially
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	53	170	non-generating	non-generating
CBCC-D-6	Upper Mine Shop Dump	0.19	4.8	48	5.94	48	8	non-generating	non-generating
AO1AP	Alaskite Porphyry	0.09	3	30	2.81	27	11	non-generating	non-generating
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	25	80	non-generating	non-generating
AO1GBR	Gabbro	0.33	2.6	26	10.31	16	3	uncertain	uncertain
AO2GBR	Gabbro	0.91	3.1	31	28.44	3	1	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	57	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	34	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	57	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.09	1.5	15	2.81	12	5	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.03	2.4	24	0.94	23	26	non-generating	non-generating
AO1YS	Yavapai Series	0.25	4.8	48	7.81	40	6	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	65	208	non-generating	non-generating
AO1SR	Sulfitic Rock	0.72	3.3	33	22.50	11	1	uncertain	uncertain
AO2SR	Sulfitic Rock	0.43	3	30	13.44	17	2	uncertain	uncertain
AO3SR	Sulfitic Rock	0.03	2.1	21	0.94	20	22	uncertain	non-generating
AOISB	Sanders Basalt	0.01	16.1	161	0.31	161	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	147	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	136	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	143	458	non-generating	non-generating

Table 3 (continued)
Acid Generating Potential of Waste Rock (1)
Total Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

		Total Sulfur							
Sample No.	Rock Type	Total Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)	Status (7)	Status (8)
AO1TF	Tuff	0.01	4	40	0.31	40	128	non-generating	non-generating
AO2TF	Tuff	0.01	5.8	58	0.31	58	186	non-generating	non-generating
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	26	83	non-generating	non-generating
AO2BTF	Baked tuff	0.01	38.8	388	0.31	388	1242	non-generating	non-generating
CBCC-RPB-10	Pit Area	0.35	5	50	10.94	39	5	Non-generating	Non-generating
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	26	83	Non-generating	Non-generating
CBCC-QM-5P	Pit Area	1.66	1.8	18	51.88	-34	0	potentially	potentially
CBCC-QM-90X	Pit Area	0.02	1.5	15	0.63	14	24	uncertain	Non-generating
CBCC-LPG-6S	Pit Area	0.65	2	20	20.31	0	1	uncertain	potentially
CBCC-BFT-7S	Pit Area	1.65	2.7	27	51.56	-25	1	potentially	potentially
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	11	35	uncertain	Non-generating
CBCC-QM-1S	Pit Area	0.66	1.9	19	20.63	-2	1	uncertain	potentially
CBCC-AP-30X	Pit Area	0.11	0.1	1	3.44	-2	0	uncertain	potentially
CBCC-AP-2S	Pit Area	2.16	1.2	12	67.50	-56	0	potentially	potentially
CBCC-QM-4S	Pit Area	1.09	2.8	28	34.06	-6	1	uncertain	potentially

Analytical results provided by ACZ Laboratories

Notes:
(1) Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.
(2) NP = Neutralization Potential in %.
(3) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.
(4) AP = Acid Potential in T/1000T. Calulcated using AP = 31.25 * % sulfur
(5) ABP = Acid Base Potential in T/1000T
(6) Ratio of NP to AP helps predict acid generating potential based on:
- Ratios greater 3:1 indicate a lower risk for acid drainage to develop
- Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
- Ratios of 1:1 or less are more likely to generate acid.

(7) Status based on :
- Values of ABP >20T/1000T are non-generating
- Values of ABP between -20 and 20 are uncertain
- Values of ABP <-20 are potentially acid generating

(8) Status based on:
- Values of NP >3AP are non-generating
- Values of NP between AP and 3AP are uncertain
- Values of NP < AP are potentially acid generating

Table 4
Acid Generating Potential of Waste Rock (1)
Pyritic Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

		Pyritic Sulfur							
Sample No.	Rock Type	Pyritic Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)	Status (7)	Status (8)
AO1QM	Quartz Monzonite	0.19	2.4	24	5.94	18.06	4	Nongenerating	Nongenerating
AO2QM	Quartz Monzonite	0.08	3.5	35	2.50	32.50	14	Nongenerating	Nongenerating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	287.69	922	Nongenerating	Nongenerating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	156.69	502	Nongenerating	Nongenerating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	63.69	205	Nongenerating	Nongenerating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	29.69	96	Nongenerating	Nongenerating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	66.69	214	Nongenerating	Nongenerating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	37.69	122	Nongenerating	Nongenerating
CBCC-D-4	Upper Mine Shop Dump	0.02	0.2	2	0.63	1.38	3	uncertain	uncertain
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-6	Upper Mine Shop Dump	0.01	4.8	48	0.31	47.69	154	Nongenerating	Nongenerating
AO1AP	Alaskite Porphyry	0.02	3	30	0.63	29.38	48	non-generating	non-generating
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	24.69	80	non-generating	non-generating
AO1GBR	Gabbro	0.06	2.6	26	1.88	24.13	14	non-generating	non-generating
AO2GBR	Gabbro	0.47	3.1	31	14.69	16.31	2	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	33.69	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.01	2.4	24	0.31	23.69	77	non-generating	non-generating
AO1YS	Yavapai Series	0.06	4.8	48	1.88	46.13	26	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	64.69	208	non-generating	non-generating
AO1SR	Sulfitic Rock	0.36	3.3	33	11.25	21.75	3	nongenerating	uncertain
AO2SR	Sulfitic Rock	0.13	3	30	4.06	25.94	7	non-generating	non-generating
AO3SR	Sulfitic Rock	0.01	2.1	21	0.31	20.69	67	non-generating	non-generating
AO1SB	Sanders Basalt	0.01	16.1	161	0.31	160.69	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	146.69	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	135.69	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	142.69	458	non-generating	non-generating

Table 4 (continued)
Acid Generating Potential of Waste Rock (1)
Pyritic Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

		Pyritic Sulfur							
Sample No.	Rock Type	Pyritic Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)	Status (7)	Status (8)
AO1TF	Tuff	0.01	4	40	0.31	39.69	128	non-generating	non-generating
AO2TF	Tuff	0.01	5.8	58	0.31	57.69	186	non-generating	non-generating
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating
AO2BTF	Baked tuff	0.01	38.8	388	0.31	387.69	1242	non-generating	non-generating
CBCC-RPB-10	Pit Area	0.32	5	50	10.00	40.00	5	non-generating	non-generating
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating
CBCC-QM-5P	Pit Area	0.36	1.8	18	11.25	6.75	2	uncertain	uncertain
CBCC-QM-90X	Pit Area	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
CBCC-LPG-6S	Pit Area	0.53	2	20	16.56	3.44	1	uncertain	uncertain
CBCC-BFT-7S	Pit Area	1.4	2.7	27	43.75	-16.75	1	uncertain	potentially
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	10.69	35	uncertain	non-generating
CBCC-QM-1S	Pit Area	0.11	1.9	19	3.44	15.56	6	uncertain	non-generating
CBCC-AP-30X	Pit Area	0.01	0.1	1	0.31	0.69	3	uncertain	non-generating
CBCC-AP-2S	Pit Area	0.97	1.2	12	30.31	-18.31	0	uncertain	potentially
CBCC-QM-4S	Pit Area	0.35	2.8	28	10.94	17.06	3	uncertain	uncertain

Analytical results provided by ACZ Laboratories

Notes:
(1) Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.
(2) NP = Neutralization Potential in %.
(3) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.
(4) AP = Acid Potential in T/1000T. Calulcated using AP = 31.25 * % sulfur
(5) ABP = Acid Base Potential in T/1000T
(6) Ratio of NP to AP helps predict acid generating potential based on:
- Ratios greater 3:1 indicate a lower risk for acid drainage to develop
- Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
- Ratios of 1:1 or less are more likely to generate acid.

(7) Status based on :
- Values of ABP >20T/1000T are non-generating
- Values of ABP between -20 and 20 are uncertain
- Values of ABP <-20 are potentially acid generating

(8) Status based on:
- Values of NP >3AP are non-generating
- Values of NP between AP and 3AP are uncertain
- Values of NP < AP are potentially acid generating

APPENDIX C

Acid Rock Drainage Evaluation

TITAN Environmental

By: KRB Date: 10/26/94 Subject: Acid Rock Drainage Prediction Sheet No: ___of_

Chkd: KAF Date: 11/29/94 Cyprus Bagdad Copper Corporation Proj No: 4112-001

Purpose:

Determine the Acid Rock Drainage (ARD) Potential of the waste rock material within the proposed South Waste Rock Disposal (SWRD) Facility . Determination of the ARD potential is important in determining the configuration and cover requirements of the SWRD Facility that will be generated by the proposed expansion of the existing open pit at the Cyprus Bagdad Copper Mine.

Methods:

Methods used in determining the ARD Potential are consistent with those found in the U.S. EPA's Technical Document: Acid Mine Drainage Prediction, August 1994. A qualitative prediction of the ARD potential was determined by comparing the Acid Base Potential (ABA) and the Acid Producing Potential (AP) to two empirical guidelines developed by SME in 1991 and by comparing the ratio of the Neutralization Potential (NP) to the AP using another set of empirical guidelines. The empirical guidelines state that:

(1) Values of ABA > 20 T/1000T are non-generating
Values of ABA between -20 and 20 are uncertain
Values of ABA < -20 are potentially generating

(2) Values of NP > 3AP are non-generating
Values of NP between AP and 3AP are uncertain
Values of NP < AP are potentially acid generating

Evaluating the ratio of NP to AP is compared to the guidelines that:

Ratios < 3:1 indicate a lower risk for acid drainage to develop
Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty
Ratios 1:1 or less are more likely to generate acid.

Two approaches were evaluated during determination; the first considered the total sulfur in calculating the AP of the materials; and the second approach only considered the pyritic sulfur. Some concern exists that evaluating the potential using total sulfur may overestimate the acid producing potential by including sulfur that does not produce ARD.

Results:

The acid generating potential of several soil samples from various known and unknown locations were considered for this evaluation. The known sample locations centered around the existing pit and proposed stockpile locations. Other soil samples were evaluated as potential waste rock sources that could be encountered in the pit expansion. Samples of particular interest in addition to the pit area samples include Quartz Monzonite, Alaskite Porphyry, Tuff and Gila Conglomerate all of which are predominate in the waste rock.

A majority of the potential waste rock source samples including the Gila Conglomerate yielded no acid generating potential from the total sulfur and pyritic evaluations. The non acid generating potential of these samples was further confirmed by a NP to AP ratio significantly greater than 3:1.

- However, some uncertainty as to the acid generating potential was determined from the Quartz Monzonite, Alaskite Porphyry and pit area samples. Potentials for these samples ranged from non-generating to potentially generating for both the total sulfur and pyritic sulfur evaluations. Comparing ratios of NP to AP confirmed six samples as more likely to generated acid using total sulfur. That number was reduced to three using pyritic sulfur. On the other hand, 4 samples were determined to be non-generating using total sulfur. The number of non-generating samples increased by one using pyritic sulfur. The remainder remained in a zone of uncertainty.

  Supplemental information has been gathered to assist in determining the acid generating potential of the waste rock. In addition to the above mentioned static testing, kinetic testing such as humidity cell testing has been performed. Six of the pit area samples analyzed using the humidity cell exhibited potential to generate acid. It should however be noted that the humidity cell test is very aggressive as compared to natural conditions.

- This information coupled with supplemental documentation noting that a majority of the waste rock will be mineralized waste consisting of 2% to 3% pyritic sulfur (Plan of Operations for Tailings Facility Expansion and South Waste Rock Disposal Facility, CBCC and AGRA, Inc.) which is greater than any of the analyzed waste rock samples that exhibited ARD potential, the SWRD Facility exhibits characteristics of material likely to generate acid.

Acid Generating Potential of South Waste Rock Disposal Facility Constituents
Cyprus Bagdad Copper Mine
Bagdad, Arizona

		Total Sulfur								Pyritic Sulfur							
Sample No.	Rock Type	Total Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (3) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status(6)	Status(7)	Pyritic Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (8) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status (6)	Status (7)
AO1QM	Quartz Manzonite	1.19	2.4	24	37.19	13	1	uncertain	potentially	0.19	2.4	24	5.94	18.06	4	Nongenerating	Nongenerating
AO2QM	Quartz Monzonite	0.37	3.5	35	11.56	23	3	non-generating	non-generating	0.08	3.5	35	2.50	32.50	14	Nongenerating	Nongenerating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	288	922	non-generating	non-generating	0.01	28.8	288	0.31	287.69	922	Nongenerating	Nongenerating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	157	502	non-generating	non-generating	0.01	15.7	157	0.31	156.69	502	Nongenerating	Nongenerating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	64	205	non-generating	non-generating	0.01	6.4	64	0.31	63.69	205	Nongenerating	Nongenerating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	53	170	non-generating	non-generating	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	30	96	non-generating	non-generating	0.01	3	30	0.31	29.69	96	Nongenerating	Nongenerating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	67	214	non-generating	non-generating	0.01	6.7	67	0.31	66.69	214	Nongenerating	Nongenerating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	38	122	non-generating	non-generating	0.01	3.8	38	0.31	37.69	122	Nongenerating	Nongenerating
CBCC-D-4	Upper Mine Shop Dump	0.07	0.2	2	2.19	1	1	uncertain	potentially	0.02	0.2	2	0.63	1.38	3	uncertain	uncertain
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	53	170	non-generating	non-generating	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-6	Upper Mine Shop Dump	0.19	4.8	48	5.94	48	8	non-generating	non-generating	0.01	4.8	48	0.31	47.69	154	Nongenerating	Nongenerating
AO1AP	Alaskite Porphyry	0.09	3	30	2.81	27	11	non-generating	non-generating	0.02	3	30	0.63	29.38	48	non-generating	non-gener.
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	25	80	non-generating	non-generating	0.01	2.5	25	0.31	24.69	80	non-generating	non-generating
AO1GBR	Gabbro	0.33	2.6	26	10.31	16	3	uncertain	uncertain	0.06	2.6	26	1.88	24.13	14	non-generating	non-generating
AO2GBR	Gabbro	0.91	3.1	31	28.44	3	1	uncertain	uncertain	0.47	3.1	31	14.69	16.31	2	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	57	182	non-generating	non-generating	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	34	109	non-generating	non-generating	0.01	3.4	34	0.31	33.69	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	57	182	non-generating	non-generating	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.09	1.5	15	2.81	12	5	uncertain	non-generating	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.03	2.4	24	0.94	23	26	non-generating	non-generating	0.01	2.4	24	0.31	23.69	77	non-generating	non-generating
AO1YS	Yavapai Series	0.25	4.8	48	7.81	40	6	non-generating	non-generating	0.06	4.8	48	1.88	46.13	26	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	65	208	non-generating	non-generating	0.01	6.5	65	0.31	64.69	208	non-generating	non-generating
AO1SR	Sulfitic Rock	0.72	3.3	33	22.50	11	1	uncertain	uncertain	0.36	3.3	33	11.25	21.75	3	nongenerating	uncertain
AO2SR	Sulfitic Rock	0.43	3	30	13.44	17	2	uncertain	uncertain	0.13	3	30	4.06	25.94	7	non-generating	non-generating
AO3SR	Sulfitic Rock	0.03	2.1	21	0.94	20	22	uncertain	non-generating	0.01	2.1	21	0.31	20.69	67	non-generating	non-generating
AO1SB	Sanders Basalt	0.01	16.1	161	0.31	161	515	non-generating	non-generating	0.01	16.1	161	0.31	160.69	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	147	470	non-generating	non-generating	0.01	14.7	147	0.31	146.69	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	136	435	non-generating	non-generating	0.01	13.6	136	0.31	135.69	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	143	458	non-generating	non-generating	0.01	14.3	143	0.31	142.69	458	non-generating	non-generating
AO1TF	Tuff	0.01	4	40	0.31	40	128	non-generating	non-generating	0.01	4	40	0.31	39.69	128	non-generating	non-generating
AO2TF	Tuff	0.01	5.8	58	0.31	58	186	non-generating	non-generating	0.01	5.8	58	0.31	57.69	186	non-generating	non-generating
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	26	83	non-generating	non-generating	0.01	2.6	26	0.31	25.69	83	non-generating	non-gener.
02BTF	Baked tuff	0.01	38.8	388	0.31	388	1242	non-generating	non-generating	0.01	38.8	388	0.31	387.69	1242	non-generating	non-generating
CBCC-RPB-10	Pit Area	0.35	5	50	10.94	39	5	Non-generating	Non-generating	0.32	5	50	10.00	40.00	5	non-generating	non-generating
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	26	83	Non-generating	Non-generating	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating
CBCC-QM-5P	Pit Area	1.66	1.8	18	51.88	-34	0	potentially	potentially	0.36	1.8	18	11.25	6.75	2	uncertain	uncertain
CBCC-QM-90X	Pit Area	0.02	1.5	15	0.63	14	24	uncertain	Non-generating	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
CBCC-LPG-6S	Pit Area	0.65	2	20	20.31	0	1	uncertain	potentially	0.53	2	20	16.56	3.44	1	uncertain	uncertain
CBCC-BFT-7S	Pit Area	1.65	2.7	27	51.56	-25	1	potentially	potentially	1.4	2.7	27	43.75	-16.75	1	uncertain	potentially
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	11	35	uncertain	Non-generating	0.01	1.1	11	0.31	10.69	35	uncertain	non-generating
CBCC-QM-1S	Pit Area	0.66	1.9	19	20.63	-2	1	uncertain	potentially	0.11	1.9	19	3.44	15.56	6	uncertain	non-generating
CBCC-AP-30X	Pit Area	0.11	0.1	1	3.44	-2	0	uncertain	potentially	0.01	0.1	1	0.31	0.69	3	uncertain	non-generating
CBCC-AP-2S	Pit Area	2.16	1.2	12	67.50	-56	0	potentially	potentially	0.97	1.2	12	30.31	-18.31	0	uncertain	potentially
CBCC-QM-4S	Pit Area	1.09	2.8	28	34.06	-6	1	uncertain	potentially	0.35	2.8	28	10.94	17.06	3	uncertain	uncertain

√R+ 12/5/94

Acid Generating Potential of South Waste Rock Disposal Facility Constituents
Cyprus Bagdad Copper Mine
Bagdad, Arizona

		Total Sulfur							Pyritic Sulfur							
Sample No.	Rock Type	Total Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (3) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status(6)	Status(7)	Pyritic Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (8) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status (6)	Status (7)

Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.

Notes:

(1) NP = Neutralization Potential in % or T/100 T

(2) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.

(3) AP = Acid Potential in T/1000T. Calulcated using AP = 31.25 * % sulfur

(4) ABP = Acid Base Potential in T/1000T

(5) Ratio of NP to AP helps predict acid generating potential based on:
- Ratios greater 3:1 indicate a lower risk for acid drainage to develop
- Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
- Ratios of 1:1 or less are more likely to generate acid.

(6) Status based on :
- Values of ABP >20T/1000T are non-generating
- Values of ABP between -20 and 20 are uncertain
- Values of ABP <-20 are potentially acid generating

Status based on:
- Values of NP >3AP are non-generating
- Values of NP between AP and 3AP are uncertain
- Values of NP < AP are potentially acid generating

(8) AP calculated using AP = % pyritic sulfur * 31.25

BB 12/5/94

Analytical Support Data

GEOCHEMICAL TESTING OF ROCK SAMPLES

Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES[1]			
					Standard Suite	Acid-Base Accounting	Humidity[2] Cell	SMLP
AO1QM	Quartz Monzonite	AO4HB 03, 04	27-36	1600	X	X		
AO2QM	Quartz Monzonite	AO5HB 04, 05, 07	45-71	1600	X	X		
AO1AP	Alaskite Porphyry	AO6HB 03, 04	26-39	1600	X	X		
AO2AP	Alaskite Porphyry	AO9HB 06, 13, 14	50-121	1600	X	X		
AO1GBR	Gabbro	AO3HB 02, 03, 04	12-35	1600	X	X		X
AO2GBR	Gabbro	AO3HB 05, 06, 07	38-57	1600	X	X		X
AO3GBR	Gabbro	A11HB 31, 33, 34, 36, 37	281-344	—	X	X		
AO1GD	Granodiorite	A10HB 01, 02, 03, 04, 05, 06	281-344	1600	X	X		X
AO2GD	Granodiorite	A14HB 01, 02, 04, 05, 06, 07, 08	23-100	1600	X	X		X
AO1KPR	King Peak Rhyolite	AO2HB 01, 02, 03, 04, 05	3-36	1600	X	X		
AO2KPR	King Peak Rhyolite	AO2HB 06, 07	47-56	1600	X	X		
AO1YS	Yavapai Series	AO7HB 04, 05, 06, 07, 08, 09	28-85	1600	X	X		
AO2YS	Yavapai Series	AO8HB 04, 05, 06, 07, 08	33-73	1600	X	X		
AO1SR	Sulfitic Rock	AO3HB 08, 09, 10	65-95	1600		X		X
AO2SR	Sulfitic Rock	AO4HB 09, 11, 12	76-114	1600		X		X
AO3SR	Sulfitic Rock	AO7HB 03	22-25	1600		X		X
AO1SB	Sanders Basalt	AO1HB 01, 02	7-25	1600	X	X		
AO2SB	Sanders Basalt	AO1GB 03, 04, 05, 06, 07	4-24	1600	X	X		X
AO1WB	Wilder Basalt	A11HB 20, 21, 24, 25, 26, 27	178-249	1600	X	X		X
AO2WB	Wilder Basalt	AO1HB 09, 11, 12, 13, 14	163-234	1600	X	X		
AO1TF	Tuff	AO3BS	---	1600	X	X		
AO2TF	Tuff	AO9BS	---	1600	X	X		X
AO1BTF	Baked Tuff	AO2BS	---	1600	X	X		
AO2BTF	Baked Tuff	AO5BS	---	1600	X	X		

GEOCHEMICAL TESTING OF ROCK SAMPLES

Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES[1]			
					Standard Suite	Acid-Base Accounting	Humidity[2] Cell	SMLP
AO1QM	Quartz Monzonite	AO4HB 03, 04	27-36	1600	X	X		
AO2QM	Quartz Monzonite	AO5HB 04, 05, 07	45-71	1600	X	X		
AO1AP	Alaskite Porphyry	AO6HB 03, 04	26-39	1600	X	X		
AO2AP	Alaskite Porphyry	AO9HB 06, 13, 14	50-121	1600	X	X		
AO1GBR	Gabbro	AO3HB 02, 03, 04	12-35	1600	X	X		X
AO2GBR	Gabbro	AO3HB 05, 06, 07	38-57	1600	X	X		X
AO3GBR	Gabbro	A11HB 31, 33, 34, 36, 37	281-344	---	X	X		
AO1GD	Granodiorite	A10HB 01, 02, 03, 04, 05, 06	281-344	1600	X	X		X
AO2GD	Granodiorite	A14HB 01, 02, 04, 05, 06, 07, 08	23-100	1600	X	X		X
AO1KPR	King Peak Rhyolite	AO2HB 01, 02, 03, 04, 05	3-36	1600	X	X		
AO2KPR	King Peak Rhyolite	AO2HB 06, 07	47-56	1600	X	X		
AO1YS	Yavapai Series	AO7HB 04, 05, 06, 07, 08, 09	28-85	1600	X	X		
AO2YS	Yavapai Series	AO8HB 04, 05, 06, 07, 08	33-73	1600	X	X		
AO1SR	Sulfitic Rock	AO3HB 08, 09, 10	65-95	1600		X		X
AO2SR	Sulfitic Rock	AO4HB 09, 11, 12	76-114	1600		X		X
AO3SR	Sulfitic Rock	AO7HB 03	22-25	1600		X		X
AO1SB	Sanders Basalt	AO1HB 01, 02	7-25	1600	X	X		
AO2SB	Sanders Basalt	AO1GB 03, 04, 05, 06, 07	4-24	1600	X	X		X
AO1WB	Wilder Basalt	A11HB 20, 21, 24, 25, 26, 27	178-249	1600	X	X		X
AO2WB	Wilder Basalt	AO1HB 09, 11, 12, 13, 14	163-234	1600	X	X		
AO1TF	Tuff	AO3BS	---	1600	X	X		
AO2TF	Tuff	AO9BS	---	1600	X	X		X
AO1BTF	Baked Tuff	AO2BS	---	1600	X	X		
AO2BTF	Baked Tuff	AO5BS	---	1600	X	X		

V.06 12/5/94

AGRA
Earth & Environmental Group

GEOCHEMICAL TESTING OF ROCK SAMPLES

Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES[1]			
					Standard Suite	Acid-Base Accounting	Humidity[2] Cell	SMLP
AO1GC	Gila Conglomerate	AO6BS	---	1600	X	X		X
AO2GC	Gila Conglomerate	AO7BS & AO8BS	---	1600	X	X		X
AO3GC	Gila Conglomerate	A11HB 14	123-125	1880	X	X		X
AO4GC	Gila Conglomerate	A15HB 03	30-32	1700	X	X		X

Notes: 1. Requested Analysis

- Standard Suite
  - Cation exchange capacity
  - Paste extractable calcium, magnesium and sodium
- Acid-Base Accounting
  - Maximum potential acidity
  - Neutralization potentail
  - Organic sulfur
  - Pyritic sulfur
  - Total sulfur
  - Sulfur as sulfate
  - Paste pH
  - Paste Specific conductance
- Humidity Cell
  - ICP scans of selected metals
  - pH
  - EC
  - Alkalinity
  - Acidity
  - Sulfate
- Soluble Metal Leaching Procedure (EPA Method 1312)
  - Extracted leachate will be tested for dissolved fraction concentration of arsenic, cadmium, copper, chromium, lead, mercury, selenium, and silver.

2. Humidity cell testing will be based on the results of the acid-base accounting tests.

V/15
2/5/97

Acid Base Potential
AGRA Rock Samples
E93-293

COMPOUND	Location ID / Sample ID / Date	A01GB / A02SB / 08/21/94	A01HB / A01SB / 08/21/94	A01HB / A02WB / 08/21/94	A02BS / A01BTF / 08/21/94	A02HB / A01KPR / 08/21/94	A02HB / A02KPR / 08/21/94
Acid Base Potential (T/100T)..		147.0	161.0	143.0	26.0	12.0	23.0
Cation Exch. Cap. (meq/100g)..		5.4	6.5	15.6	17.7	1.8	1.8
Neutralization Potential.....		14.7	16.1	14.3	2.6	1.5	2.4
Sulfur, organic.....		0.01	<0.01	<0.01	<0.01	0.09	0.03
Sulfur, pyritic.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, total.....		0.01	<0.01	<0.01	<0.01	0.09	0.03
Calcium, soluble (meq/l).....		0.50	2.10	1.20	1.50	0.85	0.25
Magnesium, soluble (meq/l)....		0.41	0.99	1.15	0.49	0.33	0.08
Sodium, soluble (meq/l).....		3.44	1.39	1.87	0.39	1.74	2.18
pH (units).....		9.0	8.4	8.1	8.0	7.4	6.8
Conductivity (mmhos/cm).....		0.44	0.48	0.45	0.31	0.43	0.46
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
Concentrations in % unless otherwise indicated

Acid Base Potential
AGRA Rock Samples
E93-293

COMPOUND	Location ID / Sample ID / Date	A03BS A01TF 08/21/94	A03HB A01GBR 08/21/94	A03HB A01SR 08/21/94	A03HB A02GBR 08/21/94	A04HB A01QM 08/21/94	A04HB A02SR 08/21/94
Acid Base Potential (T/100T)		40.0	16.0	11.0	3.0	<13.0	17.0
Cation Exch. Cap. (meq/100g)		14.0	5.7	—	3.8	5.4	—
Neutralization Potential		4.0	2.6	3.3	3.1	2.4	3.0
Sulfur, organic		0.01	0.22	0.32	0.41	0.88	0.24
Sulfur, pyritic		<0.01	0.06	0.36	0.47	0.19	0.13
Sulfur, sulfate		<0.01	0.05	0.04	0.03	0.12	0.05
Sulfur, total		0.01	0.33	0.72	0.91	1.19	0.43
Calcium, soluble (meq/l)		6.69	11.30	—	7.83	4.64	—
Magnesium, soluble (meq/l)		1.15	3.78	—	2.47	1.07	—
Sodium, soluble (meq/l)		3.87	3.18	—	3.13	2.18	—
pH (units)		8.4	6.9	8.2	7.5	8.1	8.5
Conductivity (mmhos/cm)		1.11	1.48	0.72	1.22	0.75	0.58
Laboratory		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type		Original	Original	Original	Original	Original	Original

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Concentrations in % unless otherwise indicated

Acid Base Potential
AGRA Rock Samples
E93-293

COMPOUND	Location ID / Sample ID / Date	A05BS A02BTF 08/21/94	A05HB A02QM 08/21/94	A06BS A01GC 08/21/94	A06HB A01AP 08/21/94	A07BS A02GC 08/21/94	A07HB A01YS 08/21/94
Acid Base Potential (T/100T)..		388.0	23.0	288.0	27.0	157.0	40.0
Cation Exch. Cap. (meq/100g)..		22.4	7.7	17.1	4.1	13.9	5.3
Neutralization Potential.....		38.8	3.5	28.8	3.0	15.7	4.8
Sulfur, organic.....		0.01	0.28	<0.01	0.07	0.01	0.18
Sulfur, pyritic.....		<0.01	0.08	<0.01	0.02	<0.01	0.06
Sulfur, sulfate.....		<0.01	0.01	<0.01	<0.01	<0.01	0.01
Sulfur, total.....		0.01	0.37	<0.01	0.09	0.01	0.25
Calcium, soluble (meq/l).....		2.64	6.29	0.85	1.75	7.24	2.10
Magnesium, soluble (meq/l)....		1.07	3.29	0.56	0.74	1.97	1.97
Sodium, soluble (meq/l).....		1.31	5.48	6.22	2.57	24.40	2.48
pH (units).....		8.0	8.0	8.6	8.9	9.6	7.8
Conductivity (mmhos/cm).....		0.62	1.28	0.84	1.59	3.21	0.68
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

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Concentrations in % unless otherwise indicated

Acid Base Potential
AGRA Rock Samples
E93-293

Location ID / Sample ID / COMPOUND / Date	A07HB / A03SR / 08/21/94	A08HB / A02YS / 08/21/94	A09BS / A02TF / 08/21/94	A09HB / A02AP / 08/21/94	A10HB / A01GD / 08/21/94	A11HB / A01WB / 08/21/94
Acid Base Potential (T/100T)..	20.0	65.0	58.0	25.0	34.0	136.0
Cation Exch. Cap. (meq/100g)..	—	4.4	44.0	6.6	3.0	14.8
Neutralization Potential.....	2.1	6.5	5.8	2.5	3.4	13.6
Sulfur, organic.....	0.03	0.01	<0.01	0.01	<0.01	0.01
Sulfur, pyritic.....	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, total.....	0.03	0.01	<0.01	0.01	<0.01	0.01
Calcium, soluble (meq/l).....	—	0.50	0.40	1.30	0.60	0.55
Magnesium, soluble (meq/l)....	—	0.33	0.41	0.74	0.25	0.66
Sodium, soluble (meq/l).....	—	1.39	4.79	2.04	1.83	1.96
pH (units).....	6.9	8.4	8.6	8.1	8.8	8.7
Conductivity (mmhos/cm).....	0.36	0.29	0.58	1.49	0.30	0.33
Laboratory.....	ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....	Original	Original	Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
Concentrations in % unless otherwise indicated

Acid Base Potential
AGRA Rock Samples
E93-293

COMPOUND	Location ID / Sample ID / Date				
	Location ID	A11HB	A11HB	A14HB	A15HB
	Sample ID	A03GBR	A03GC	A02GD	A04GC
	Date	08/21/94	08/21/94	08/21/94	08/21/94
Acid Base Potential (T/100T)..		57.0	64.0	57.0	53.0
Cation Exch. Cap. (meq/100g)..		3.7	17.1	9.1	23.6
Neutralization Potential.....		5.7	6.4	5.7	5.3
Sulfur, organic.....		<0.01	<0.01	<0.01	0.01
Sulfur, pyritic.....		<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....		<0.01	<0.01	<0.01	<0.01
Sulfur, total.....		<0.01	<0.01	<0.01	0.01
Calcium, soluble (meq/l).....		0.35	1.25	0.65	4.19
Magnesium, soluble (meq/l)....		0.49	1.56	0.49	5.10
Sodium, soluble (meq/l).....		1.35	2.09	1.96	21.10
pH (units).....		9.0	8.2	8.7	8.0
Conductivity (mmhos/cm).....		0.30	0.54	0.39	3.02
Laboratory.....		ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
Concentrations in % unless otherwise indicated

ACZ LABORATORIES, INC.

Acid Base Potential (ABP)

(NP*10)−(ST*31.25)=ABP

ANALYST: TJV

DATE: 1/29/93

PROJECT: CONVERSE

SDG NO: N/A

SAMPLE ID	LAB NO.	Neutralization Potential	Sulfur Total	= ABP CaCO3/1000 Tons
CBCC - LT - 1	58	2.7	0.22	20
CBCC - LT - 5	59	1.5	0.14	11
CBCC - MM - 1	60	3.5	0.20	29
CBCC - MM - 2	61	2.3	0.25	15
CBCC - MM - 3	62	3.0	0.27	22
CBCC - MM - 4	63	3.3	0.30	24
CBCC - KT - A	64	2.4	0.35	13
CBCC - KT - 7	65	3.4	0.25	26
CBCC - KT - 8	66	2.5	0.08	23
CBCC - KT - 71	67	2.0	0.07	18
CBCC - KT - 72	68	2.1	0.06	19
CBCC - KT - 81	69	2.8	0.18	22
CBCC - MH - 1	70	1.7	0.18	11
CBCC - MH - 2	71	0.6	0.20	−0
CBCC - MH - 3	72	2.4	0.10	21
CBCC - MH - 4	73	2.3	0.37	11
CBCC - PQM - 45	74	2.8	1.09	−6
CBCC - PQM - 80X	75	1.1	<0.01	11
CBCC - AP - 30X	76	0.1	0.11	−2
CBCC - QM - 15	77	1.9	0.66	−2
CBCC - QM - 5P	78	1.8	1.66	−34
CBCC - QM - 90X	79	1.5	0.02	14
CBCC - LP - 110X	80	2.6	<0.01	26
CBCC - LPG - 65	81	2.0	0.65	−0
CBCC - RPB - 10	82	5.0	0.35	39
CBCC - AP - 25	83	1.2	2.16	−56
CBCC - BFT - 75	84	2.7	1.65	−25
CBCC - UT - 2	85	4.0	0.36	29
CBCC - UT - 6	86	2.3	0.32	13

ACZ LABORATORIES, INC.

Acid Base Potential (ABP)

Calculated from Pyritic Sulfur)

ANALYST: TJV

DATE: 1/29/93

PROJECT: CONVERSE

SDG NO: N/A

SAMPLE ID	LAB NO.	Neutralization Potential	Pyritic Sulfur	= ABP CaCO3/1000 Tons
CBCC-LT-1	58	2.7	0.08	25
CBCC-LT-5	59	1.5	<0.01	15
CBCC-MM-1	60	3.5	<0.01	35
CBCC-MM-2	61	2.3	0.04	22
CBCC-MM-3	62	3.0	0.19	24
CBCC-MM-4	63	3.3	0.19	27
CBCC-KT-A	64	2.4	0.09	21
CBCC-KT-7	65	3.4	0.06	32
CBCC-KT-8	66	2.5	0.02	24
CBCC-KT-71	67	2.0	<0.01	20
CBCC-KT-72	68	2.1	<0.01	21
CBCC-KT-81	69	2.8	0.04	27
CBCC-MH-1	70	1.7	0.04	16
CBCC-MH-2	71	0.6	<0.01	6
CBCC-MH-3	72	2.4	0.05	22
CBCC-MH-4	73	2.3	0.02	22
CBCC-PQM-4S	74	2.8	0.35	17
CBCC-PQM-80X	75	1.1	<0.01	11
CBCC-AP-30X	76	0.1	<0.01	1
CBCC-QM-1S	77	1.9	0.11	16
CBCC-QM-5P	78	1.8	0.36	7
CBCC-QM-90X	79	1.5	<0.01	15
CBCC-LP-110X	80	2.6	<0.01	26
CBCC-LPG-6S	81	2.0	0.53	3
CBCC-RPB-10	82	5.0	0.32	40
CBCC-AP-2S	83	1.2	0.97	-18
CBCC-BFT-7S	84	2.7	1.40	-17
CBCC-UT-2	85	4.0	0.19	34
CBCC-UT-6	86	2.3	0.24	15

Humidity Cell Data

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00082: CBCC-RPB-10: CELL#26
Test Dates:02/02/93-

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	150	258	250	200	208	202	184	167
Leachate Vol., Cumulative	ml	150	408	658	858	1066	1268	1452	1619
pH	units	8.6	8.5	8.8	8.9	8.8	8.9	9.0	9.1
Conductivity	umhos/cm	140	120	80	50	70	60	60	60
Acidity	mg/L CaCO3	0	0	0	0	0	0	0	0
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg CaCO3	15	20	25	20	25	25	20	20
Alkalinity, Cumulative	mg CaCO3	2.3	7.4	13.7	17.7	22.9	27.9	31.6	34.9
Iron	mg/L	0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.003	0.003	0.018	0.018	0.018	0.018	0.018	0.018
Sulfate	mg/L	45	37	19	12	16	14	19	17
Sulfate, Cumulative	mg	6.8	16.3	21.0	23.4	26.8	29.6	33.1	35.9

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	202	201	205	208				
Leachate Vol., Cumulative	ml	1821	2022	2227	2435	2435	2435	2435	2435
pH	units	9.0	9.0	8.9	8.8				
Conductivity	umhos/cm	60	50	50	40				
Acidity	mg/L CaCO3	0	0	0	0				
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	25	25	20	20				
Alkalinity, Cumulative	mg CaCO3	40.0	45.0	49.1	53.3	53.3	53.3	53.3	53.3
Iron	mg/L	<0.02	<0.02	<0.02	<0.02				
Iron, Cumulative	mg	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Sulfate	mg/L	11	13	13	10				
Sulfate, Cumulative	mg	38.2	40.8	43.4	45.5	45.5	45.5	45.5	45.5

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00078: CBCC-QM-5P: CELL#22
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	184	232	228	221	220	222	209	184
Leachate Vol., Cumulative	ml	184	416	644	865	1085	1307	1516	1700
pH	units	6.6	6.7	6.7	6.5	6.4	6.5	6.2	6.0
Conductivity	umhos/cm	270	220	200	170	150	120	120	80
Acidity	mg/L CaCO3	15	10	10	15	5	20	5	5
Acidity, Cumulative	mg CaCO3	2.8	5.1	7.4	10.7	11.8	16.2	17.3	18.2
Alkalinity	mg/L CaCO3	5	5	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.9	2.1	3.2	4.3	5.4	6.5	7.6	8.5
Iron	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfate	mg/L	130	101	99	86	69	58	51	42
Sulfate, Cumulative	mg	23.9	47.4	69.9	88.9	104.1	117.0	127.6	135.4

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	214	222	219	220				
Leachate Vol., Cumulative	ml	1914	2136	2355	2575				
pH	units	6.0	5.9	5.7	5.6				
Conductivity	umhos/cm	80	50	60	60				
Acidity	mg/L CaCO3	5	15	20	15				
Acidity, Cumulative	mg CaCO3	19.3	22.6	27.0	30.3				
Alkalinity	mg/L CaCO3	5	5	0	5				
Alkalinity, Cumulative	mg CaCO3	9.6	10.7	10.7	11.8				
Iron	mg/L	<0.02	<0.02	<0.02	<0.02				
Iron, Cumulative	mg	0.000	0.000	0.000	0.000				
Sulfate	mg/L	34	25	30	30				
Sulfate, Cumulative	mg	142.6	148.2	154.8	161.4				

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00079: CBCC-QM-90X: CELL#23
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	173	224	224	204	204	202	190	172
Leachate Vol., Cumulative	ml	173	397	621	825	1029	1231	1421	1593
pH	units	6.9	7.2	7.0	7.0	6.8	7.3	7.3	7.4
Conductivity	umhos/cm	20	20	10	10	<10	<10	<10	<10
Acidity	mg/L CaCO3	10	0	0	0	5	0	0	0
Acidity, Cumulative	mg CaCO3	1.7	1.7	1.7	1.7	2.8	2.8	2.8	2.8
Alkalinity	mg/L CaCO3	5	10	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.9	3.1	4.2	5.2	6.3	7.3	8.2	9.1
Iron	mg/L	0.05	0.08	0.03	0.12	0.14	0.10	0.17	0.13
Iron, Cumulative	mg	0.009	0.027	0.033	0.058	0.086	0.107	0.139	0.161
Sulfate	mg/L	8	6	5	5	4	4	4	3
Sulfate, Cumulative	mg	1.4	2.7	3.8	4.9	5.7	6.5	7.3	7.8

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	196	201	209	205				
Leachate Vol., Cumulative	ml	1789	1990	2199	2404				
pH	units	7.1	7.0	6.9	6.8				
Conductivity	umhos/cm	<10	<10	<10	<10				
Acidity	mg/L CaCO3	0	0	15	0				
Acidity, Cumulative	mg CaCO3	2.8	2.8	5.9	5.9				
Alkalinity	mg/L CaCO3	0	10	0	15				
Alkalinity, Cumulative	mg CaCO3	9.1	11.1	11.1	14.2				
Iron	mg/L	<0.02	0.04	<0.02	0.02				
Iron, Cumulative	mg	0.161	0.169	0.169	0.173				
Sulfate	mg/L	3	3	3	3				
Sulfate, Cumulative	mg	8.4	9.0	9.6	10.2				

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00081: CBCC-LPG-6S: CELL#25
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	178	212	222	201	201	200	188	174
Leachate Vol., Cumulative	ml	178	390	612	813	1014	1214	1402	1576
pH	units	7.9	7.7	8.1	7.7	7.2	7.2	7.0	7.1
Conductivity	umhos/cm	180	80	80	50	70	60	60	50
Acidity	mg/L CaCO3	0	0	0	0	0	0	0	0
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	10	10	10	10	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	1.8	3.9	6.1	8.1	9.1	10.1	11.1	11.9
Iron	mg/L	0.03	0.03	0.05	0.03	0.03	0.03	0.03	<0.02
Iron, Cumulative	mg	0.005	0.012	0.023	0.029	0.035	0.041	0.047	0.047
Sulfate	mg/L	68	37	30	3	29	27	38	27
Sulfate, Cumulative	mg	12.1	19.9	26.6	27.2	33.0	38.4	45.6	50.3

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	190	201	202	209				
Leachate Vol., Cumulative	ml	1766	1967	2169	2378				
pH	units	6.9	7.1	6.9	6.7				
Conductivity	umhos/cm	60	40	30	30				
Acidity	mg/L CaCO3	5	0	10	5				
Acidity, Cumulative	mg CaCO3	1.0	1.0	3.0	4.0				
Alkalinity	mg/L CaCO3	5	5	5	10				
Alkalinity, Cumulative	mg CaCO3	12.9	13.9	14.9	17.0				
Iron	mg/L	<0.02	0.03	0.05	0.05				
Iron, Cumulative	mg	0.047	0.053	0.063	0.073				
Sulfate	mg/L	24	21	16	16				
Sulfate, Cumulative	mg	54.8	59.1	62.3	65.6				

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00084: CBCC-BFT-7S: CELL#29
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	175	226	208	186	195	191	181	176
Leachate Vol., Cumulative	ml	175	401	609	795	990	1181	1362	1538
pH	units	7.4	7.6	6.9	6.7	6.7	6.6	6.8	6.2
Conductivity	umhos/cm	240	130	80	90	60	50	50	40
Acidity	mg/L CaCO3	0	0	20	5	10	10	5	5
Acidity, Cumulative	mg CaCO3	0.0	0.0	4.2	5.1	7.0	9.0	9.9	10.7
Alkalinity	mg/L CaCO3	10	10	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	1.8	4.0	5.1	6.0	7.0	7.9	8.8	9.7
Iron	mg/L	<0.02	0.02	0.04	0.05	0.06	0.04	<0.02	0.06
Iron, Cumulative	mg	0.000	0.005	0.013	0.022	0.034	0.041	0.041	0.052
Sulfate	mg/L	109	54	34	39	26	23	34	24
Sulfate, Cumulative	mg	19.1	31.3	38.4	45.6	50.7	55.1	61.2	65.4

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	182	193	195	201				
Leachate Vol., Cumulative	ml	1720	1913	2108	2309				
pH	units	6.4	6.2	6.3	5.5				
Conductivity	umhos/cm	60	30	30	40				
Acidity	mg/L CaCO3	10	10	10	0				
Acidity, Cumulative	mg CaCO3	12.6	14.5	16.4	16.4				
Alkalinity	mg/L CaCO3	0	5	5	5				
Alkalinity, Cumulative	mg CaCO3	9.7	10.7	11.6	12.6				
Iron	mg/L	0.05	0.04	0.04	0.02				
Iron, Cumulative	mg	0.061	0.069	0.077	0.081				
Sulfate	mg/L	23	18	17	20				
Sulfate, Cumulative	mg	69.6	73.1	76.4	80.4				

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00075: CBCC-PQM-80X: CELL#19
Test Dates:02/02/93-

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	177	227	221	193	194	191	177	168
Leachate Vol., Cumulative	ml	177	404	625	818	1012	1203	1380	1548
pH	units	7.5	7.4	7.5	7.0	7.3	7.4	7.4	7.2
Conductivity	umhos/cm	20	10	10	10	<10	<10	<10	<10
Acidity	mg/L CaCO3	0	0	0	0	0	0	0	0
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	10	10	10	10	5	5	5	10
Alkalinity, Cumulative	mg CaCO3	1.8	4.0	6.3	8.2	9.2	10.1	11.0	12.7
Iron	mg/L	0.05	0.02	0.03	0.08	0.06	0.10	0.16	0.04
Iron, Cumulative	mg	0.009	0.013	0.020	0.035	0.047	0.066	0.095	0.101
Sulfate	mg/L	9	5	5	5	4	4	4	3
Sulfate, Cumulative	mg	1.6	2.7	3.8	4.8	5.6	6.3	7.0	7.6

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	184	191	198	206				
Leachate Vol., Cumulative	ml	1732	1923	2121	2327	2327	2327	2327	2327
pH	units	7.6	7.1	7.0	7.0				
Conductivity	umhos/cm	<10	<10	<10	<10				
Acidity	mg/L CaCO3	0	0	0	0				
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	10	10	0	5				
Alkalinity, Cumulative	mg CaCO3	14.5	16.4	16.4	17.5	17.5	17.5	17.5	17.5
Iron	mg/L	0.06	0.12	0.06	0.03				
Iron, Cumulative	mg	0.112	0.135	0.147	0.153	0.153	0.153	0.153	0.153
Sulfate	mg/L	3	3	3	<1				
Sulfate, Cumulative	mg	8.1	8.7	9.3	9.3	9.3	9.3	9.3	9.3

Approved:

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00077: CBCC-QM-1S: CELL#21
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	178	227	229	214	215	211	204	170
Leachate Vol., Cumulative	ml	178	405	634	848	1063	1274	1478	1648
pH	units	6.1	6.3	6.2	6.1	6.1	6.2	6.0	6.1
Conductivity	umhos/cm	290	220	220	170	120	100	90	70
Acidity	mg/L CaCO3	10	10	5	5	30	10	5	5
Acidity, Cumulative	mg CaCO3	1.8	4.1	5.2	6.3	12.7	14.8	15.8	16.7
Alkalinity	mg/L CaCO3	0	0	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.0	0.0	1.1	2.2	3.3	4.3	5.4	6.2
Iron	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfate	mg/L	148	113	115	85	57	46	42	40
Sulfate, Cumulative	mg	26.3	52.0	78.3	96.5	108.8	118.5	127.0	133.8

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	202	213	216	219				
Leachate Vol., Cumulative	ml	1850	2063	2279	2498				
pH	units	6.0	6.1	6.0	5.9				
Conductivity	umhos/cm	50	30	30	20				
Acidity	mg/L CaCO3	5	20	0	0				
Acidity, Cumulative	mg CaCO3	17.7	22.0	22.0	22.0				
Alkalinity	mg/L CaCO3	5	5	0	10				
Alkalinity, Cumulative	mg CaCO3	7.2	8.3	8.3	10.5				
Iron	mg/L	<0.02	0.04	<0.02	0.03				
Iron, Cumulative	mg	0.000	0.009	0.009	0.015				
Sulfate	mg/L	21	18	16	13				
Sulfate, Cumulative	mg	138.1	141.9	145.4	148.2				

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00076: CBCC-AP-30X: CELL#20
Test Dates:02/02/93-

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	169	235	216	189	193	191	173	164
Leachate Vol., Cumulative	ml	169	404	620	809	1002	1193	1366	1530
pH	units	5.2	5.4	5.5	5.5	5.4	5.6	5.6	5.7
Conductivity	umhos/cm	310	180	130	120	100	60	60	40
Acidity	mg/L CaCO3	15	10	10	5	5	0	5	5
Acidity, Cumulative	mg CaCO3	2.5	4.9	7.0	8.0	9.0	9.0	9.8	10.6
Alkalinity	mg/L CaCO3	5	0	0	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.8	0.8	0.8	1.8	2.8	3.7	4.6	5.4
Iron	mg/L	1.52	0.36	0.23	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.257	0.341	0.391	0.391	0.391	0.391	0.391	0.391
Sulfate	mg/L	162	93	66	59	47	30	28	21
Sulfate, Cumulative	mg	27.4	49.2	63.5	74.6	83.7	89.4	94.3	97.7

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	171	194	192	198				
Leachate Vol., Cumulative	ml	1701	1895	2087	2285	2285	2285	2285	2285
pH	units	5.8	5.8	5.7	6.1				
Conductivity	umhos/cm	20	10	10	<10				
Acidity	mg/L CaCO3	5	5	10	10				
Acidity, Cumulative	mg CaCO3	11.5	12.5	14.4	16.4	16.4	16.4	16.4	16.4
Alkalinity	mg/L CaCO3	5	5	5	5				
Alkalinity, Cumulative	mg CaCO3	6.3	7.2	8.2	9.2	9.2	9.2	9.2	9.2
Iron	mg/L	0.15	0.02	0.19	0.05				
Iron, Cumulative	mg	0.417	0.421	0.457	0.467	0.467	0.467	0.467	0.467
Sulfate	mg/L	10	10	7	7				
Sulfate, Cumulative	mg	99.4	101.4	102.7	104.1	104.1	104.1	104.1	104.1

Approved: _____

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00083: CBCC-AP-2S: CELL#28
Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	196	253	236	188	204	197	185	179
Leachate Vol., Cumulative	ml	196	449	685	873	1077	1274	1459	1638
pH	units	4.3	4.1	4.3	4.2	4.1	4.1	3.9	4.2
Conductivity	umhos/cm	160	200	110	90	100	80	60	80
Acidity	mg/L CaCO3	35	39	25	20	60	75	30	30
Acidity, Cumulative	mg CaCO3	6.9	16.7	22.6	26.4	38.6	53.4	59.0	64.3
Alkalinity	mg/L CaCO3	0	0	0	0	0	0	0	0
Alkalinity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron	mg/L	3.97	1.65	0.68	0.37	0.45	0.41	0.41	0.51
Iron, Cumulative	mg	0.778	1.196	1.356	1.426	1.517	1.598	1.674	1.765
Sulfate	mg/L	73	93	50	42	43	35	43	44
Sulfate, Cumulative	mg	14.3	37.8	49.6	57.5	66.3	73.2	81.2	89.0

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	186	196	199	201				
Leachate Vol., Cumulative	ml	1824	2020	2219	2420				
pH	units	4.0	4.0	3.9	3.9				
Conductivity	umhos/cm	100	80	80	90				
Acidity	mg/L CaCO3	20	30	35	35				
Acidity, Cumulative	mg CaCO3	68.0	73.9	80.9	87.9				
Alkalinity	mg/L CaCO3	0	0	0	5				
Alkalinity, Cumulative	mg CaCO3	0.0	0.0	0.0	1.0				
Iron	mg/L	0.55	0.67	0.48	0.42				
Iron, Cumulative	mg	1.868	1.999	2.094	2.179				
Sulfate	mg/L	36	34	33	38				
Sulfate, Cumulative	mg	95.7	102.4	109.0	116.6				

Approved: _____

REFERENCES

FYI
AGEA 10/6/94

TECHNICAL DOCUMENT

ACID MINE DRAINAGE PREDICTION

DRAFT

August 1994

U.S. Environmental Protection Agency
Office of Solid Waste
Special Waste Branch
401 M Street, SW
Washington, DC 20460

2.2 Static Tests

Static tests predict drainage quality by comparing the sample's maximum acid production potential (AP) with its maximum neutralization potential (NP). The AP is determined by multiplying the percent of total sulfur or sulfide sulfur (depending on the test) in the sample by a conversion factor (AP = 31.25 * %S). NP is a measure of the carbonate material available to neutralize acid. The value for NP is determined either by adding acid to a sample and back titrating to determine the amount of acid consumed or by direct acid titration of the sample; the endpoint pH is usually 3.5 (Ferguson and Morin 1991, Lapakko 1993a). Lapakko (1992) reported that using an endpoint pH of 3.5 measures a sample's acid neutralizing potential below 6.0, but noted that a drainage pH in the range of 3.5 may not be environmentally acceptable. The net neutralization potential (NNP), or acid/base account (ABA) is determined by subtracting the AP from the NP (NNP = NP - AP). A ratio of NP to AP is also used. An NNP of 0 is equivalent to an NP/AP ratio of 1 (Ferguson and Morin 1991). Units for static test results (AP, NP, and NNP) are typically expressed in mass (kg, metric ton, etc.) of calcium carbonate ($CaCO_3$) per 1000 metric tons of rock, parts per thousand.

Used For Preliminary Criteria

If the difference between NP and AP is negative then the potential exists for the waste to form acid. If it is positive then there may be lower risk. Prediction of the acid potential when the NNP is between -20 and 20 is more difficult. If ratios are used, when the ratio of a sample's neutralization potential and acid production potential is greater than 3:1, experience indicates that there is lower ri for acid drainage to develop (Brodie et al. 1991). For ratios between 3:1 and 1:1, referred to as the zone of uncertainty, additional kinetic testing is usually recommended. Those samples with a ratio of 1:1 or less are more likely to generate acid. Prediction of drainage quality for a sample based on these values requires assumptions that reaction rates are similar and that the acid consuming minerals will dissolve (Lapakko 1992). When reviewing data on static tests, an important consideration is the particle size of the sample material and how it is different from the waste or unit being characterized

Information on these and other static acid prediction tests, including summaries of test results, is available (Coastech 1989, Lapakko 1993b). The following descriptions are excerpted from Lapakko (1993b). Lapakko (1992) has also conducted comparison tests of static methods using mine waste samples from different mines. Additional summaries of static tests have been completed by Coastech (1989) as part of the MEND Project, and the California Mining Association (1991). Five static tests will be summarized here and in Table 5.

that the potential for economic mineralization in this area is very low. Drilling indicated that minor localized groundwater is largely confined to discrete geologic structures and fracture zones, with an overall hydrologic gradient sloping northward, resulting in shallow groundwater migrating to the pit. The geology, subsurface hydrology, surface drainage pattern, and proximity to the pit combine to make the South WRDF an ideal site for mineralized waste.

3.4.4 Waste Rock Characteristics

To date, the current dump activity on private and state land has involved several types of mine waste including relocated mill tailings, unmineralized Gila overburden, copper-oxide cemented Gila Conglomerate, and weakly mineralized, coarsely broken hard rock. None of these waste types, or those to be dumped in the future, are highly pyritic or significantly acid-generating. The majority of the material to be deposited in this area will be coarsely broken durable rock from the continued excavation of the pit.

Although subject to future revisions as the long-range mine plan and individual pushback designs evolve, the following table presents the current estimated tonnage for the five waste categories scheduled for the South WRDF.

Material	Tonnage (thousands)
Mineralized Waste	498,690
Gila Conglomerate	76,410
Relocated Mine Dump Material	18,460
Relocated Tailings	13,260
Low-grade Oxide Waste	10,750
Total	617,570

Mineralized Rock Waste - predominantly coarsely fragmented, hard, durable crystalline rock, having a non-economic copper content (generally in the range of 0.07 to 0.20 percent Cu), and a relatively low pyrite content (generally in the 2 to 3 percent range). Late Cretaceous quartz monzonite predominates, but Precambrian granitic and metamorphic rocks will be abundant in some parts of the dump. It is estimated that more than 70 percent of the tonnage will consist of rock fragments ranging from a few inches to about two feet in diameter.

Gila Conglomerate - poorly sorted and weakly cemented Miocene alluvial conglomerate, dirty sandstone, and sandy siltstone. The Gila Conglomerate consists of locally derived alluvial gravels representing unmineralized overburden on top of the Bagdad orebody. Where present in the mine, it generally ranges in thickness from several hundred to nearly a thousand feet. Because of its silt and clay content and unmineralized character, the Gila alluvium makes almost ideal capping material and is readily revegetated. Calcium carbonate cementation of the Gila Conglomerate is significant, helping to neutralize adjacent acidic conditions. Gila alluvial material may also be used for surfacing the coarse rock ramps and the dump levels to minimize tire wear and other maintenance costs.

Relocated Mine Dump Material - mostly oxidized and decomposed mineralized waste rock material from the old Mineral Creek and Alum Creek dumps in the west part of the mine area. Copper contents typically range from about 0.1 to 0.2 percent and the material is somewhat acid-generating because of residual pyrite.

Relocated Tailings - old Bagdad mill tailings that are truck or conveyor-transported to this area in order to clear the perimeter of the pit for future expansion. The current approved Plan of Operations reflects the ongoing relocation of these tailings into Bevering Gulch by the bucketwheel excavator and conveyor system. These tailings are weakly mineralized with copper contents typically in the range from 0.07 to 0.10 percent and pyrite contents averaging no more than 2 to 3 percent.

Low-grade Oxide Waste - partially oxidized, low-grade mineralized rock that will be mined below the 3250 feet elevation in the pit. It is similar to the mineralized rock waste except that its oxide mineralology makes it more susceptible to copper leaching.

APPENDIX E SPECIAL STATUS SPECIES ANALYSIS

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Table E.1 Review of Special Status Species

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Amphibians						
Arizona toad (southwestern toad)	*Anaxyrus (Bufo) microscaphus*	SC			**Range:** Historic range includes Arizona, California, New Mexico, Nevada, Utah and Mexico. Found in east to west central Arizona, canyons and flood plains south of the Mogollon Rim, but also found in East Clear Creek. **Habitat:** Rocky streams and canyons in the pine-oak belt. Also occurs in lower deserts, e.g. Agua Fria River area. **Elevation:** 480—8,400 feet	**None.** Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
Chiricahua leopard frog	*Lithobates (Rana) chiricahuensis*	T		WSC	**Range:** US range includes mountain regions of central and southeastern Arizona, southwestern New Mexico, south in the Sierra Madre Occidental to Western Jalisco, Mexico. **Habitat:** Variety of permanent or nearly permanent aquatic habitats, including springs, livestock tanks, ponds, lakes, marshes, and headwater streams into which nonnative predators either have yet to invade or habitats are marginal for them. **Elevation**: 3,281—8,990 feet	**None.** Lack of suitable habitat within the project area. The project area would not contribute to Chiricahua leopard frog dispersal or provide year-round suitable habitat for populations or metapopulations of Chiricahua leopard frog.
Lowland leopard frog	*Rana yavapaiensis*	SC	S	WSC	**Range:** Historically this species ranged from southeastern California, extreme northwestern Arizona, and southwestern New Mexico to Sonora. **Habitat:** Preference for lotic systems, including small to medium-sized streams and occasionally small ponds. This species will often concentrate near deep pools in association with root masses of large riparian trees. This species is associated with riparian areas within grasslands, chaparral, and evergreen woodlands. **Elevation:** Less than 6,400 feet	**None.** Lack of suitable habitat within the project area. There are no perennial water sources within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Northern leopard Frog	*Lithobates pipiens*		S	WSC	**Range**: This species ranges throughout the Great Basin Region from northern Arizona, western Nevada and Washington to southern Canada; east to southeast Canada and New Jersey. **Habitat:** This species is usually found in permanent waters with rooted aquatic vegetation in a variety of habitats including grassland, brush land, woodland, and forest ranging high into mountains; also frequents ponds, canals, marshes, springs, and streams. **Elevation:** 2,640—9,155 feet	**None.** Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
Birds						
American peregrine falcon	*Falco peregrinus anatum*	SC, R	S	WSC	**Range:** Breeding range is from Canada and Alaska south into Baja California, the central Mexican highlands, and northwest Mexico, including the continental US (except the southeast corner of the country). This species winters in South America, and breeds in the state wherever sufficient prey is available near cliffs. Areas of spectacular cliffs such as the Mogollon Rim, Grand Canyon and Colorado Plateau, contain most of Arizona's breeding peregrines. **Habitat:** Rocky, steep cliffs overlooking woodlands, riparian areas, or other habitats supporting an abundance of avian prey species. Nests on cliff ledges above or near water. Open landscapes surrounding these areas are critical for foraging. **Elevation:** 400—9,000 feet; (prefer 6,500-8,599 feet)	**Unlikely.** Lack of suitable habitat within the project area. Transient individuals may pass through project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
American redstart	*Setophaga ruticilla*			WSC	**Range:** This species nests throughout much of the continental US, including southern Alaska and Canada. Wintering occurs from southern Baja California, central Mexico and West Indies south into northern South America. **Habitat:** Breeding habitat is comprised of mature and second growth wooded habitats, requiring closed canopy with preference for dense midstory and understory, and well-developed undergrowth. Wintering and migration habitats are more diverse, including various kinds of forests, woodlands, scrublands, and thickets, as well as arborous agricultural areas and mangroves. **Elevation:** 5,190—7,365 feet	**Unlikely.** Lack of suitable habitat within the project area. Individuals may pass through project area during non-breeding periods. Species not known to occur in the project vicinity.
Bald eagle	*Haliaeetus leucocephalus*	SC, R	S	WSC	**Range:** Widespread across US and Canada, and into northwestern Mexico. In central Arizona, bald eagles are present year-round, with a wintering population spreading into the northern part of the state. The populations north and south of the 40th parallel are considered unique. **Habitat:** Forested areas along coasts, large lakes, and rivers, but also other areas. Known to roost in large trees and on ledges or cliffs near water bodies with abundant prey. Nests are generally found on the order of 600 lateral feet, and 300 vertical feet of the water body. **Elevation:** 460—7,930 feet	**Unlikely.** Lack of suitable breeding or nesting habitat. Transient individuals may pass through the project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Belted kingfisher	*Megaceryle alcyon*			WSC	**Range:** Sources vary, but indicate that breeding range spans Alaska and Canada, into the continental US as far south as South Dakota and east to Wisconsin. Winter range extends throughout the US and into Central and South America, with documented dispersal as far as Hawaii and the West Indies. **Habitat:** This species is found in or near persistent water sources, such as rivers, brooks, ponds, lakes, coasts, streams, tidal creeks, mangroves, swamps and estuaries **Elevation:** 1,840—8,400 feet	**None.** Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
California condor	*Gymnogyps californianus*	E,EXPN			**Range:** Historically, the Pacific Coast between British Columbia and Baja California. Reintroduced in Arizona to Vermillion Cliffs and Hurricaine Cliffs. **Habitat:** Condors in Arizona roost and nest in steep terrain with rock outcroppings, cliffs, and caves. High perches are necessary to create the strong updrafts the bird requires to lift into flight. Open grasslands or savannahs are essential to condors for searching for food. **Elevation:** 2,000—6,500 feet	**None.** Lack of suitable habitat within the project area. *Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Common black-hawk	*Buteogallus anthracinus anthracinus*			WSC	**Range:** This species occurs from Arizona to southern Texas and southward to Peru and Paraguay. Arrives in the US to breed as early as March-April, leaving by mid-October. Individuals occasionally overwinter in Arizona and New Mexico. The breeding range is along remote streams draining the Mogollon Rim, the Big Sandy and Virgin rivers drainages, and the upper Gila River drainages. **Habitat:** Riparian nester, dependent on mature, relatively undisturbed habitat supported by a permanent flowing stream. It may less commonly occur on intermittent streams if pools remain present. Prefer groves to single trees, and streams that are less than 30.0 cm deep, of low to moderate gradient with many riffles, runs, pools and scattered boulders or lapped with branches. **Elevation:** 1,750—7,080 feet	**None.** Lack of suitable breeding, nesting, and foraging habitat. There are no perennial water sources within the project area.
Ferruginous hawk	*Buteo regalis*	SC	S	WSC	**Range:** No records outside the Americas. Primarily found in the western states of North America, southern Canada and into central Mexico. Breeds across southern central Canada and into the US between the Great Plains and Rocky Mountains south to northern Arizona and New Mexico. Winter range is primarily from central Mexico north through the southwestern and mid-western US. **Habitat:** Open scrublands and woodlands, grasslands, and Semidesert Grassland – prefers open grasslands dotted with suitable low hills or short trees, which serve as perches. **Elevation:** 3,500—6,000 feet	**Unlikely.** Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Golden eagle	*Aquilia chrysaetos*		S		**Range:** Contiguous North America, Canada south to central Mexico, Northern Russia, Siberia, British Isles, Northern Africa, Asia minor, Persia, southern Tibet, Korea and Japan. This outline represents the combined ranges of several subspecies, only one of which (*A. c. canadensis*) is found in North America. **Habitat:** The species is found in open country, in prairies, arctic and alpine tundra, open wooded country and barren areas, especially in hilly or mountainous regions. They nest on rock ledges, cliffs or in large trees. In Arizona nests are found in mountainous areas and are virtually vacant after breeding in some desert areas. **Elevation:** 4,000—10,000 feet	**Unlikely.** Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.
Mexican spotted owl	*Strix occidentalis lucida*	T		WSC	**Range:** From southern Utah and central Colorado south through Arizona, New Mexico, and western Texas to the mountains of central Mexico. Patchily distributed in Arizona in forested mountains statewide, along with steep canyons on the Colorado Plateau including the Grand Canyon. **Habitat:** Dense old growth mixed-conifer forests and canyons. Preferred nesting and breeding habitat includes high canopy closure, high stand density, a multilayered canopy, uneven-aged stands, numerous snags, and downed woody matter. Diverse dispersal habitat. Nearly all isolated patches of mixed conifer or ponderosa pine in the southwest could be reached by dispersing owls. **Elevation:** 2,720—9,600 feet	**None.** Lack of suitable breeding, nesting, and foraging habitat. There is no mature forest in or near the project area. The closest area of designated critical habitat is in Coconino County, approximately 125 miles from the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Northern goshawk	*Accipiter gentilis atricapillus*	SC	S	S	**Range:** This species breeds and winters extensively in North America, with some populations wintering south of the US border. In Arizona they breed in high, forested mountains and plateaus, usually above 6,000 feet. **Habitat:** Goshawks nest in a wide variety of forest types including deciduous, coniferous and mixed forests, though typically in mature or old growth forests, generally selecting larger tracts of forests over smaller tracts. In Arizona, they nest most commonly in ponderosa pine forests along the Mogollon Rim and on the Kaibab Plateau, and in Arizona pine and ponderosa pine forests in the southeastern mountains. Occasionally, they breed in relatively low elevation oak forests in the southeastern portion of the state, with the lowest-elevation nest found at 4,900 feet. **Elevation:** 4,750—9,120 feet	**Unlikely**. The project area is within the currently known geographic range, and some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat, elevation, and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area.
Pine grosbeak	*Pinicola enucleator*			WSC	**Range:** This species is found in most of Alaska, Canada, and throughout the Western US. Populations in Arizona are largely in the White Mountains, north Kaibab Plateau, and Oak Creek Canyon, and possibly the San Francisco Peaks. **Habitat:** Open coniferous (less commonly mixed coniferous-deciduous) forest and forest edge; in migration and winter also in deciduous forest, woodland, second growth and shrubbery. They prefer coniferous stands with large trees and low to intermediate canopy cover, usually near an edge. **Elevation:** 7,140—9,400 feet	**None.** Low elevation, lack of suitable breeding, nesting, and foraging habitat.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Southwestern willow flycatcher	*Empidonax traillii extimus*	E		WSC	**Range:** A neotropical migrant that winters in Mexico and Central America. Known to breed throughout the southwest US. In Arizona, this species breeds locally along the Colorado River in the Grand Canyon near mouth of Little Colorado River, and south of Yuma. Also breeds at the headwaters of the Little Colorado River near Greer and Eagar; very locally along the middle Gila, Salt, and Verde rivers; middle to lower San Pedro River; and upper San Francisco River near Alpine. **Habitat:** A riparian obligate that prefers dense canopy cover, large volume of foliage, and surface water during midsummer. They appear to avoid riparian areas found in steep, closed canyons. **Elevation:** 75—9,180 feet	**None.** Vegetation found within the project area has none of the documented and required habitat elements for this species. Lack of suitable riparian habitat necessary for breeding and foraging.
Western burrowing owl	*Athene cunicularia hypugaea*	SC	S		**Range:** Species breeds in North America and winters primarily south of the US-Mexico border. In Arizona, occurs locally in open areas, generally year-round, with only a few winter records on the Colorado Plateau. **Habitat:** Variable in open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands, often associated with burrowing mammals. Burrowing owls are at times observed in open areas such as vacant lots near human habitation, golf courses and airports. **Elevation:** 650—6,140 feet	**Unlikely.** Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis (western pop)*	PT		WSC	**Range**: A late spring migrant from South America, cuckoos breed throughout the western US. The species can be found in every county of Arizona, and is generally found in southern and central Arizona, and extreme northeast portion of state. **Habitat:** Suitable habitats is limited to narrow, and often widely separated, riparian cottonwood-willow galleries or salt cedar, or larger mesquite bosques. Dense understory foliage appears to be an important factor in nest site selection. They are rarely observed as transients in xeric desert or urban settings. **Elevation:** Less than 6,000 feet	**None.** Lack of suitable riparian habitat. Vegetation found within the project area has none of the documented and required habitat elements for this species.
Yuma clapper rail	*Rallus longirostris yumanensis*	E		WSC	**Range:** The species is distributed throughout the Lower Colorado River basin. In Arizona, they can be found on the Colorado River as far north as Lake Mead, Virgin River, Bill Williams River, the lower Gila River from near Phoenix to the Colorado River, and the lower Salt and Verde rivers. Occasionally recorded outside of this range. **Habitat:** This species breeds in freshwater marshes and also inhabit brackish water marshes and side waters, preferring the tallest, densest cattail and bulrush marshes. **Elevation:** 75—1,700 feet; occasionally found up to 2,200 feet	**None.** Lack of suitable riparian habitat. Vegetation found within the project area has none of the documented and required habitat elements for this species. *Federal sources do not list this species as having presence in Yavapai County, but AGFD considers presence possible.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Fish						
Colorado pikeminnow	*Ptychocheilus lucius*	E,EXPN	WSC		**Range:** Historically widespread in the Colorado River basin from Wyoming to Arizona and California. Considered extirpated in Arizona, Colorado pikeminnow are restricted to two "experimental, non-essential" reintroduced populations in the state. **Habitat:** Spawning takes place over clean cobbles and rubble in relatively swift waters. Preferred temperatures for embryo development, juvenile growth, and adult spawning range from 20.0—26.0°C (68.0—78.8°F). Juveniles utilize slackwater, backwater, and side channel areas with low or no current velocity and silt/sand substrates. Larger individuals, greater than 200mm (7.9 in.) occur in turbid, deep, and strongly flowing waters. **Elevation:** Re-introduced at 1,960 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Desert pupfish	*Cyprinodon macularius*	E		WSC	**Range:** Historic range includes the lower Gila River basin and the lower Colorado River. No natural populations remain in Arizona, but populations have been reintroduced in several locations, including AD Wash in Yavapai County. **Habitat:** Pupfish occupy shallow waters of springs, small streams, and marshes. Often associated with areas of soft substrates and clear water. **Elevation:** 1,200—3,450 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Desert sucker	*Catostomus clarki*	SC	S		**Range:** Historic range includes Arizona, New Mexico, Nevada, Utah, and Mexico. Current range within the lower Colorado River drainage and the Gila River basin in Arizona-New Mexico, including the Bill Williams drainage. **Habitat:** Rapids and flowing pools of streams, primarily over bottoms of gravel-rubble with sandy silt in the interstices. **Elevation:** 480—8,840 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Gila chub	*Gila intermedia*	E		WSC	**Range:** Historically, populations have been recorded throughout the Gila River basin in northern Sonora, Mexico, central and southeastern Arizona, and western New Mexico. In Arizona, known to exist in the following drainages; Santa Cruz River, Middle Gila River, San Pedro River, Agua Fria River, and Verde River. **Habitat**: Pools in small streams, springs, and cienegas. Adults prefer deeper waters with cover including terrestrial vegetation, fallen logs, and boulders, while young prefer shallower waters. **Elevation**: 2,720—5,420 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Gila longfin dace	*Agosia chrysogaster chrysogaster*	SC	S		**Range:** Native to the Gila, and Bill Williams drainages in Arizona, and the Magdalena and Sonoyta drainages in Mexico. Distribution has increased in mountainous areas, probably due to climatic trends. **Habitat:** They tend to occupy relatively small or medium size streams with sandy or gravely bottoms, eddies, pools near overhanging banks or other cover. Usually in water less than 0.6 feet (0.2 m) deep with moderate velocities. **Elevation:** Less than 4,900 feet; have been recorded up to 6,700 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E		WSC	**Range:** Historically occupied the Gila River drainage in New Mexico, Arizona, and Mexico. The Gila topminnow has been eliminated from almost all of its historic range. Currently, disjunct populations exist in 9-11 natural locations and 22-24 re-introduced locations within the Gila River drainage and one location in the Bill Williams River drainage. **Habitat**: Gila topminnows occupied headwater springs, and vegetated margins and backwater areas of intermittent and perennial streams and rivers. This species prefers shallow warm water in a moderate current with dense aquatic vegetation and algae mats. **Elevation**: Less than 5,000 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Gila trout	*Oncorhynchus gilae*	T		WSC	**Range:** Found historically in the Verde and Agua Fria drainages in Arizona. Fisheries surveys in 1993 revealed no Gila trout and they were considered extirpated from Arizona. **Habitat**: Gila trout are found in small mountain headwater streams, which are generally narrow and shallow, siltation is usually low and cobble is the predominate substrate. During drought years they tend to be confined to pools with sufficient depth and cover. Gila trout use cover extensively **Elevation**: 5,446—9,220 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area. *Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Headwater chub	*Gila nigra*	C			**Range:** Gila River basin of Arizona and New Mexico. In Arizona, they are identified from Ash Creek, Tonto Creek, and Spring and Marsh Creeks. Also, in the Verde River system, they inhabit Upper Fossil Creek (above the diversion dam), East Verde River and Deadman Creek. **Habitat:** Middle and headwater reaches of middle-sized streams. They are associated with deep, near-shore pools adjacent to swift riffles and runs, and near obstructions. Cover consists of root wads, boulders, undercut banks, submerged organic debris, or deep water. **Elevation:** 4,200—5,000 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Loach minnow	*Tiaroga cobitis*	E			**Range**: Historic range includes many Arizona and New Mexico rivers and their tributaries, but is considered extirpated in much of its native range. In Arizona, they are found in Aravaipa Creek, the Blue River, and irregularly at the confluence of the north and east forks of the White River and the San Francisco River, between Clifton and the New Mexico border **Habitat**: Occupies turbulent, rocky riffles of mainstream rivers and tributaries, preferring moderate to swift current velocity and gravel or cobble substrates. **Elevation**: 2,325—8,240 feet	**None.** Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area. *Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Razorback sucker	*Xyrauchen texanus*	E		WSC	**Range:** Endemic to large rivers of the Colorado River Basin from Wyoming to Mexico. Presently natural adult populations exist in Arizona only in Lake Mohave, Lake Mead, and Lake Havasu. **Habitat:** Use a variety of habitat types from mainstem channels to slow backwaters of medium and large streams and rivers, sometimes around cover. In impoundments they prefer depths of a meter or more over sand, mud or gravel substrates. **Elevation:** 181—5,000 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Roundtail chub	*Gila robusta*	C		S	**Range:** Mainstem Colorado River and its larger tributaries in the upper Colorado River basin in Wyoming, Utah and Colorado; and in the lower Colorado River basin. Populations in Arizona are found locally in several rivers and tributaries, including 8 tributaries in the Bill Williams basin. **Habitat:** Cool to warm water over a wide range of elevations in rivers and streams. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low velocity water adjacent to overhead bank cover. **Elevation:** 1,210—7,220 feet (typically 2,000—5,000 feet)	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Sonora sucker	*Catostomus insignis*	SC	S		**Range:** Gila and Bill Williams systems (Colorado River drainage) New Mexico, Arizona, and northern Sonora, Mexico. Currently widespread in the Gila and Bill Williams river basins in Arizona. **Habitat:** Lentic and pool habitats and are found in a variety of habitats from warm water rivers to trout streams. **Elevation:** 1,210—8,730 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Speckled dace	*Rhinicthys osculus*	SC	S		**Range:** Native to all major western drainages from the Columbia and Colorado Rivers south to Sonora, Mexico. In Arizona, found in Colorado, Bill Williams, and Gila River drainages, except slower and warmer portions of Colorado River mainstream. **Habitat:** Speckled dace is a bottom dweller, found in rocky riffles, runs, and pools of headwaters, creeks, and small to medium rivers. **Elevation:** 1,550—9,843 feet (most commonly above 6562 feet)	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Spikedace	*Meda fulgida*	E		WSC	**Range**: Historically, spikedace were common and locally abundant throughout the upper Gila River basin of Arizona and New Mexico. Present populations in Arizona are limited, but include 35 miles of the Verde River in Yavapai County. **Habitat**: Shallow riffles of moderate to large perennial streams with sand, gravel, and rubble substrates. **Elevation**: 1,620—4,500 feet (historically much more diverse)	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Woundfin	*Plagopterus argentissimus*	E,EXPN			**Range:** Historically occurred in the Lower Colorado River Basin below the Grand Canyon the Virgin River in Utah, Arizona, and Nevada; and the lower and middle Gila River drainages in Arizona. The species has been extirpated from almost all of its historical range except the mainstream Virgin River, from Pah Tempe Springs to Lake Mead in northwestern Arizona (Mohave County). **Habitat**: Inhabits shallow, warm, turbid, fast-flowing water. Tolerates high salinities and relatively warm water temperatures. **Elevation**: Less than 4,500 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area. *Federal sources list this species as Experimental/Non-Essential in Yavapai County, but AGFD does not list it as having presence.
Invertebrates						
Balmorhea saddle-case caddisfly	*Protoptila balmorhea*	SC			**Range:** This species is found only in Reeves County, Texas and the age Springs/Bubbling Ponds/Lolomai Springs/Oak Creek Complex in Yavapai County, Arizona. **Habitat:** Swift spring outfalls with sufficient cobble substrate to support the algal grazing habits of the larvae. **Elevation:** 3,500 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Brown springsnail	*Pyrgulopsis sola*	SC	S		**Range:** Endemic to type locality of Brown Spring, Yavapai County, northwestern Arizona. **Habitat:** The genus *Pyrgulopsis* is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing. Specific habitat needs undefined. **Elevation:** 3,160—5,600 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Fossil springsnail	*Pyrgulopsis simplex*	SC	S		**Range:** Spring near Strawberry, Gila County, along with Fossil Springs, Yavapai County, Arizona. **Habitat:** Typically found only in the headspring and upper sections of the outflow. The genus *Pyrgulopsis* is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing. **Elevation:** 4,140—4,310 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Maricopa tiger beetle	*Cicindela oregona Maricopa*	SC			**Range:** This species is restricted to the state of Arizona, and may occur statewide. Historically or recently collected in all counties except Apache, La Paz, Santa Cruz, and Yuma. **Habitat:** The beetle is found in several different habitats within its range, most commonly on sandy stream banks and less commonly on gravels and clays along stream banks. **Elevation:** 1,092—6,940 feet	**None.** Lack of suitable habitat within the project area.
Montezuma well springshail	*Pyrgulopsis monteumensis*	SC	S		**Range:** Montezuma Well, Yavapai County, Arizona. **Habitat:** The endemic location is a freshwater, bethnic, spring. The genus *Pyrgulopsis* is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing. **Elevation:** 3,600 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Page spring micro caddisfly	*Metrichia nigritta*	SC			**Range:** No data (presumed to be endemic to Page Spring, Yavapai County, Arizona). **Habitat:** No data **Elevation:** No data	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area.
Page springsnail	*Pyrgulpsis morrisoni*	C	S		**Range:** Page Spring and several nearby springs in Verde Valley, Yavapai County, and central Arizona. **Habitat:** Typically occurs on firm substrates such as rocks, vegetation, floating algal mats and submerged woody debris in association with slow to moderate flows of head springs, seeps and lateral spring runs. **Elevation:** 3,300—3,600 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Parker's cylloepus riffle beetle	*Cylloepus parkeri*	SC			**Range:** Only known habitat occurs in Yavapai County, Arizona, in spring fed Roundtree Canyon in Bloody Basin within the Tonto National Forest. May also occur in Tangle Creek, also located in Bloody Basin. **Habitat:** Permanent, clean, slow moving small streams, with loose gravelly substrate and very little sand. **Elevation:** 2,850—4,000 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Verde rim springsnail	*Pyrgulopsis glandulosa*	SC	S		**Range:** Nelson Place Spring complex, consisting of two springs, separated by 150 meters, that form the headwaters of Sycamore Creek, Yavapai County, central Arizona. **Habitat:** Freshwater, bethnic, spring-spingbrook. The genus *Pyrgulopsis* is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing. **Elevation:** 5,280 feet	**None.** Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Mammals						
Allen's big-eared bat (Allen's lappet-browed bat)	*Idionycteris phyllotis*	SC	S		**Range:** In the US, this species is known from Arizona, Nevada, Utah, and southwestern New Mexico. Specimens taken across most of Arizona, but not known from the southwestern deserts of Arizona. **Habitat:** This species is found in ponderosa pine forest, oak-piñon-juniper-pine transition, and riparian cottonwood-sycamore forest. Often associated with water. Roosts in caves, and abandoned mine shafts. **Elevation:** 1,320—9,800 feet (mostly 3,500—7,500 feet)	**Unlikely.** Lack of suitable foraging habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Arizona myotis	*Myotis occultus*	SC	S		**Range:** Southwest US and Mexico, including southeastern California, Arizona, New Mexico (except perhaps extreme northeast), southern Colorado, and perhaps southern Utah and western Texas. **Habitat:** In summer, found in ponderosa pine and oak-pine woodland near water. Also found along permanent water or in riparian areas in some desert areas. Vegetation zone is not thought to be an important influence. **Elevation:** 3,200—8,000 feet (rare records at 150—1,000 feet)	**None.** Lack of suitable roosting or foraging habitat in the project area. There are no perennial streams or rivers within the project area.
Big free-tailed bat	*Nyctinomops macrotis*	SC			**Range:** Widely dispersed throughout central and western North America, as well as Central and South America. Widespread through most of state, with majority of occurrences in northern Arizona. Scattered observations from southeast part of state, but seems to be absent from southwestern and eastern portions. **Habitat:** This species primarily inhabits rugged, rocky country, roosting in rock crevices (vertical or horizontal) in cliffs, caves, buildings, and occasionally tree holes, and riparian areas. Winter range and habitat unknown. **Elevation:** 1,810—8,475 feet (primarily below 5,900 feet)	**Unlikely.** Lack of suitable foraging habitat within the project area. Some marginally suitable roosting habitat may be present, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Black-footed ferret	*Mustela nigripes*	E,EXPN	WSC		**Range**: This species historic range spanned the western US intermountain and prairie grasslands, from Canada to Mexico. Now exists in the wild at 18 reintroduction sites across 8 states, Canada, and Mexico. Current range includes a reintroduced population in Coconino County. **Habitat**: Prairie and grassland habitat. This species is highly dependent on prairie dog colonies as prairie dogs are this species primary food source, and prairie dog burrows are required for shelter. Since 1967, this species has been listed as endangered across its entire range, except for several reintroduced experimental populations. **Elevation**: 5,250—6,234 feet	**None.** Lack of suitable habitat within the project area; there are no prairie dog colonies in the vicinity.
California leaf-nosed bat	*Macrotus californicus*	SC	S	WSC	**Range:** Species range from northern Sinaloa and southwestern Chihuahua, Mexico, north to southern Nevada and California; also range into Baja California and Tamaulipas, Mexico. In Arizona found primarily south of Mogollon Plateau; additional reports in extreme southeastern and in summer extreme northwestern Mohave County. **Habitat:** Mostly found in the Sonoran desertscrub with roost sites with large areas of ceiling and flying space including a variety of manmade structures, rock shelters and mines. **Elevation:** All Arizona records below 4,000 feet with most below 2,500 feet.	**Unlikely.** Lack of suitable habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity or elevation.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Camp Verde cotton rat	*Sigmodon arizonae arizonae*			WSC	**Range:** Camp (Fort) Verde, Yavapai County, Arizona. **Habitat:** Species at large known to life in desert areas, usually characterized by mesquite and tumbleweeds with a small amount of grass. Also live in less arid areas along canals and banks of small streams with weeds and brush. It is estimated that 90-95% of all habitat is found within 10 miles of waterways and drainages of southern Arizona. **Elevation:** 3,200 feet	**None.** Lack of suitable roosting or foraging habitat in the project area. There are no perennial streams or rivers within the project area.
Cave myotis	*Myotis velifer incautus; brevis*	SC	S		**Range:** This species ranges from Honduras to Kansas, and west to southeastern California. Found in much of the state of Arizona, except for the extreme southwestern part of the state. **Habitat:** The species roost in caves, tunnels, and mineshafts, and under bridges, and sometimes in buildings within a few miles of water in areas of desertscrub of creosote, brittlebush, palo verde and cacti. Winter roosts in Arizona are wet mine tunnels above 6000 feet, where preferred temperatures reported as 8°-11° C. **Elevation:** Active from 300—5,000 feet	**Unlikely.** Marginally suitable foraging habitat may be present in the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Fringed myotis	*Myotis thysanodes thysanodes*	SC			**Range:** Western North America from British Columbia into Mexico. Found throughout much of Arizona, though not known from northeast or southwest corners. Their winter range in Arizona shifts to the southernmost counties and Mohave County. **Habitat**: Found in middle elevation habitats ranging from deserts, grasslands, and woodlands, and most frequently captured in oak-piñon woodlands and other open, coniferous, middle-elevation forests. Roosts in caves, mine tunnels, in large snags, under exfoliating bark, and in buildings. **Elevation:** 4,000—8,437 feet	**Possible.** Potentially suitable foraging habitat occurs in or near the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.
Hualapai Mexican vole	*Microtos mexicanus hualapaiensis*	E		WSC	**Range:** Restricted to Arizona, in Mohave, Coconino, and Yavapai Counties. **Habitat:** Preferred habitat is grassy areas usually in or adjacent to spruce-fir, ponderosa pine, or Gambel's oak stands at higher elevations (above 6,000 feet), and piñon-juniper woodland or sagebrush at lower elevations (below 6,000 feet). Presently found only in moist, grass/sedge habitats along permanent and semi-permanent waters, but may be capable of occupying drier areas when grass/forb habitats are available. **Elevation:** 3,080—8,400 feet	**Unlikely.** Some marginal foraging habitat may exist in the project area, but distance from ideal habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity. *Federal sources do not list this species as having presence in Yavapai County, but AGFD considers presence possible.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Long-legged myotis	*Myotis volans interior*	SC			**Range:** Found from southern Alaska and western Canada, southward into northern Mexico. The species is found In forested mountains of Apache, Cochise, Coconino, Gila, Greenlee, Mohave, Navajo, and Yavapai counties. Absent from desert and desert mountains of southwestern part of the state. **Habitat:** Although primarily a coniferous forest bat, it can also be observed in riparian and desert habitats. This species utilizes a variety of roosts including abandoned buildings, cracks in the ground, crevices in cliff faces and spaces behind exfoliating tree bark. Caves and mine tunnels are used as hibernacula. In the summer, they apparently do not use caves as a daytime roost site. **Elevation:** 4,000—12,000 feet	**Unlikely.** Lack of suitable foraging and roosting habitat located within the project area. Species may winter in nearby abandoned mines, though, species not known to occur in the project vicinity.
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	SC	S		**Range:** Widespread in Arizona, this species is found throughout western Canada, the western US to southern Mexico; a few isolated populations exist in the midwestern US. **Habitat:** In Arizona, summer day roosts are found in caves and mines from desertscrub up to woodlands and coniferous forests. Night roosts may often be in abandoned buildings. In winter, they hibernate in cold caves, lava tubes and mines mostly in uplands and mountains from the vicinity of the Grand Canyon to the southeastern part of the state. **Elevation:** 550—8,437 feet (few records below 3,000 feet)	**Possible.** Suitable foraging habitat may be present in the project area. Suitable roost sites may be available in nearby abandoned mines, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Spotted bat	*Euderma maculatum*	SC	S	WSC	**Range:** Locally distributed throughout central western North America from southern British Columbia and Montana, south through California and Big Bend, Texas to Durango and Queretaro, Mexico. Local populations known to exist at several sites throughout Arizona. **Habitat:** Varied. In Arizona, most are captured in dry, rough desertscrub with a few captured or heard in ponderosa pine forest. This bat has been found from low desert in southwestern Arizona to high desert and riparian habitats in northwestern Arizona and Utah, and conifer forests in northern Arizona and other western states. Limited observations suggest that they prefer to roost singly in crevices and cracks in cliff faces. Believed to be an elevational migrant. **Elevation:** 110—8,670 feet	**Possible.** Suitable foraging habitat may be present in the project area. Suitable roost sites may be available in nearby abandoned mines, though, species not known to occur in the project vicinity.
Western red bat	*Lasiurus blossevillii*			WSC	**Range**: Western Canada, western US and western Mexico to Central America. Generally distributed in south central to southern and southeastern Arizona, with a few observations along the Colorado River near Bill Williams. **Habitat:** Preferred habitat includes riparian and wooded areas, roosting during the day in trees. Summer roosts usually in tree foliage, sometimes in leafy shrubs or herbs. They may also roost in saguaro boots, and occasionally in cave-like situations although they generally avoid caves and buildings during both summer and winter. **Elevation**: 1,900—7,200 feet	**None.** Lack of suitable riparian foraging and roosting habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Western small-footed myotis	*Myotis ciliolabrum*	SC			**Range:** From southern British Columbia, Alberta, and Saskatchewan to the southwestern US. Found in Cochise, Coconino, Graham, Mohave, Pinal, and Yavapai counties in Arizona. **Habitat:** This species is more common in montane and coniferous forests, rarely occurring below the level of ponderosa pine. Roosts singly or in small groups in cracks and crevices in rock, caves, mines, under tree bark, in abandoned swallow nests, and in buildings. **Elevation:** 2,100—8,670 feet	**Unlikely.** Lack of suitable foraging habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.
Plants						
Aquarius milkvetch	*Astragalus newberryi var. aquarii*	S			**Range:** Burro Creek, Mohave County, Arizona. **Habitat:** The seraphic islands on which this species grows do not support Sonoran Desert dominants such as creosote bush and foothill palo verde. Occurs with other rare plants, mostly in the BLM Clay Hills Area of Critical Environmental Concern. **Elevation:** 2,000—2,600 feet	**None.** Lack of suitable habitat within the project area.
Aravaipa wood fern	*Thelypteris puberula var. sonorensis*		S		**Range:** Arizona, including Yavapai County, southwestern California to western Mexico. **Habitat:** This species is found in moist soil in the shade of boulders in mesic canyons, on riverbanks, seepage areas, and meadow habitats. **Elevation:** 2,220—4,500 feet	**None.** Lack of suitable habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Arizona cliffrose	*Purshia subintegra*	E		HS	**Range:** Endemic to Arizona. **Habitat:** Rolling, rocky, limestone hills and slopes within Sonoran desertscrub. The species occurs where the winters are mild, summers are hot, and rainfall is evenly distributed between summer and winter rainfall periods. **Elevation:** 2,120—4,000 feet	**None.** Lack of suitable habitat within the project area.
Arizona giant sedge	*Cares ultra*	S			**Range:** Species occurs only in southeast Arizona, extreme southwest New Mexico and northern Mexico. **Habitat:** Moist soil near perennially wet springs and streams in undulating rocky-gravelly terrain. **Elevation:** 2,040—6,000 feet	**None.** Lack of suitable habitat within the project area.
Cameron water-parsley	*Cymopterus megacephalus*	SC			**Range:** Endemic to northern Arizona. From eastern Coconino County, north and south of Cameron, and north of Gray Mountain, northeast of Flagstaff. Also collected in Yavapai County near Montezuma Castle. **Habitat:** In Yavapai County, collected on Canotia hillsides with limey soil. **Elevation:** Not available	**None.** Lack of suitable habitat within the project area.
Flannel bush	*Fremontodendron californicum*		S	SR	**Range:** Central Arizona, southern California, and Baja California, Mexico. Specific range in Arizona includes several locations in southern Yavapai County. **Habitat:** Mainly well-drained rocky hillsides and ridges, in chaparral and oak/pine woodland. In Arizona, usually on dry, north slopes in canyons. **Elevation:** 1,312—6,562 feet	**Possible.** Suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Hohokam agave	*Agave murpheyi*	SC	S	HS	**Range:** Found in wild from central Arizona to Sonora, Mexico. Most instances centered around Hank Raymond Lake bordered by Yavapai and Maricopa counties. **Habitat:** In central Arizona, usually found on benches or alluvial terraces on gentle bajada slopes (not steep slopes or drainage bottoms) above major drainages in desert scrub, with pre-Columbian agricultural and settlement features, having been cultivated by the Hohokam. The species requires a well-drained soil, being susceptible to root-rot. **Elevation:** 1,300—3,200 feet	**None.** Lack of suitable habitat within the project area.
Mogollon fleabane	*Erigeron anchana*	SC			**Range:** Known mainly from the mountains of central Arizona, Gila County, including the Sierra Ancha, Pine, Mazatzal, and Mescal mountains. One location from the Superstition Mountains in Pinal County. The Sierra Ancha's are the center of their range. **Habitat:** Granite cliff faces, chaparral through pine forests; rock crevices or ledges on boulders and vertical rock faces, usually in canyons. **Elevation:** 3,500—7,000 feet	**Possible.** Suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.
Parish's alkali grass	*Puccinellia parishii*	SC		HS	**Range:** Historically five small, widely disjunct sites from California, Nevada, Arizona and New Mexico. A population was located in Yavapai County in a tributary to Little Shipp Wash. **Habitat**: Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes. This species requires continuously damp soils during its late winter to spring growing period. **Elevation**: 2,780—7,350 feet	**None.** Lack of suitable habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Pima Indian mallow	*Abutilon parishii*	SC	S	SR	**Range:** Presently known from 84 populations in 17 mountain ranges from Bagdad to Nachopouli Canyon, Sonora, Mexico. **Habitat:** Mesic situations in full sun within higher elevation Sonoran desertscrub. On rocky hillsides, cliff bases, canyon bottoms, lower side slopes and ledges of canyons among rocks and boulders. In riparian zones, occurs on flat secondary terraces but typically not in canyon bottoms. **Elevation:** 1,720—4,900 feet	**Unlikely.** Lack of suitable habitat in the project area. A population is known to occur in Little Shipp Wash drainage, 3—10 miles from the project area, but hydrologically disconnected.
Ripley wild-buckwheat	*Eriogonum ripleyi*	SC		SR	**Range:** Known from five widely separated localities in central to northwestern Arizona, where it seems to be restricted to white, calcareous substrates. **Habitat:** In Tertiary lakebeds on well-drained powdery soils derived from limestone, sandstone, or volcanic tuffs and ashes. **Elevation:** 2,000—6,000 feet	**None.** Lack of suitable habitat in the project area.
Tonto Basin agave	*Agave delamateri*	SC		HS	**Range:** Small geographic area in Central Arizona. **Habitat:** Usually found atop benches at edges of slopes, and on open hilly slopes in desert scrub, overlooking major drainages and perennial streams. Occasionally found in chaparral or juniper-grassland. Species requires a well-drained soil, being susceptible to root-rot. **Elevation:** 2,190—5,100 feet	**Unlikely.** Marginally suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Tusayan flame flower	*Phemeranthus validulus*	SC		SR	**Range:** Present only in several separate localities in Coconino and Yavapai Counties, Arizona. Locations in Yavapai County include the Juniper Mountains, Big Black Mesa, and Black Hills. **Habitat:** Open mountain meadows with very shallow rocky clay soils derived from basalt in ponderosa pine forest, and shallow basins at rims of canyons and flat ridgetops with cherty gravels from Kaibab limestone in piñon-juniper woodland. **Elevation:** 5,590— 7,700 feet	**None.** Lack of suitable habitat in the project area.
Verde Valley sage	*Salvia dorrii ssp. mearnsii*	SC		SR	**Range:** Verde Valley and Upper Verde River, Yavapai County; and near Sedona, Coconino County, Arizona. **Habitat:** Restricted to open creosotebush-shrub community on gypseous limestone. **Elevation:** 3,120—5,120 feet	**None.** Lack of suitable habitat in the project area.
Reptiles						
Banded Gila monster	*Heloderma suspectum cinctum*	SC			**Range:** Mainly northwestern Arizona, with immediately adjacent isolated populations in Utah, Nevada and California. They have also been found in western Arizona in northwest Maricopa County and southwest Yavapai County. **Habitat:** In Arizona, primarily in Sonoran Desert and extreme western edge of Mohave Desert, less frequent in desert-grassland and rare in oak woodland. Most common in undulating rocky foothills, bajadas and canyons. **Elevation:** 0—5,000 feet	**Unlikely.** Some marginal habitat may exist in the project area. Species presence limited to rare transients.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Narrow-headed gartersnake	*Thamnophis rufipunctatus rufipunctatus*	PT		WSC	**Range:** Mountains of central and eastern Arizona and west-central New Mexico. A second disjunct population found in Northern Sonora and Chihuahua, south in the Sierra Madre Occidental to central Durango, Mexico. **Habitat:** Highly aquatic species found in permanently flowing streams in piñon-juniper and pine-oak woodland into ponderosa pine forest. Strongly associated with clear, rocky streams, using predominantly pool and riffle habitat that includes cobbles and boulders, sometimes sheltered by broadleaf deciduous trees. Has also been observed using lake shoreline habitat. **Elevation:** 2,440—8,080 feet; primarily 4,000—6,000 feet	**None.** Lack of suitable aquatic habitat within the project area.
Northern Mexican gartersnake	*Thamnophis eques megalops*	PT		WSC	**Range**: Historically found in New Mexico, Arizona, and Mexico. In Arizona, its distribution has been reduced to less than 10 percent of its former range along mainstem rivers. The species is likely extant in fragmented populations within the middle/upper Verde River drainage, middle/lower Tonto Creek, and the Cienega Creek drainage, as well as a small number of isolated wetland habitats in southeastern Arizona. **Habitat**: Three general habitat types are used: 1) source area ponds and cienegas; 2) lowland river riparian forests and woodlands; 3) upland stream gallery forests. Most abundant in densely vegetative habitat. **Elevation**: 3,000—5,000 feet; may reach 8,500 feet	**None.** Lack of suitable habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA**	**BLM**	**AZ**		
Sonoran Desert tortoise	*Gopherus morafkai*	C		WSC	**Range:** The tortoise ranges from northern Sinaloa north to southern Nevada and southwestern Utah, and from south central California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act: the threatened Mojave population occurs north and west of the Colorado River, and the Candidate designated Sonoran population occurs south and east of the Colorado River. **Habitat:** The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub. In the Lower Colorado River Valley subdivision, caliche caves in cut banks of washes (arroyos) are also used for shelter sites. Shelter sites are rarely found in shallow soils. **Elevation:** Sonoran population 510—5,300 feet	**Possible.** Some suitable habitat exists in the project area. Species known to occur in the project vicinity.

Guide for potential for occurrence:
None: no suitable habitat is present or the species is not found within the elevation range of the Project site
Unlikely: no documentation; low or marginal habitat quality; outside, but close to, currently known geographic or elevational distribution; species may pass/migrate through Project site
Possible: no documentation but suitable habitat within range occurs
Present: species have been documented to occur

Sources:

Arizona Game and Fish Department. 2014. Special Status Species by County, Taxon, Scientific Name. Revised January 6, 2014. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_species_lists.shtml.

_____ . 2014. Plant and Animal Abstracts, Distribution Maps, & Illustrations. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml.

US Fish & Wildlife Service (USFWS). 2014. Environmental Conservation Online System. Species by County Report: Yavapai County, AZ. Retrieved from: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=04025.

_____ . 2013. Arizona Ecological Services Field Office. Listed and Sensitive Species in Yavapai County. Revised October 30, 2013. Retrieved from: http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Yavapai.pdf.

Special status plant and wildlife species are subject to regulations under the authority of federal and state agencies. Federal special status species include threatened and endangered species protected pursuant to the Endangered Species Act (ESA) of 1973, Section 4, as amended. Species designations prior to 1973 were originally appointed by the predecessor of the ESA, the Endangered Species Preservation Act of 1966. Additional USFWS designations include Proposed, Candidate, Species of Concern, and Delisted Monitoring. The BLM has designated some species as Sensitive. Species designations are defined as:

E Endangered species are those species in danger of extinction throughout all or a significant portion of their range.

T Threatened species are those species likely to become endangered in the foreseeable future.

C Candidate species are those species for which FWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species are not protected under the ESA.

R Recovery species are those which have previously been listed as threatened or endangered and have had that listing removed or reduced while remaining species of concern.

SC Species of Concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. Species of Concern is an informal term that refers to those species that the USFWS believes may be in need of concentrated conservation actions. Conservation actions, such as monitoring, vary depending on the health of the populations and degree and type of threats.

PT Proposed Threatened

EXPN Experimental, Nonessential Population designations imply the experimental population is not essential for the continued existence of the species.

S BLM Sensitive are those taxa occurring on BLM managed lands which are considered sensitive by the Arizona State Office.

*S BLM Proposed Sensitive species; species that are not currently considered Sensitive, but are proposed to be listed as Sensitive

WSC Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the AGFD.

HS Highly Safeguarded- no collection allowed under the Arizona Native Plant Law

SR Salvage Restricted- collection only with permit under the Arizona Native Plant Law

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APPENDIX F HANDLING GUIDELINES FOR SONORAN DESERT TORTOISE

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GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES ENCOUNTERED ON DEVELOPMENT PROJECTS

Arizona Game and Fish Department
Revised October 23, 2007

The Arizona Game and Fish Department (Department) has developed the following guidelines to reduce potential impacts to desert tortoises, and to promote the continued existence of tortoises throughout the state. These guidelines apply to short-term and/or small-scale projects, depending on the number of affected tortoises and specific type of project.

The Sonoran population of desert tortoises occurs south and east of the Colorado River. Tortoises encountered in the open should be moved out of harm's way to adjacent appropriate habitat. If an occupied burrow is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow or other appropriate shelter, as determined by a qualified biologist. Tortoises should be moved less than 48 hours in advance of the habitat disturbance so they do not return to the area in the interim. Tortoises should be moved quickly, kept in an upright position parallel to the ground at all times, and placed in the shade. Separate disposable gloves should be worn for each tortoise handled to avoid potential transfer of disease between tortoises. Tortoises must not be moved if the ambient air temperature exceeds 40° Celsius (105° Fahrenheit) unless an alternate burrow is available or the tortoise is in imminent danger.

A tortoise may be moved up to one-half mile, but no further than necessary from its original location. If a release site, or alternate burrow, is unavailable within this distance, and ambient air temperature exceeds 40° Celsius (105° Fahrenheit), the Department should be contacted to place the tortoise into a Department-regulated desert tortoise adoption program. Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and highway projects), or those requiring removal during long-term (longer than one week) construction projects, will also be placed in desert tortoise adoption programs. *Managers of projects likely to affect desert tortoises should obtain a scientific collecting permit from the Department to facilitate temporary possession of tortoises.* Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

Please keep in mind the following points:

- These guidelines do not apply to the Mojave population of desert tortoises (north and west of the Colorado River). Mojave desert tortoises are specifically protected under the Endangered Species Act, as administered by the U.S. Fish and Wildlife Service.

- These guidelines are subject to revision at the discretion of the Department. We recommend that the Department be contacted during the planning stages of any project that may affect desert tortoises.

- Take, possession, or harassment of wild desert tortoises is prohibited by state law. Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.