NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT CONDITIONS FOR THE CARLOTA COPPER PROJECT, GILA AND PINAL COUNTIES, ARIZONA

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

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BACKGROUND

The Carlota Copper Company has proposed to construct, operate, and reclaim the Carlota Copper Project, an open-pit copper mine and associated processing facilities, located approximately 6 miles west of Miami, Arizona. The proposed mine is located on lands administered by the Globe Ranger District of the Tonto National Forest and private land.

An Environmental Impact Statement (EIS) was prepared for the project. The Lead Agency for the Carlota Copper Project EIS was the United States Forest Service (USFS), Tonto National Forest, with the Army Corps of Engineers (Corps) and the Arizona Department of Environmental Quality (ADEQ) as cooperating agencies. The EIS was prepared to address regulatory requirements of the federal permitting agencies, pursuant to the National Environmental Protection Act (NEPA). The USFS issued a Final EIS in July 1997. The Corps issued a Supplemental Environmental Assessment (EA) in January 1998 for the Carlota Copper Project to address additional Corps regulatory responsibilities identified under Section 404 of the Clean Water Act (CWA).

The Carlota Copper Company has applied for an NPDES permit from the United States Environmental Protection Agency (EPA). On July 24, 2000, EPA public noticed the adoption of the 1997 Final EIS and the 1998 Corps EA for issuance of the NPDES permit. Subsequently, two permit conditions were withdrawn by EPA.

This Environmental Assessment (EA) has been prepared to further analyze and document environmental consequences associated with two NPDES permit conditions under NEPA:

> A permit condition that a partial reclamation be conducted of an inactive mine (the Gibson Mine) located south of the proposed Carlota Mine.
>
> A permit condition allowing periodic discharges of ground water from a developed wellfield into Waters of the United States.

The partial reclamation of the Gibson mine was included offset potential loadings of dissolved copper into Pinto Creek. Two alternatives are analyzed in this EA:

> No Action Alternative

Proposed Action Alternative

NO ACTION ALTERNATIVE

Under the No Action Alternative, the two specified conditions would not be included in an NPDES permit. The proposed partial reclamation of the Gibson mine would not be conducted and periodic discharges of ground water from a developed wellfield into Waters of the United States would not be allowed.

The No Action/No Project alternative for the Carlota Copper Project was addressed in the previous EIS and EA and is not discussed in this EA.

PROPOSED ACTION ALTERNATIVE

The Proposed Action Alternative, within the context of this EA, is composed of the implementation of two NPDES permit conditions.

Partial Reclamation of the Gibson Mine

The Gibson Mine is located 6 miles west-southwest of Miami, Arizona in Gila County on the watershed divide between the Pinto Creek and Mineral Creek drainages and covers a total area of approximately 320 acres (WRA, 1993).

The Gibson Mine produced copper ore, mostly oxides, from 1908 to 1919, with sporadic production continuing through 1930 (ADEQ, 1995). Leaching of low-grade ore was conducted in the 1960s and 1970s by installation of a leach pad, process ponds and an iron-precipitation recovery system. The site was subleased by Lodestar Minerals, Inc. in 1988 who rebuilt the ponds, and reestablished the leach pad and copper recovery system (ADEQ, 1995). The site is currently abandoned with the leach pad, and two process ponds remaining on the Pinto Creek side of the divide and abandoned *in situ* leaching operations on the Mineral Creek side of the divide. On the Pinto Creek side of the divide, the leach pad consists of approximately 20,000 tons of ore that contains copper oxide and sulfide minerals (Mining & Environmental Consultants, Inc., 1993a).

The partial reclamation of the Gibson mine as described by Carlota Copper Company (1999) includes:

- Removal of the PLS pond located at the toe of the leach pad;
- Removal of the raffinate pond located south-southeast of the leach pad;
- Excavation and relocation of the leach pad material away from the immediate drainage and configuring it to minimize drainage and runoff.

- Covering the removed leach pad material with non-mineralized local fill and soil;
- Prevent runoff from the upper watershed from coming in contact with the relocated leached material and cover.

Local fill and soil for capping the disposed leach pad material would be obtained from the proposed disposal site and, if required, from a disturbed area of clean fill located immediately south of the raffinate pond. Prior to removal of the ponds, any existing solution and rainwater in the process ponds would be pumped out and disposed of at an approved off-site disposal facility. Pond liners, and associated piping from the leach pad and ponds would also be disposed of at an approved off-site disposal facility. A conceptual drawing of the existing leach pad, process ponds, the iron-precipitation process system, and the location of the proposed disposal area is provided in Figure 2-2 of the main text.

Periodic Discharges of Ground Water to Waters of the United States

A water supply wellfield would be developed to provide supplemental water for the Carlota Copper Project, as described in Chapter 2, Section 2.1.1.4 of the Final EIS (USFS, 1997). The wellfield would be developed in a defined area along Haunted Canyon and Pinto Creek. Figure 2-3 of the main text depicts the location of the water supply wellfield and the location of test wells that were installed to characterize aquifer production and ground water quality, and to evaluate impacts. The Final EIS identified potential reductions to stream base flows in Haunted Canyon and Pinto Creek as a result of pumping in this wellfield. These impacts are described in Chapter 3, Section 3.3.2.1, and as a result, mitigation measures were defined in Chapter 3, Section 3.15 of the 1997 Final EIS. These mitigation measures are:

- Conduct additional aquifer and wellfield testing during the mine construction phase but prior to wellfield production for operating the mine.

- Implement a wellfield mitigation program to offset potential flow reductions in Haunted Canyon and Pinto Creek and to maintain aquatic and riparian resources at pre-project levels. Streamflow would be augmented with ground water pumped from the wellfield, or with water from other suitable sources(s) approved by the USFS and other appropriate agencies.

- Implement measures, as necessary to ensure that the water discharged to supplement stream flow meets applicable Arizona water quality standards.

The wellfield mitigation program is described in Appendix E of the 1997 Final EIS. Under this program, stream flow in Haunted Canyon and Pinto Creek would be continuously monitored at defined points of compliance. Pumped water from the wellfield would be discharged to Haunted Canyon to augment stream flow, should stream flows fall below monthly minimum flow values specified in the plan. The mitigation plan also specifies resource maintenance flow levels (i.e., well discharge rates) that are required to prevent impacts to downstream riparian and aquatic resources by month. The plan further specifies the maximum discharge rates that can be used for augmentation.

The mitigation plan identifies four approximate locations for discharge of mitigation water:

- Powers Gulch above its confluence with Haunted Canyon;
- Haunted Canyon below its confluence with Powers Gulch;
- Haunted Canyon above ambient water quality monitoring station HC-2; and
- Pinto Creek near ambient water quality monitoring station AMW-23.

A system of above-ground, temporary, flexible and moveable piping will be used to maximize the effectiveness of mitigation measures.

ENVIRONMENTAL CONSEQUENCES

This EA describes and compares the environmental consequences of the No Action Alternative and the Proposed Action Alternative. Another objective of the EA is to determine whether the benefits of the Proposed Action outweigh its potential impacts. Measures to reduce impacts are proposed, as necessary. The following discussion summarizes the impacts of the two alternatives by impact area and then presents a summary table for comparison. Detailed discussions are provided in the body of the text.

Climate, Air Quality, Visibility and Odor

The No Action Alternative would not impact climate, air quality, visibility or odor.

The Proposed Action Alternative would result in emissions of fugitive dust, particulate matter less than 10 microns in diameter (PM_{10}), nitrogen oxide

compounds (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), and volatile organic compounds (VOCs) during construction operations associated with the partial reclamation of the Gibson mine. These emissions would be temporary, localized and insignificant relative to air quality standards associated with health effects, visibility and long range goals for air quality improvement.

Geology and Soils

The No Action Alternative would not impact soils or geology.

The Proposed Action would remove and relocate the leach pad materials at the Gibson mine and would involve the construction of a surface cap. The approximate area of the proposed relocation site is approximately 0.5 acre. Soil and geologic values would not be significantly impacted. Discharges of ground water under the conditions specified by the wellfield mitigation program would occur during low flow periods, which would substantially limit the potential for erosion.

Water Quality

The No Action Alternative would continue to result in adverse impacts to water quality, riparian vegetation, wetlands, and Waters of the U.S. because contaminant concentrations would not be reduced by the partial reclamation of the Gibson Mine and because stream flows would not be augmented in Haunted Canyon, Powers Gulch, or Pinto Creek.

Both components of the Proposed Action Alternative are designed to mitigate water quality impacts in terms of contaminant concentrations and stream flows and would have a beneficial impact. The temperature of the discharge of wellfield bedrock ground water would not produce a significant adverse impact to ambient surface water temperature.

Wellfield mitigation measure WR-4 included in the Final EIS states that any water discharged to Haunted Canyon or Pinto Creek from wellfield mitigation pumping would have to meet applicable Arizona surface water quality standards, including temperature. Because the wellfield discharge points are referenced as individual point source discharges on the cover page of the Carlota NPDES permit, surface water quality standards for temperature apply at the point of discharge to Haunted Canyon or Pinto Creek.

Discharge or instream temperature monitoring were not included in the wellfield monitoring requirements of the NPDES permit and they presently are not included in the Carlota Wellfield Mitigation Program, dated July 27, 1997. In

a letter dated March 27, 2001, EPA requested that the USFS, in cooperation with the Carlota Copper Co., amend the Wellfield Mitigation Program to include temperature monitoring. The USFS concurred with EPA's request in a letter dated April 17, 2001. In this letter, Tonto National Forest agreed to amend the workplan prepared for additional wellfield and aquifer testing as required by mitigation measure WR-2 in the Final EIS to include continuous and concurrent water temperature monitoring of the wellfield mitigation discharges and ambient stream water during testing of the wellfield program; daily water temperature measurement of wellfield mitigation discharges and ambient instream water during testing of a mitigation measure; and revision of the Ground and Surface Water Monitoring Plan to include daily or weekly water temperature measurements of mitigation discharges and instream flows during periods of wellfield mitigation discharges.

Ground Water

The No Action Alternative would not result in impacts to existing ground water resources. The Proposed Alternative would reestablish historic drainage pathways across the Gibson mine site, but these changes in site hydrology would not be expected to significantly impact existing ground water conditions or hydrogeology. Implementation of the wellfield discharge program, which was designed to address ground water drawdown impacts on surface waters, would not be expected to adversely impact ground water resources.

Vegetation and Wetlands

The No Action Alternative will not impact vegetation, wetlands, or Waters of the U.S. at the Gibson Mine site. However, the No Action Alternative would allow adverse impacts to continue downstream on vegetation, wetlands, and Waters of the U.S. through unrestricted loading of dissolved copper and other contaminants to the Gibson Mine tributary and Pinto Creek.

The Proposed Action Alternative is not expected to adversely impact wetlands, Waters of the U.S., and vegetation at the Gibson Mine site in a significant manner. Removal of the PLS pond, raffinate pond, and heap leach pad would not disturb existing vegetation because no vegetation exists in these areas and material disposal areas would be capped with non-mineralized local soil. Some vegetation could be adversely impacted around the edges of the disposal area and around the borrow pit. Heavy brush will need to be cleared around the perimeter of the disposal site, the width of the cleared area would be approximately 10 feet. Additionally, a temporary road would need to be constructed between the leach pad and the proposed disposal area. Road construction would require clearing of scrub oak and juniper along the road

alignment between the leach pad and proposed disposal area, a distance of approximately 120 feet. Reseeding of the cap has not been proposed; however, some establishment of vegetation could occur over time on the surface cap from natural recruitment.

Pipelines from the wellfield would be placed on the ground. Some minor and inconsequential disturbance of local vegetation would be expected.

Wildlife and Threatened and Endangered (T&E) Species

The No Action Alternative may directly and indirectly impact wildlife, wildlife habitat, aquatic species, and T&E and other special status species in Haunted Canyon, Powers Gulch, and Pinto Creek due to unrestricted loading of dissolved copper and other contaminants to the Gibson Mine tributary and Pinto Creek. Potential direct and indirect impacts to special status species may arise from lowered baseflows in Haunted Canyon, Powers Gulch, and Pinto Creek and continued degradation of water quality in Pinto Creek. Lowered baseflows could directly impact the Maricopa tiger beetle, Arizona toad, and lowland leopard frog by reducing available habitat for foraging and breeding. The Arizona toad is susceptible to continued degradation of water quality if partial reclamation of the Gibson Mine site does not occur. The yellow-billed cuckoo and common black-hawk could also be indirectly impacted by the No Action Alternative if lower baseflows decrease the acreage of riparian habitat adjacent to the impacted streams.

The Proposed Action Alternative would mitigate potential impacts to special status species by addressing water quality issues and stream flow requirements. Partial reclamation of the Gibson Mine site would not directly or indirectly impact the Arizona agave (*Agave arizonica*) and Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*) or other special status species. A site visit to the Gibson Mine site on December 12, 2000 by the U.S. Forest Service and representatives from Carlota Copper Company determined that these plant species do not occur at the Gibson Mine site.

Cultural Resources

The No Action Alternative would not impact any prehistoric or historic cultural resources at the Gibson Mine site.

The Proposed Action Alternative would not produce a significant adverse impact to historic archaeological site AZ V:9:423 (ASM). This site is outside of the boundary of the proposed relocation site for the leach pad material and will be avoided during reclamation activities. Precautionary measures will be taken

to ensure that adverse impacts do not occur; these measures have been accepted by EPA as stated in correspondence to the State Historic Preservation Office. The State Historic Preservation Office concurred with these measures.

Land Use

Neither alternative is expected to have a significant impact on land use because the primary use (mining) will not change. Impacts to current land use at the Gibson Mine site would not be expected by partial reclamation activities. Implementation of the wellfield mitigation program would not cause significant impacts to current land uses of recreation and grazing.

Hazardous Materials

The No Action Alternative will allow the leach pad, PLS pond, and raffinate pond at the Gibson Mine site to remain in place. The process ponds would continue to collect rainwater and leachate from the leach pad. These ponds would continue to pose a threat to the environment in the event that the geotextile liners fail or the ponds overflow during a severe precipitation event. The leach pad would remain exposed to the environment and pollutants will continue to be mobilized by wind, rain and runoff.

The Proposed Action Alternative would remove the leach pad, PLS pond, and raffinate pond. The mineralized materials associated with the leach pad would be relocated away from the Gibson Mine tributary and capped with non-mineralized local soil to minimize the potential for pollutants to be mobilized by wind or rain. The process ponds would be pumped out, deconstructed, and all materials would be disposed of at an approved disposal facility. By removing or covering these potential sources of pollutants, the Proposed Alternative would have a positive impact on water quality downstream from the site.

Noise

The No Action Alternative would not cause ambient noise levels to increase.

The Proposed Alternative would result in temporary increases in ambient noise levels during construction, hauling and earthmoving operations. These impacts would be temporary and would be considered insignificant relative to mining operations, which have occurred on the site in the past.

Visual Resources

The No Action Alternative will have no impact on visual aesthetic resources.

The Proposed Action Alternative will result in minor adverse visual impacts during the construction period while making some improvement at the Gibson mine site. Pipelines used for conveyance of ground water to surface water discharge locations may be visible. Within the site area, these disturbances would not be considered substantial.

Socioeconomics

Neither of the alternatives would have an impact on the economic and social conditions in the project area or Gila County.

Recreation

Neither of the alternatives would have a significant impact on outdoor recreation. The Gibson Mine is located on private property and is not developed or suitable for recreation.

Wilderness and Wild and Scenic Rivers

The No Action Alternative could potentially jeopardize the qualities that make an 8-mile perennial section of Pinto Creek, located several miles downstream of the mining project, eligible for a "Scenic" designation. The segment is eligible for inclusion based on scenic, riparian, and ecological values, all of which could be impaired by contaminant loads and by not allowing stream flow augmentation, as specified by the wellfield mitigation plan of the 1997 Final EIS.

The Proposed Action Alternative would protect Pinto Creek.

Transportation

The transport of contaminated materials from the Gibson Mine site to an off-site disposal facility would pose a risk for spills. However, this risk would be quite low and would be sufficiently mitigated by standard practices for hiring and supervising qualified and experienced contractors for this type of work.

Summary Comparison

The findings of the EA indicate that Proposed Action Alternative, inclusion of two conditions, would present some minor environmental impacts that were not

described in the previous EIS and EA. However, it appears that these impacts would be offset by the intended benefits of the conditions. Table ES-1 provides a summary of adverse and positive impacts for major resource areas.

Table ES-1. Summary Comparison of Beneficial and Adverse Impacts of the Proposed Action

Primary Resource Area	Beneficial Impacts Relative to the No Action Alternative	Adverse Impacts	Significance of Impacts	Proposed Mitigation Measures
Climate, Air Quality, Visibility and Odor		Fugitive dust and vehicle emissions could impact PM_{10} concentrations, air quality and visibility.	Temporary, localized and insignificant, relative to air quality standards.	None.
Water Resources, Wildlife, and Threatened & Endangered Species	Reduced contaminant loadings to Pinto Creek from reclamation activities at the Gibson Mine site.		Positive Impact. Beneficial to Pinto Creek water quality, aquatic life, and Waters of the U.S.	None Required
		Potential temperature impacts to surface water from the discharge of ground water.	No significant adverse impact because discharge is required to meet applicable Arizona water quality standards.	Revise USFS Ground Water and Surface Water Monitoring Plan to include monitoring for ground and surface water temperature. NPDES permit requires AZ water quality standards, including temperature to be met at point of discharge.
	Maintenance of minimum surface water flows in Powers Gulch and Pinto Creek by implementation of the wellfield mitigation program.		Positive Impact. Mitigation of potential impacts to aquatic resources, riparian vegetation, protected species, and proposed Wild & Scenic River designation.	
Vegetation and Wetlands		Disturbance of vegetation from partial reclamation activities at the Gibson Mine site.	Minor.	None.

Table ES-1. Summary Comparison of Beneficial and Adverse Impacts of the Proposed Action

Primary Resource Area	Beneficial Impacts Relative to the No Action Alternative	Adverse Impacts	Significance of Impacts	Proposed Mitigation Measures
		Potential disturbance of vegetation from construction of pipelines from wellfield area to surface water discharge points.	Minor and Insignificant.	None.
	Maintenance of minimum surface water flows in Powers Gulch and Pinto Creek by implementation of the wellfield mitigation program.		Positive impact. Maintenance of flows would prevent degradation of the riparian corridor from decreased base flows.	
Cultural Resources		No impacts.		
Transportation		Potential spill of contaminated materials during transfer from Gibson Mine to approved off-site disposal location.	Minor.	None.
Noise		Ambient noise levels would increase during partial reclamation activities at the Gibson Mine site.	Temporary, Localized and Insignificant	None.
Visual Resources		Aesthetic impacts during partial reclamation activities at the Gibson Mine site.	Temporary, Localized and Insignificant	
		Pipelines from wellfield area to surface water discharge points could be visible	Insignificant.	

Table ES-1. Summary Comparison of Beneficial and Adverse Impacts of the Proposed Action

Primary Resource Area	Beneficial Impacts Relative to the No Action Alternative	Adverse Impacts	Significance of Impacts	Proposed Mitigation Measures
Wilderness, Wild & Scenic Rivers, Recreation, Land Use, Geology and Soils, Socioeconomics		No impacts.		

1.0 PURPOSE AND NEED FOR PROPOSED ACTION

1.1 BACKGROUND

The Carlota Copper Company has proposed to construct, operate, and reclaim the Carlota Copper Project, an open-pit copper mine and associated processing facilities located approximately 6 miles west-southwest of Miami, Arizona. The proposed mine is located partly on lands administered by the Globe Ranger District of the Tonto National Forest and partly on private land.

The proposed project would use conventional open-pit mining techniques, such as blasting, truck hauling from the pit to the crusher, and conveyor or truck transport from the crusher to a leach pad to extract copper ore. Acid leaching and solvent extraction/electrowinning would be used to beneficiate the ore to produce copper metal. The project would produce an estimated 900 million pounds of copper. Mining activities would be conducted for approximately 15 years and ore leaching and solution processing would continue for an additional 5 years. Mine closure would be completed in 2 to 3 years following the end of operations and reclamation.

Two mineralized zones, the Carlota and Cactus deposits, would be mined from a single pit referred to as the Carlota Cactus pit. Smaller mineralized zones would be mined from three smaller pits termed the North, Middle and South Eder pits during the latter half of the project. A diversion would be constructed to reroute an intermittent reach of Pinto Creek around the Carlota Cactus pit. Mine rock (i.e., waste rock) would be taken from this pit and deposited in the Main mine rock disposal area located northwest of the Carlota Cactus pit and in the Cactus Southwest mine rock disposal area located south of the pit. In addition, mine rock would be used to partially backfill the Carlota Cactus pit. Mine rock from the three Eder pits would be hauled to the Eder mine rock disposal area located between the Eder North and South pits.

Processing facilities would consist of crushers, a heap-leach pad, and a solvent-extraction/electrowinning (SX/EW) plant. The heap leach pad would be located in the Powers Gulch drainage. Surface runoff from areas up-gradient of the leach pad would be rerouted around the facility via an inlet control structure and a diversion channel. Ore processing would include curing the material with sulfuric acid and leaching it to produce a copper-bearing solution. Pregnant (copper-bearing) leach solution would be collected in internal ponds and then piped to the SX/EW plant for copper recovery.

The water supply requirements for the project would average 590 gallons per minute (gpm). The proposed water sources would consist of a maximum of five

ground water supply wells in the Pinto Creek drainage and dewatering wells around the pits.

Additional facilities for the proposed action would include access and haul roads, power lines, an equipment maintenance shop and warehouse, office and laboratory buildings, water, fuel and reagent tanks, and sewage treatment/disposal systems.

An Environmental Impact Statement (EIS) for the proposed Carlota Copper Project was prepared to address regulatory requirements of the federal permitting agencies, pursuant to the National Environmental Protection Act (NEPA). The lead agency for preparation of the Carlota Copper Project EIS was the United States Forest Service (USFS), Tonto National Forest. The Army Corps of Engineers (Corps) and the Arizona Department of Environmental Quality (ADEQ) served as cooperating agencies. The USFS issued a Final EIS in July 1997. In January 1998, the Corps issued a Supplemental Environmental Assessment (EA) to address additional Corps regulatory responsibilities that were identified under Section 404 of the Clean Water Act (CWA).

1.2 PURPOSE AND NEED FOR ACTION

The Carlota Copper Company has applied for an NPDES permit from EPA. On July 24, 2000, EPA public noticed the adoption of the 1997 Final EIS and the 1998 Corps EA for issuance of the NPDES permit. Subsequently, two permit conditions were withdrawn by EPA.

This Environmental Assessment (EA) has been prepared to further analyze and document environmental consequences associated with the two NPDES permit conditions that were withdrawn.

> A permit condition that a partial reclamation be conducted of an inactive mine (the Gibson Mine) located south of the proposed Carlota Mine.
>
> A permit condition allowing periodic discharges of ground water from a developed wellfield into Waters of the United States.

This EA was prepared in compliance with Council of Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) using EPA regulations (40 CFR Part 6) as guidance.

The environmental analyses of the proposed Carlota Mine project contained in the Final EIS and Supplemental EA (USACE, 1998) are incorporated into this document by reference.

1.3 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This Environmental Assessment analyzes and documents the environmental consequences associated with two NPDES permit conditions that were not addressed in the 1997 Final EIS or the 1998 Supplemental EA. The characteristics of these conditions are described in Section 2. The scope and purpose of this EA are to determine whether the benefits of the permit conditions outweigh any resulting impacts, with and without the consideration of further measures to reduce those impacts.

The following general topics are included in the scope of this EA:

- Physical Environment;
- Biological Environment;
- Cultural Environment; and
- Cumulative Impacts.

In preparing this EA, EPA examined various federal laws and Executive Orders (EOs) in accordance with 40 CFR 6.300. These laws and EOs are:

National Natural Landmarks - The Secretary of the Interior is authorized to designate areas as National Natural Landmarks for listing on the National Registry of Natural Landmarks pursuant to the Historic Act of 1935, 16 U.S. Code (USC) 461 *et seq.*. In conducting the environmental review of the proposed action, EPA is required to consider the existence and location of natural landmarks, using information provided by the National Park Service (NPS) pursuant to 36 CFR 62.6(d).

No natural landmarks listed on the National Registry of Natural Landmarks were identified within the project area.

Historical, Architectural, Archeological, and Cultural Sites - If an EPA action affects any property with historic, architectural, archeological, or cultural value that is listed on or eligible for listing on the National Register of Historic Places, the responsible official is required to comply with the procedures for consultation and comment promulgated by the Advisory Council on Historic Preservation (ACHP) in compliance with Section 106 USC 470, and EO 11593.

Environmental consequences for cultural resources for this project are addressed in Section 3.3. Consultations with the Arizona State Museum and the State Historic Preservation Office, including concurrence with proposed precautionary measures, are included in Appendix B.

Historic, Prehistoric, and Archeological Data - The Archeological and Historic Preservation Act (AHPA) of 1974, 16 USC 469 *et seq*. provides for the preservation of cultural resources, if an EPA activity may cause irreparable loss or destruction of significant scientific, prehistoric, or archeological data. In accordance with the AHPA, the responsible official or the Secretary of the Interior is authorized to undertake data recovery and preservation activities.

Environmental consequences for cultural resources for this project are addressed in Section 3.3. Consultations with the Arizona State Museum (ASM) and the Arizona State Historic Preservation Office (ASHPO) are included in Appendix B.

Wetlands Protection - EO 11990, "Protection of Wetlands" of 1977, requires federal agencies conducting certain activities to avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands, if a practicable alternative exists. Discharge of dredge or fill material into wetlands and other Waters of the U.S. is also regulated under Section 404 of the Clean Water Act.

Environmental consequences for wetland resources for this project are addressed in Section 3.2.1.

Floodplain Management - EO 11988, "Floodplain Management" of 1977, requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, any adverse effects associated with the direct and indirect development of a floodplain.

Environmental consequences for water resources are addressed in Section 3.1.3.

Important Farmlands - EPA Policy to Protect Environmentally Significant Agricultural Lands requires EPA to consider the protection of the nations' significant/important agricultural lands from irreversible conversion to uses that result in their loss as an environmental or essential food production resource. Moreover, the Farmland Protection Policy Act (FPPA), 7 USC 4201 *et seq*., and the U.S. Department of Agriculture's (USDA) implementing procedures require federal agencies to evaluate the adverse effects of their actions on prime and unique farmland, including farmland of statewide and local importance.

The proposed action does not involve conversion of, or otherwise affect, prime, unique, or important farmland.

Coastal Zone Management Act - The Coastal Zone Management Act (CZMA), 16 USC 1451 *et seq.*, requires that federal agencies in coastal areas be consistent

with approved State Coastal Zone Management Programs, to the maximum extent possible. If an EPA action may affect a coastal zone area, the responsible official is required to assess the impact of the action on the coastal zone.

The proposed action does not affect a coastal zone area.

Coastal Barrier Resources Act - The Coastal Barrier Resources Act (CBRA), 16 USC 3501 *et seq*., generally prohibits new federal expenditures and financial assistance for development within the Coastal Barrier Resources System (CBRS) and therefore protects ecologically sensitive U.S. coastal barriers.

The proposed action does not affect any coastal barriers.

Wild and Scenic Rivers - The Wild and Scenic Rivers Act (WSRA), 16 USC 271 *et seq*., establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System, as well as rivers designated on the National Rivers Inventory.

Environmental consequences for Wild and Scenic River Systems are addressed in Section 3.3.8.

Fish and Wildlife Protection - The Fish and Wildlife Coordination Act (FWCA), 16 USC 661 *et seq*., requires federal agencies involved in actions that will result in the control or structural modification of any natural stream or body of water for any purpose, to take action to protect the fish and wildlife resources that may be affected by the action.

Environmental consequences for wildlife and aquatic resources are addressed in Section 3.2.2.

Endangered Species Protection - The Endangered Species Act (ESA), 16 USC 1536 *et seq*., prohibits agencies from jeopardizing threatened or endangered species or adversely modifying habitats essential to their survival.

Environmental consequences associated with Threatened and Endangered Species (T&E) are addressed in Section 3.2.2. Consultation with the U.S. Fish and Wildlife Service (USFWS) for this project is included in Appendix B.

Wilderness Protection - The Wilderness Act (WA), 16 USC 1131 *et seq*., establishes a system of National Wilderness Areas. The WA establishes a policy for protecting this system by generally prohibiting motorized equipment, structures, installations, roads, commercial enterprises, aircraft landings, and mechanical transport.

No wilderness areas occur within the project area.

Air Quality - The Clean Air Act (CAA) requires federal actions to conform to any state implementation plan approved or promulgated under Section 110 of the Act. For EPA actions, the applicable conformity requirements specified in 40 CFR Part 51, Subpart W; 40 CFR Part 93, Subpart B; and the applicable state implementation plan must be met. Under the Federal Rule on General Conformity, 40 CFR Part 93, a conformity determination is required only when emissions occur in a non-attainment area.

Environmental consequences associated with air quality are addressed in Section 3.1.1.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The Carlota Copper Company has applied for an NPDES permit for the Carlota Copper Project. The NPDES permit contains two special permit conditions (EPA, 2000b) that are the subject of this analysis. One special condition is intended to offset potential discharges of dissolved copper into Pinto Creek by specifying partial reclamation of the abandoned Gibson Mine site. The second special condition would allow discharges of ground water into Waters of the United States in order to maintain base-flow conditions downstream. EPA developed and analyzed two alternatives for this project:

1. No Action
2. Proposed Action: Issuance of the NPDES permit with the two specified special permit conditions.

A third alternative that would utilize the proposed mine pit to provide an offset for potential discharges was developed but eliminated from detailed analysis. These alternatives are described below.

2.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, EPA would not issue an NPDES permit to Carlota Copper Company with the two specified special conditions. Consequently, the proposed partial reclamation of the Gibson mine would not be conducted and the permit would not allow periodic discharges of ground water from a developed wellfield into Waters of the United States.

2.2 PROPOSED ACTION ALTERNATIVE

Under this alternative, EPA would issue an NPDES permit to Carlota Copper Company under conditions and effluent limits specified by the permit. Part I.A.11 of the permit specifies two special conditions that would be implemented by the Proposed Action Alternative as described below.

2.2.1 Description of the Partial Reclamation of the Gibson Mine

EPA established a special NPDES permit condition requiring Carlota Copper to conduct a partial reclamation of the inactive Gibson Mine before a discharge is allowed from the Carlota Mine (EPA, 2000b). Part I.A.11.a of the permit states:

> "As described in Parts I.A.1.a & b of this permit, the Permittee must perform reclamation work which will result in a reduction in copper loadings into Pinto Creek from upstream sources which are equal or greater than the projected copper loadings expected through permitted discharges. The reclamation activities

required under this permit, as proposed by the Permittee in a letter to EPA dated November 29, 1999, are listed below:

i. Remove the "PLS pond," located at the toe of the leach area, from the Gibson mine.
ii. Remove the "Raffinate pond," located to the east of the leach area, from the Gibson mine.
iii. Relocate the leached material from the leach pad to an area immediately northeast of the shop and configure it to minimize drainage.
iv. Cover the newly removed leach material with non-mineralized local material.
v. Configure drainage so as to be diverted away from the new location of the leached material."

The Gibson Mine site is located six miles west-southwest of Miami, Arizona in Gila County on the watershed divide between the Pinto Creek and Mineral Creek drainages (Figure 2-1). The portion of the site that is in the Pinto Creek drainage is situated south (upstream) of the proposed Carlota Mine project. Descriptions of the Gibson Mine area and of mining activities that occurred there are contained in reports by SHB AGRA, Inc. (1993), WRA (1993), and ADEQ (1995). The reclamation activities that Carlota Copper has agreed to conduct at the Gibson Mine site are described in Carlota Copper Company (1999).

The Gibson Mine site, which covers a total area of approximately 320 acres (WRA, 1993), is situated entirely on private land. The mine occurs in Township 1 South, Range 14 East, Section 21 (Gila and Salt River baseline and meridian). It is depicted on the U.S. Geological Survey 7.5' quadrangle series topographic map for Pinal Ranch (1979), Gila County, Arizona.

The Gibson Mine produced copper ore, mostly oxidized, from 1908 to 1919, with sporadic production continuing through 1930 (ADEQ, 1995). Leaching of low-grade ore was conducted in the 1960s and 1970s by installation of a leach pad, process ponds and iron-precipitation recovery system. The site was subleased by Lodestar Minerals, Inc. in 1988 who rebuilt the ponds and reestablished the leach pad and copper recovery system (ADEQ, 1995). The site is currently abandoned, with the leach pad and two process ponds remaining on the Pinto Creek side of the divide and abandoned *in situ* leaching operations present on the Mineral Creek side of the divide.

The leach pad consists of approximately 20,000 tons of ore that contains copper oxide and sulfide minerals (Mining & Environmental Consultants, Inc., 1993a). The ore rests on an asphalt liner. During operation, a "barren" solution of dilute acid was applied to the ore pile to extract copper. Copper-bearing ("pregnant") leach solution was collected in the pregnant leach solution pond (PLS), located below and east of the leach pad. This pond is 62 feet by 44.5 feet by 3.4 feet deep

with a volume of 60,200 gallons (SHB AGRA, Inc.,1993). The pregnant solution was passed through an iron precipitation launder to remove copper from solution. The resulting "barren" leach solution was cycled to the raffinate pond for reapplication to the ore pile. The raffinate pond, located south-southeast of the leach pad, is 88 feet by 61 feet by 5.2 feet deep with a volume of 160,800 gallons (SHB AGRA, 1993). Both ponds are lined with a geotextile material.

As described above, the proposed reclamation actions include removal of the PLS and raffinate ponds; excavation, relocation and contouring of the ore materials on the leach pad; covering of the removed ore materials; and contouring of the upper watershed to divert storm runoff away from the ore materials in their new location.

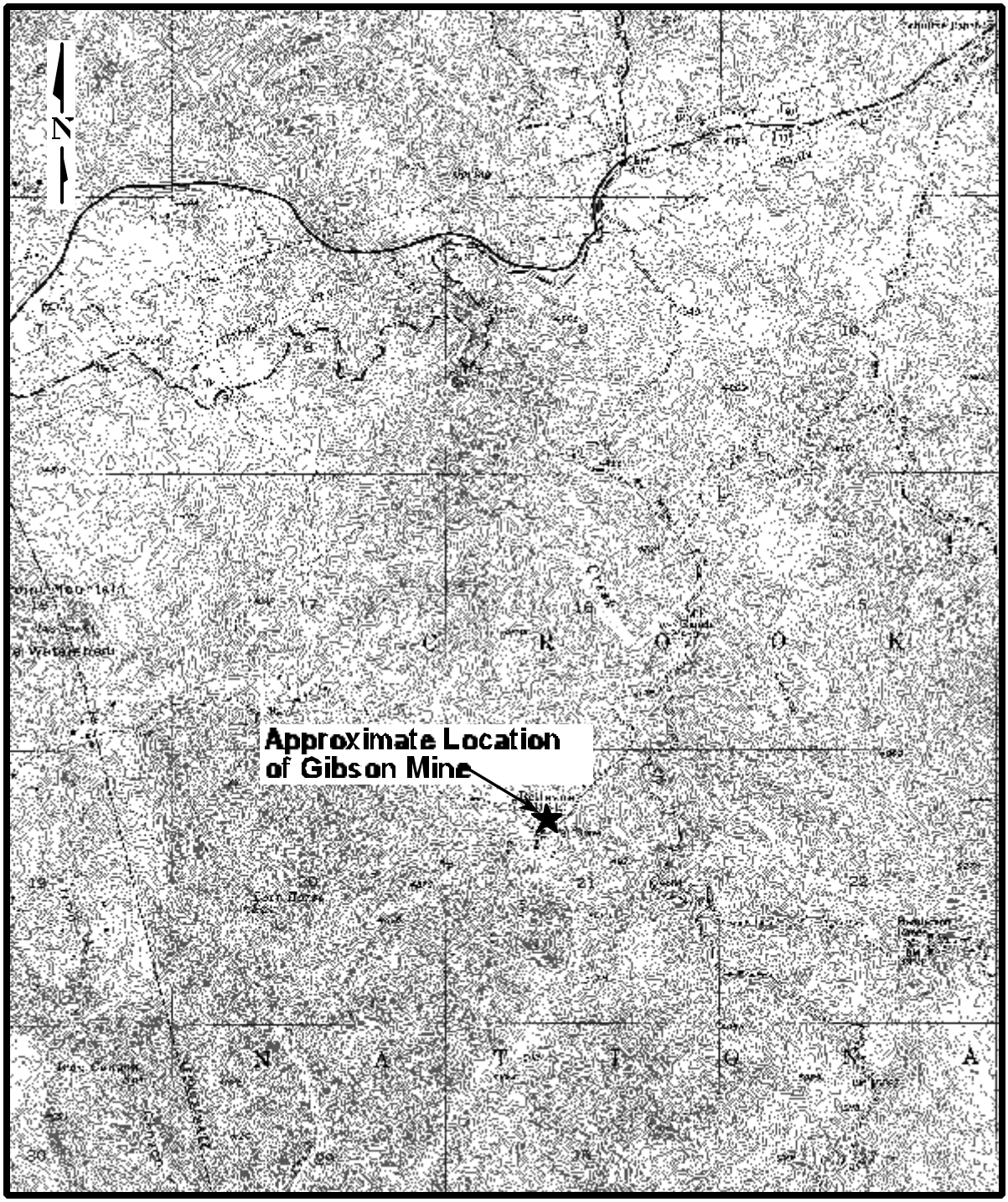


Figure 2-1
Approximate Location of Gibson Mine

Figure 2-2 is a schematic drawing of a portion of the Gibson Mine site that shows the locations of the existing leach pad, process ponds, iron-precipitation process system, and proposed disposal area. Carlota Copper proposes to obtain fill and soil for capping the disposed leach pad material from the proposed disposal site and if required, from a disturbed area of clean fill located immediately east of the raffinate pond. Prior to removal of the ponds, any contained solution or rainwater would be pumped out and disposed of off-site. Pond liners and associated piping from the leach pad and ponds also would be disposed of off-site.

2.2.2 Description of Periodic Discharges of Ground Water to Waters of the United States

A water supply wellfield would be developed to provide supplemental water for the Carlota Copper Project, as described in Chapter 2, Section 2.1.1.4 of the Final EIS. The wellfield would be developed in a defined area along Haunted Canyon and Pinto Creek. Figure 2-3 depicts the proposed location of the water supply wellfield and the location of test wells installed to characterize aquifer production and ground water quality and evaluate impacts. The Final EIS identified a potential reduction in stream base flows in Haunted Canyon and Pinto Creek as an impact that would occur as a result of pumping in this wellfield. These impacts were described in Chapter 3, Section 3.3.2.1 of the Final EIS. Mitigation measures defined in Chapter 3, Section 3.15 included:

i. Conduct additional aquifer and wellfield testing during the mine construction phase but prior to wellfield production during mine operations.

ii. Implement a wellfield mitigation program to offset potential flow reductions in Haunted Canyon and Pinto Creek and to maintain aquatic and riparian resources at pre-project levels. Stream flows would be augmented with ground water pumped from the wellfield, or with water from other suitable sources(s) approved by the USFS and other appropriate agencies.

iii. Implement measures, as necessary, to ensure that water discharged to supplement stream flows meet applicable Arizona water quality standards.

The wellfield mitigation program is described in Appendix E of the Final EIS. Under this program, stream flow in Haunted Canyon and Pinto Creek would be continuously monitored at defined points of compliance. Pumped water from the wellfield would be discharged to Haunted Canyon to augment stream flow,

should stream flows fall below monthly minimum flow values specified in the plan. The mitigation plan also specifies resource maintenance flow levels (i.e., well discharge rates) that are required to prevent impacts to downstream riparian and aquatic resources by month. The plan further specifies the maximum discharge rates that can be used for augmentation.

The mitigation plan identifies four approximate locations for discharge of mitigation water (see Figure 2-3):

i. Powers Gulch above its confluence with Haunted Canyon;
ii. Haunted Canyon below its confluence with Powers Gulch;
iii. Haunted Canyon above ambient water quality monitoring station HC-2; and
iv. Pinto Creek near ambient water quality monitoring station AMW-23.

EPA established a special NPDES permit condition requiring Carlota Copper to implement various elements of it wellfield mitigation program (EPA, 2000b). Part I.A.11.b of the permit states:

> "The following conditions apply to discharges resulting from the operation of the Carlota Wellfield Mitigation Program (outfall 008):
>
> v. All discharges shall be conducted in accordance with the Wellfield Mitigation Program approved by the U.S. Forest Service on July 27, 1997 and any amendments thereto.
> vi. The Permittee will collect and analyze discrete samples, as defined in Part I.E.1, from the wellfield discharges and the receiving stream, on a quarterly basis, for the parameters listed in Table 1 of this permit. The location and number of such samples shall be in accordance with the approved Wellfield Mitigation Program and any amendments thereto.
> vii. All sampling and analysis shall be conducted according to test procedures approved under 40 CFR Part 136 and Section B of this permit. For all metals, sampling results will be reported in terms of both total recoverable and dissolved metals.
> viii. All discharges into Pinto Creek must meet the requirements set forth in Part I.A.2. All discharges into Powers Gulch and/or Haunted Canyon must meet the requirements set forth in Part I.A.3.
> ix. If a discharge sampling result exceeds Arizona's water quality standards for the receiving stream, as of the date of permit issuance, as set forth in A.A.C. R18-11-109, the permittee shall accelerate sampling and analysis under Part I.A.11.b.ii above to monthly for the parameters found in exceedance. If none of the next three monthly sample results exceed the applicable standards, the permittee may return to the quarterly testing frequency for that parameter. If any one of the next three monthly sample results exceeds applicable standards, EPA may reopen the permit in accordance with Part I.A.10.a and impose numeric water quality limitations for those parameters exceeding standards.

x. Reporting:

(1) All results from the wellfield monitoring shall be reported on the Discharge Monitoring Reports (DMRs) as required in Section B.1 of this permit.

(2) After a minimum of eight quarterly sample have been collected and analyzed from the wellfield and receiving water, the Permittee may prepare a report which:

- tabulates the wellfield and instream monitoring results including the method/laboratory detection limits and appropriate surface water quality standard; and
- provides an assessment of the impacts, if any, on the water quality in Pinto Creek.
- Based on the assessment, the Permittee may recommend a reduction or elimination of continued wellfield monitoring on a parameter specific basis.

vii. EPA and ADEQ will review the report and determine whether the permit should be reopened and modified to reduce or eliminate any of the Wellfield Mitigation Program monitoring requirements on a parameter specific basis."

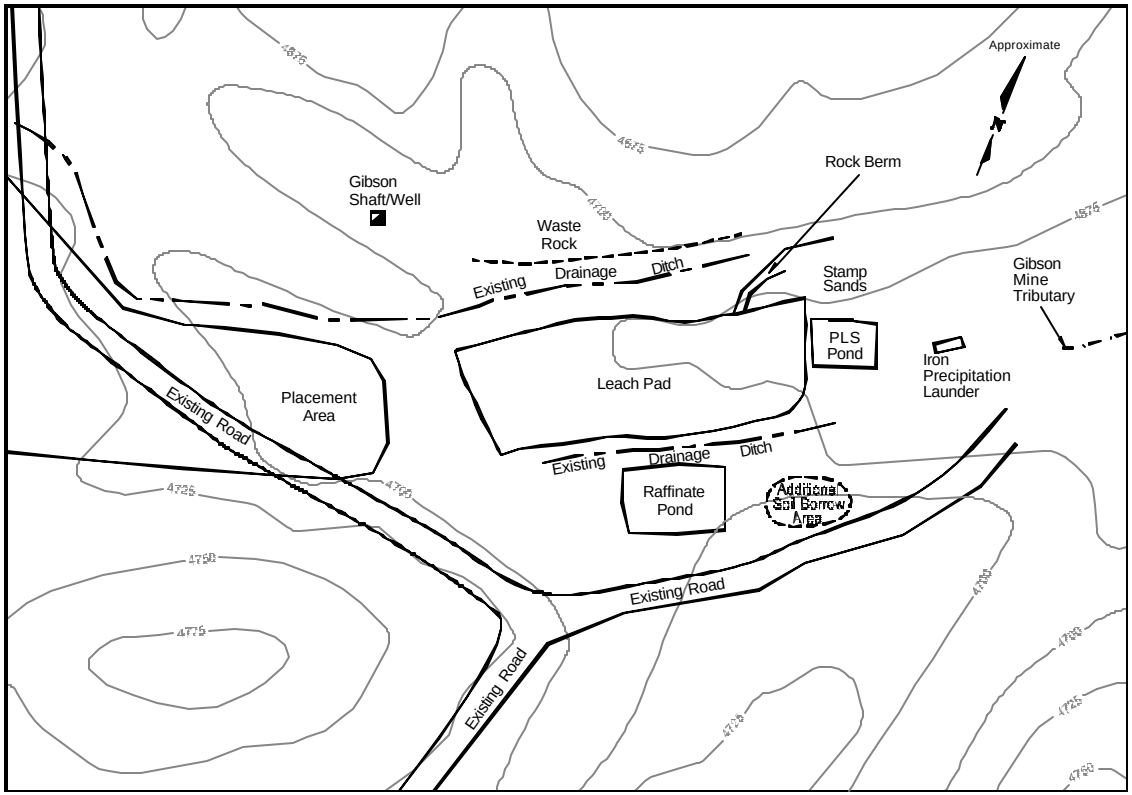


Figure 2-2
Approximate Location of the Gibson Mine Features
and Leach Pad Relocation Area

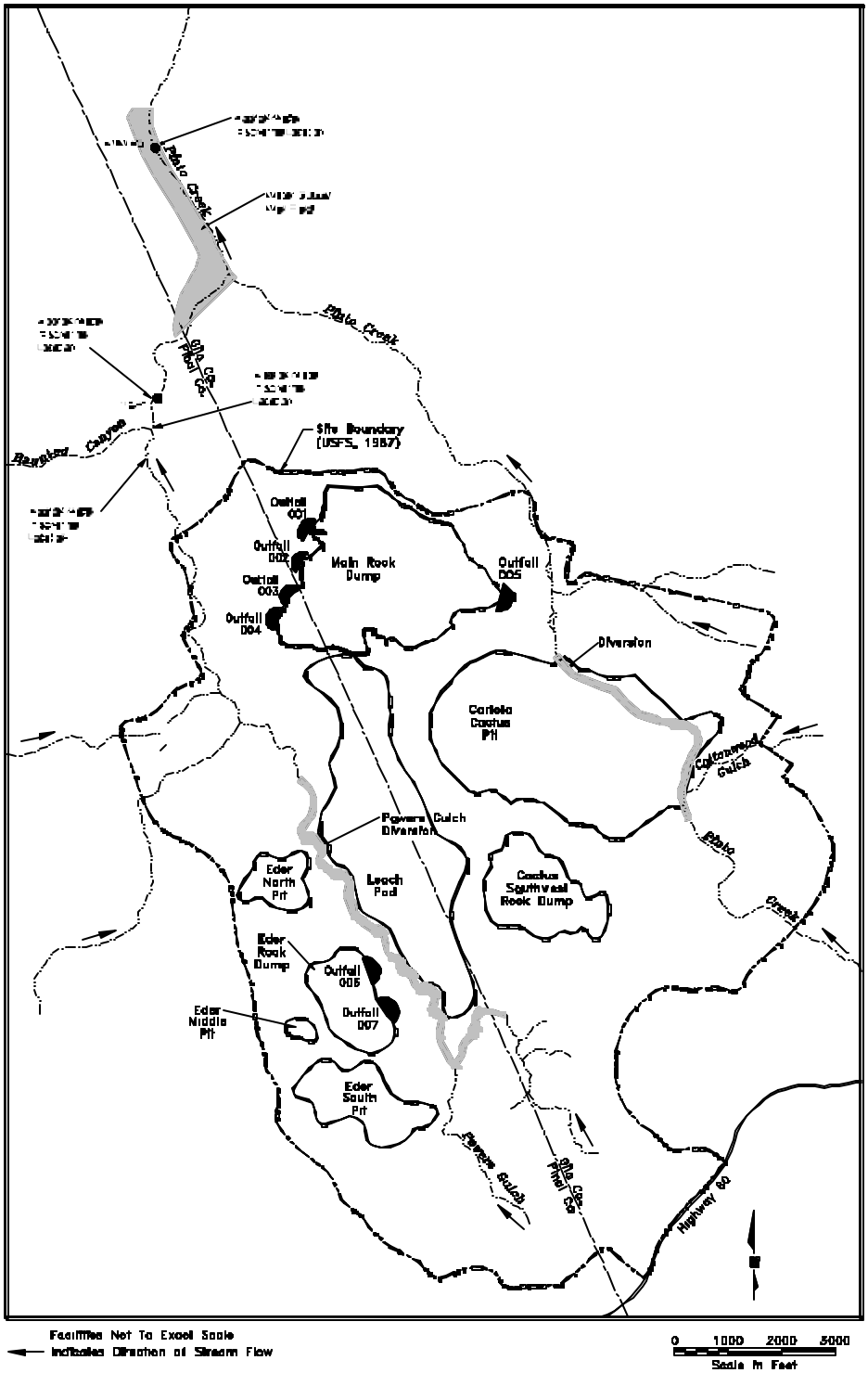


Figure 2-2
Approximate Location s for Discharge of Ground Water and Water Supply Well Field

2.3 ALTERNATIVE ELIMINATED FROM DETAILED CONSIDERATION

A third alternative was developed but eliminated from further consideration in this EA. Under this alternative, mining of the Cactus Breccia ore body and construction of the Pinto Creek diversion channel, as described in the Final EIS, would be used to offset dissolved copper loadings associated with the new source NPDES discharges from the proposed Carlota Copper Project facilities.

A review and analysis of water quality data collected from Pinto Creek was conducted in support of a draft Total Maximum Daily Load (TMDL) analysis by EPA (2000a). This study concluded that the Cactus Breccia is a significant contributor of dissolved copper to Pinto Creek (EPA, 2000a), which presently flows across a portion of the formation that is exposed in the stream bed. Water quality samples collected from upstream of the Breccia contain lower concentrations of dissolved copper than samples collected from downstream of the Breccia (mean value of 0.035 mg/L at upstream site AMP-2 vs. mean value of 0.050 mg/L at downstream site AMP-3). Based on these values, EPA (2000a) computed loadings of dissolved copper contributed by the Cactus Breccia that range from 225 kg/day for a 10-year, 24-hour storm event to 376 kg/day for a 100-year, 24-hour storm event. These values are substantially greater than the expected dissolved copper loads that would be discharged from the proposed Carlota Copper Project facilities (0.094 kg/day for the 10-year, 24-hour storm event and 2.014 kg/day for the 100-year, 24-hour storm event).

As described in the Final EIS, the Carlota Copper Project would construct a diversion channel to route Pinto Creek around the mineralized ore body and would excavate and remove the Cactus Breccia from which it would recover copper. This process essentially would eliminate dissolved copper loadings from this source.

EPA formulated this alternative but ultimately eliminated it from further consideration because the Pinto Creek diversion channel would not be completed prior to the onset of mining of the Cactus Breccia ore body and the disposal of waste rock. Consequently, an offset for loadings of dissolved copper would not be achieved during the initial phases of mining. For this reason, this alternative was not considered a technically feasible means of providing a loading offset.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the affected environment and the consequences that would occur to this environment if either the No Action Alternative or Proposed Action Alternative described in Section 2.0 are implemented. The environmental impacts associated with each alternative are described and then compared as appropriate. Short-term impacts, irreversible and irretrievable impacts, and cumulative effects are described in Sections 3-4 through 3-6, respectively. Issues addressed in the 1997 Final EIS and the 1998 Supplemental EA are not revisited in this EA.

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate, Air Quality, Visibility, and Odor

Affected Environment

A detailed description of the affected climatic environment of the Carlota Copper project is provided in Section 3.1 of the Final EIS (USFS, 1997). The abandoned Gibson Mine site is located in the upper watershed for Pinto Creek, approximately 5 miles south of the Carlota Copper Project. The elevation of the site is approximately 4,700 feet. Climate data for the Gibson site are not available; however, the climate at this location is not expected to be significantly different than was characterized in detail in the Final EIS. For this reason, a detailed description of the affected environment for climate, air quality, visibility and odor is incorporated into this EA by reference.

The climate of the Carlota Copper Project area and in the vicinity of Miami, Arizona is characterized by low to moderate precipitation, dry winds and warm temperatures. The area has a high percentage of sunshine and low humidity. The mean annual temperature at Miami, Arizona is 62.9 F and the mean annual precipitation measured at the Pinto Valley Mine is 23.8 inches. Wind predominates from south-southeasterly and southerly directions at an average speed of 8.5 feet per second.

The EPA has established a classification system for the prevention of significant deterioration (PSD) of air quality. Areas are categorized as Class I, Class II, and Class III. Class I airsheds are areas with pristine air quality, such as national parks, national monuments, or wilderness areas. Class II areas include all other areas in the United States; there are no areas in the United States with a Class III designation.

The project area, including the Gibson mine site, is designated as a Class II airshed. Class I airsheds in this portion of Arizona include the Superstition and Sierra Ancha wildernesses, located approximately 2 to 3 miles west and 25 miles north-northeast of the Carlota Project area, respectively. Two other wilderness areas, the Salt River Canyon and Salome wildernesses, are situated approximately 12 miles northeast and 25 miles northwest of the project area, respectively. These wilderness areas are designated as Class II airsheds.

Particulate matter less than 10 microns in diameter (PM_{10}) and sulfur dioxide (SO_2) levels in the Hayden/Miami area have been determined to exceed the federal standards for this airshed. These impacts are assumed to be related to SO_2 emissions from the Miami smelter and particulate emissions from other smelter and mining operations in the area. The ambient air quality of this area is considered to be within air quality standards for all other criteria pollutants. The State of Arizona has submitted a State Implementation Plan (SIP) to EPA for approval to bring the airshed into attainment status. Exceedances of (PM_{10}) and SO_2, have not have not been recorded in the Miami area since 1990.

Environmental Consequences

Potential impacts to climate, air quality, visibility, and odor associated with Carlota Copper Project were previously analyzed in the Final EIS and are not addressed in this EA.

No Action Alternative. Reclamation activities would not be implemented at the Gibson Mine site under the No Action Alternative, resulting in no direct, indirect, secondary or cumulative impacts to air quality or climate.

Discharge of ground waters to Waters of the United States would not occur under the No Action Alternative, resulting in no direct, indirect, secondary or cumulative impacts to air quality or climate.

Proposed Action Alternative. Under the Proposed Alternative, temporary fugitive dust emissions that contain respirable PM_{10} could be created during the removal and relocation of the leach pad materials and construction of the surface cap. In addition, emissions from vehicles used for reclamation activities could contain, PM_{10}, nitrogen oxide compounds (NO_x), SO_2, carbon monoxide (CO), and volatile organic compounds (VOCs). The fugitive dust and vehicle emissions could impact PM_{10} concentrations, air quality and visibility in an area near the Gibson Mine site. These emissions would be temporary, localized or insignificant relative to air quality standards associated with health effects, visibility and long range goals for air quality improvement. Dust suppression techniques, such as watering during earth-moving activities, could

be employed to minimize impacts if necessary. Impacts to Class I designated airsheds are not expected.

No impacts to air quality or climate would be expected by discharging ground water to Haunted Canyon, Powers Gulch or Pinto Creek under the conditions specified by the wellfield mitigation program.

3.1.2 Geology and Soils

Affected Environment

Bedrock Geology. The geologic setting of the upper Pinto Creek watershed is described in Section 3.2.1.2 of the Final EIS (USFS, 1997). Detailed descriptions of the geologic setting are incorporated into this EA by reference to the Final EIS. In general, the bedrock in this portion of the watershed is formed mostly of Precambrian Pinal Schist, which has been locally intruded by Precambrian granite and diabase. The Pinal Schist is locally overlain by Precambrian sedimentary strata (the Apache Group) and Paleozoic limestones and quartzites, which were intruded by the Late Cretaceous Schultze Granite and its associated mineralizing fluids. Tertiary volcanic and sedimentary units overlie the Schultze Granite. Multiple periods of deformation have affected these rocks, including several periods of faulting and brecciation.

The Gibson Mine is located near the headwaters of Pinto Creek, along a small, ephemeral tributary stream. The mine is underlain by the Pinal Schist (WRA, 1993). Numerous adits, shafts and associated workings were driven to exploit copper mineralization along two northeast-trending mineralized quartz veins that formed along pre-existing faults (WRA, 1993). Primary ore minerals include chalcopyrite (copper-iron sulfide), and a variety of secondary copper minerals, including azurite and malachite (WRA, 1993). An estimated 12 million pounds of ore were extracted from the Gibson Mine between 1906 and 1920; an unknown quantity of ore was produced from 1928-1929, 1939-1945, and 1965-1992.

Soils and Other Surficial Deposits. Soils and surficial deposits in portions of the upper Pinto Creek watershed are described in Sections 3.4.1.1 and 3.2.1.2, respectively, of the Final EIS (USFS, 1997). The detailed descriptions of these materials are incorporated into this EA by reference.

Soil studies conducted in support of the Final EIS did not include the area of the Gibson Mine. The Gibson Mine is situated on comparatively rugged terrain that is underlain by the Pinal Schist. The Pinal Schist also underlies areas on the east side of upper Powers Gulch, a few miles north-northeast of the Gibson Mine. This area, which was included in soil mapping studies conducted for the Final EIS, has topographic relief similar to that of the Gibson Mine and is considered to be a useful analog to the Gibson Mine area. Soil types identified for this portion of the Final EIS study area include units H and S. These units consist of soils that range in depth from 6 to 22 inches. They are composed of gravelly loams that overlie gravelly sandy clay or gravelly sandy loam.

Alluvial deposits occur in the streambed of the tributary stream that drains the Gibson Mine area (informally referred to as the Gibson Mine tributary). These deposits are presumed similar to the alluvial deposits that are described in Section 3.2.1.2 of the Final EIS.

Environmental Consequences

Potential impacts to soils and geology associated with the Carlota Copper Project were previously analyzed in Sections 3.2.2 and 3.4.2 of the Final EIS and are not addressed in this EA.

No Action Alternative. Reclamation activities would not be implemented at the Gibson Mine site under the No Action Alternative, resulting in no direct, indirect, secondary, or cumulative impacts to geologic and soil resources.

Discharge of ground waters to Waters of the United States would not occur under the No Action Alternative, resulting in no direct, indirect, secondary or cumulative impacts to geologic and soil resources.

Proposed Action Alternative. Under the Proposed Alternative, soil materials would be disrupted by a minor amount during the removal and relocation of the leach pad materials and construction of the surface cap. The approximate area of the proposed relocation site is less than one-half acre. Soils for capping the leach pad materials would be obtained from the relocation site and, if necessary, an area near the present raffinate pond. These areas were previously disturbed and do not retain natural soil structure. Consequently, only minor impacts to soil resources are expected from the Proposed Action, most occurring where brush would be cleared near the margin of the proposed disposal area and for a short distance along a temporary road that would be constructed between the leach pad and disposal area. Depending on the final configuration of the soil materials and of the borrow sources from which they are obtained, soil erosion could occur during and following precipitation events. However, the improvement in drainage that is expected to result from the Proposed Action may act to reduce erosion. Insofar as these areas presently are unvegetated, erosive soil loss is not expected to increase over the present situation.

No direct, indirect, secondary or cumulative impacts to soil or geologic resources would be expected by discharging ground water to Haunted Canyon, Powers Gulch or Pinto Creek under the conditions specified by the wellfield mitigation program. Discharges of ground water under the conditions specified by the wellfield mitigation program would occur during low flow periods. Channel erosion or scouring would not be expected.

3.1.3 Water Resources

3.1.3.1 Surface Water

Affected Environment

Watershed Characteristics. The surface water characteristics of the Pinto Creek watershed are described in Section 3.3.1.2 of the Final EIS (USFS, 1997). Detailed descriptions of the surface waters are incorporated into this EA by reference to the Final EIS.

Pinto Creek is a stream with ephemeral, intermittent, and perennial reaches that drains an area of about 178.2 square miles in Gila and Pinal Counties, central Arizona (USFS, 1997). From its source in the Pinal Mountains south of the town of Miami, the stream flows approximately 32 miles northward, discharging into Lake Roosevelt, an artificial impoundment constructed along the Salt River. Lake Roosevelt serves as a source of drinking and irrigation water for portions of central Arizona, including the Phoenix metropolitan area.

Eight tributary drainages comprise the Pinto Creek watershed (Figure 3-1). The contributing area of each tributary basin is shown in Table 3-1.

Table 3-1. Tributary Drainage Areas

Tributary Drainage	Contributing Area (sq. mi.)
Upper Pinto Creek	15.1
Powers Gulch	5.5
Haunted Canyon	12.3
Pinto Valley	20.1
West Fork of Pinto Creek	27.2
Horrell Creek	11.8
Willow Spring Creek	5.0
Lower Pinto Creek	78.4
Existing Non-Contributing Mining Area	2.8
Total	**178.2**

Source: USFS (1997)

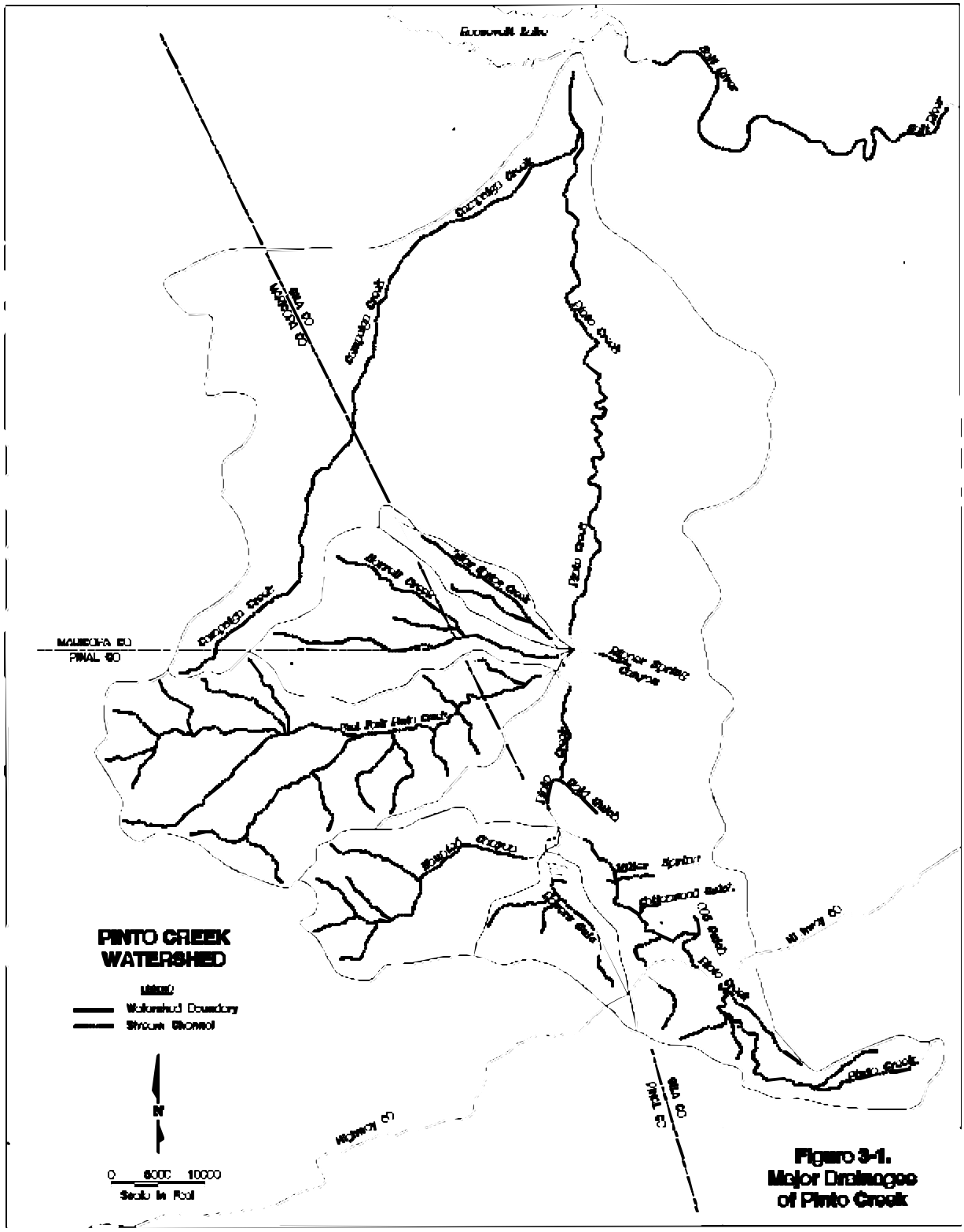


Figure 3-1.
Major Drainages of Pinto Creek

The character of Pinto Creek changes significantly along its course as described in the Final EIS. The upper reaches of Pinto Creek, including the Gibson Mine area, the area of the proposed Carlota Mine facilities and the Powers Gulch and Haunted Canyon tributaries, have the characteristics of mountain stream channels, with relatively steep gradients and coarse bed material. In these reaches, Pinto Creek is ephemeral to intermittent; however, perennial reaches occur from the confluence with Miller Spring Gulch to a point downstream of the Haunted Canyon confluence and from a point below the Iron Bridge to a point above the West Fork of Pinto Creek confluence. The upper reaches of Pinto Creek are enclosed by steep, rugged, bedrock terrain possessing a thin soil cover. The stream channel, which generally has a narrow flood plain, is underlain by thin alluvial deposits. Perennial reaches occur where Pinto Creek is incised into bedrock and alluvial flow is forced upward by bedrock constrictions (USFS, 1997). Stream gradients in the upper reaches range from 50 to 225 feet per mile, with steeper gradients present in the headwaters of some tributary streams (USFS, 1997).

Below the confluences of Horrell Creek and the West Fork of Pinto Creek and continuing to Roosevelt Lake, Pinto Creek possesses a flatter stream gradient. As a result, the creek has a markedly wider flood plain and is underlain by finer bed material. Along most of its lower portion, Pinto Creek flows intermittently, but a perennial reach is present from the Pinto Valley weir to a point upstream from the Blevens Wash confluence (USFS, 1997; BHP, 1998). The lower reaches of Pinto Creek drain a varied geologic terrain, that comprises steep, rugged bedrock in the Horrell Creek area and gullied colluvial deposits near Roosevelt Lake. Stream gradients in the lower portion of the watershed are typically less than 35 feet per mile (USFS, 1997).

In Pinto Creek, discharge from the alluvium is believed to play a significant role in sustaining base flow to the creek. In contrast, the thickness of saturated alluvium is very small in some tributary streams such as Haunted Canyon. Consequently, base flow to these reaches is assumed to be sustained by ground water leaking upward from the bedrock aquifer complex.

Water Quality. ADEQ codifies water quality regulations in Title 18, Chapter 11 of the Arizona Administrative Code (*A.A.C.*). Designated uses are described in Section R18-11-104 of the *A.A.C.* and are listed for specific surface waters in Appendix B of Title 18, Chapter 11. Pinto Creek is protected along its entire length for the following designated uses:

- Aquatic and Wildlife, warm water (A&Ww)
- Full Body Contact (FBC)
- Fish Consumption (FC)

- Agricultural Irrigation (AgI)
- Agricultural Livestock Watering (AgL).

The State of Arizona has established numeric water quality criteria to protect the designated uses described above for Pinto Creek. The criteria are listed in Appendix A of *A.A.C.* § R18-11. Under these criteria, Pinto Creek is considered a perennial drainage.
Designated uses for Powers Gulch are aquatic and wildlife, ephemeral ($A\&W_e$) and partial body contact (PBC) (EPA, 2000a). Water quality standards are prescribed in Sections R18-11-108 (Narrative) and R18-11-109 (Numeric) that are protective of the designated uses. Powers Gulch is considered an ephemeral drainage under the State of Arizona criteria. The criteria established for ephemeral drainages are less stringent than for perennial waters.

Pinto Creek is listed by the State of Arizona under Section 303(d) of the Clean Water Act for non-attainment of the water quality standard for dissolved copper (ADEQ, 1998). As described in the Final EIS, the listing resulted from a violation of the dissolved copper standard for warm water fisheries recorded below the Gibson Mine in 1992 and for a violation of the State's narrative standards as a result of tailings spills from the Pinto Valley Mine in 1991 and 1997. In addition, a spill of leach solution and tailings from the Pinto Valley Mine violated the dissolved copper standard in 1993.

Water quality in Pinto Creek and its tributaries is summarized in the Final EIS. In general, Pinto Creek waters upstream of Haunted Canyon are predominantly calcium sulfate type, with values of total hardness typically in excess of 400 mg/L. In contrast, surface waters in the Haunted Canyon and Powers Gulch tributaries are predominantly calcium-sodium bicarbonate type, with total hardness values of less than 250 mg/L (USFS, 1997). The inflow from Haunted Canyon exerts a dominating influence on the chemistry of Pinto Creek as indicated by a change in Pinto Creek water below the confluence to calcium bicarbonate type. However, the change is not permanent and further downstream, Pinto Creek water reverts back to calcium sulfate type. EPA (2000a) compiled 272 hardness values for surface water quality samples collected from stations throughout the Pinto Creek watershed. Total hardness varied from 57.9 to 1400 mg/L in these samples, with a mean value of 392 mg/L and a 5^{th} percentile value of 101 mg/L.

In general, samples collected from the watershed have neutral to slightly alkaline pH and low concentrations of total and dissolved metals (the Final EIS states that the detection limits for many analyses were higher than applicable water quality standards). Exceptions included total and dissolved copper

concentrations that exceeded applicable water quality standards in portions of Pinto Creek on multiple occasions.

Available analytical results indicate that water quality in the upper Pinto Creek watershed periodically is impacted by runoff from the abandoned Gibson Mine site, natural copper mineralization in the area of the proposed Carlota operations, spills and leaks from the BHP Pinto Valley mine operations, and other unidentified mining-related sources (EPA, 2000a).

Samples collected by ADEQ in 1993, 1995, and 2000 and by EPA in 1999 from Pinto Creek and a small tributary draining the Gibson Mine site (informally named the Gibson Mine tributary) illustrate the impacts of the abandoned mine site on the tributary stream and Pinto Creek. Table A-1 in Appendix A reports values for total and dissolved copper, hardness and pH measured on samples collected from the Gibson Mine tributary above and below the mine site. In addition, Table A-1 presents analyses of samples collected from the raffinate and pregnant leach solution (PLS) ponds at the abandoned mine site. Dissolved copper loads are computed for those samples for which flow measurements were made.

As shown on Figure 3-2, water quality in the Gibson Mine tributary diminishes from above to below the mine site. The impacts are manifested as decreases in pH and increases in hardness and total and dissolved copper. Water quality impacts occur only when surface runoff contributes significant flow to the tributary stream via the diversion ditches that enclose the site and by overflow of the solution storage ponds. Severe impacts have been observed when the solution ponds are discharging (ADEQ, 1991). The composition of the solution in the Gibson PLS pond is consistent with it being a source contributing to degradation of the tributary waters, although runoff of water from the south side of heap leach pad into a drainage ditch also is likely to impact surface water quality as indicated by observations of secondary copper sulfate minerals coating portions of the drainage ditch (SAIC, 2001). A significant proportion of the surface runoff conveyed by the ditch is collected by the PLS pond; however, the ditch also conveys runoff directly to the Gibson Mine tributary (SAIC, 2001).

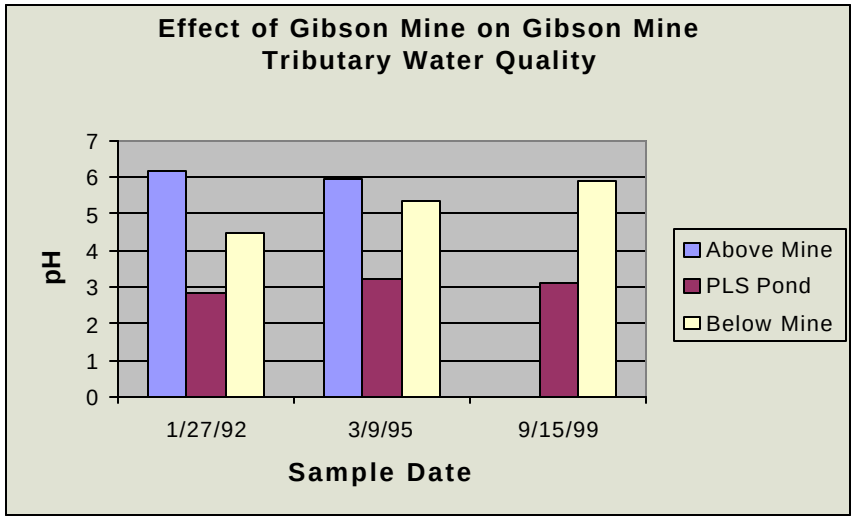
Table 3-2 summarizes the load of total copper conveyed by the Gibson Mine tributary on March 9, 1995, using data collected by ADEQ (1995) (see Appendix A, Table A-1 for analytical data). Figure 3-3 plots the total copper load with distance downstream along the tributary stream. In this figure, the location of the sample collected from above the mine workings was assigned a horizontal distance of 0 feet. The locations of other sample stations are plotted relative to this point (the location of downstream sample 13/H was assigned an arbitrary distance of 5000 feet). On this day, the total copper load in the Gibson Mine

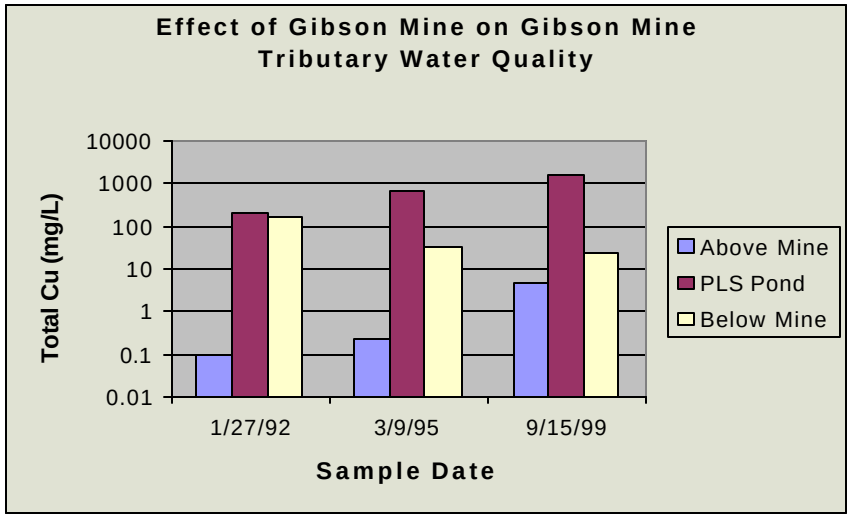
tributary increased from 0.02 kg/day above the mine to 7.87 kg/day below the mine area. The load of total copper decreased downstream through an unidentified attenuation mechanism so that, near its confluence with Pinto Creek, the tributary carried a load of 2.1 kg/day. On the day that these samples were collected, the PLS pond was discharging at a rate of only 0.5 gpm; however, the pond contributed a substantial load of copper to the tributary stream (1.78 kg/day).

Table 3-2. Total Copper Loads in the Gibson Mine Tributary - March 9, 1995

Station	Description	Flow (gpm)	pH	Total Cu (mg/L)	Cu Load (kg/day)
3/A	GMT above mine, below diversion channel confluence	17	5.97	0.23	0.02
6/E	PLS pond	0.5	---	654	1.78
8/F	Flow under leach pad through main culvert	41	5.31	30.8	6.88
12/G	GMT below north diversion channel confluence	88	5.74	16.4	7.87
13/H	GMT above Pinto Creek	172	6.36	2.24	2.10

Data from ADEQ (1995). GMT = Gibson Mine Tributary.





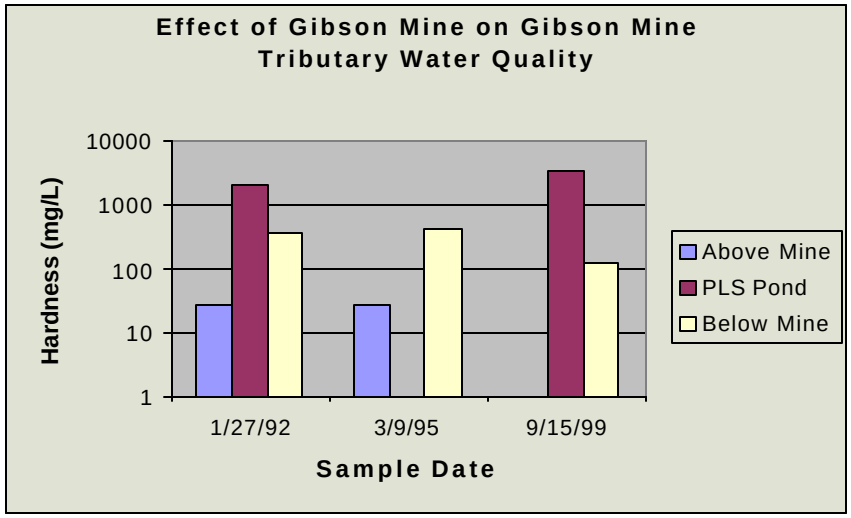


Figure 3-2. Water quality in the Gibson Mine tributary in the vicinity of the Gibson Mine. Bar charts show analyses of samples collected from above and below the mine and from the PLS pond on 3 days. Data are provided in Appendix A, Table A-1.

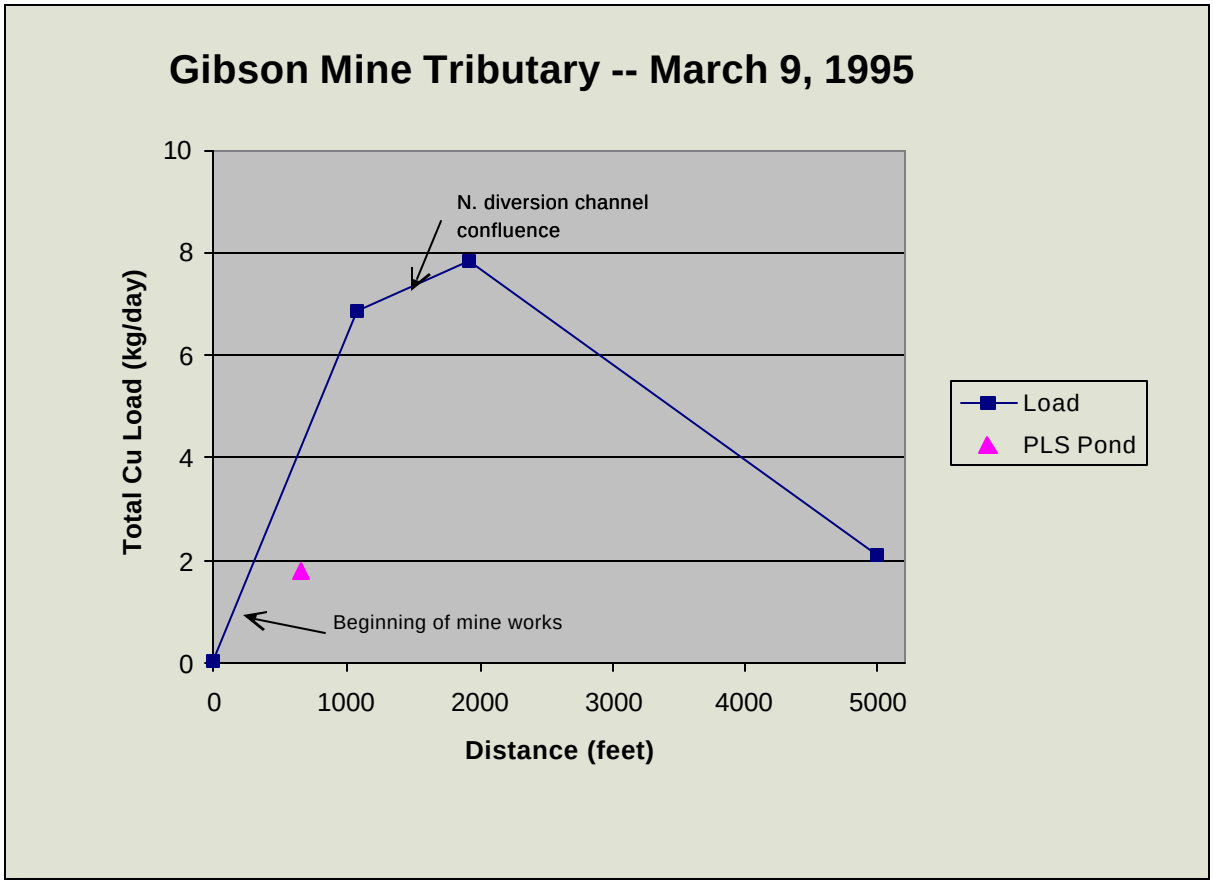


Figure 3-3. Variation in total copper load with distance along the Gibson Mine tributary on March 9, 1995. Figure also shows the total copper load discharging from the PLS pond on the same day. Data are given in Appendix A, Tables A-1 and A-2.

Table A-2 in Appendix A presents values for total and dissolved copper, hardness and pH for samples collected near the mouth of the Gibson Mine tributary and from Pinto Creek above and below the Gibson Mine tributary confluence. These data are shown graphically in Figure 3-4. Hardness values in Pinto Creek also appear to be influenced by flow from the Gibson Mine tributary, however, the nature of the influence (increase or decrease) is not consistent. Water quality analyses of samples collected from near the mouth of the Gibson Mine tributary show a strong correlation between stream pH and total copper concentration (Figure A-1, Appendix A). Figure A-1 also shows that the compositions of the solutions collected in the Gibson Mine PLS pond are likely to exert a strong influence on water quality at the mouth of the tributary stream during those times when the pond is overflowing.

As illustrated in Figure 3-4, water quality in Pinto Creek is negatively impacted by the intermittent discharges from the Gibson Mine tributary. The impacts are manifested as decreases in pH and increases in total and dissolved copper. The compositions of water samples collected from the downstream reaches of the Gibson Mine tributary are consistent with this inflow being a significant source contributing to the degradation of Pinto Creek.

Environmental Consequences

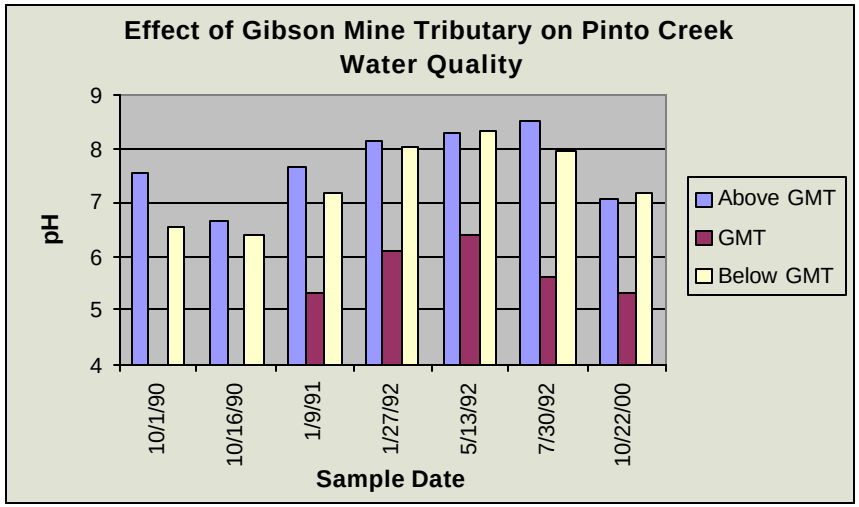
Potential impacts to surface water resources associated with the Carlota Copper Project were previously analyzed in the 1997 Final EIS and are not addressed in this EA.

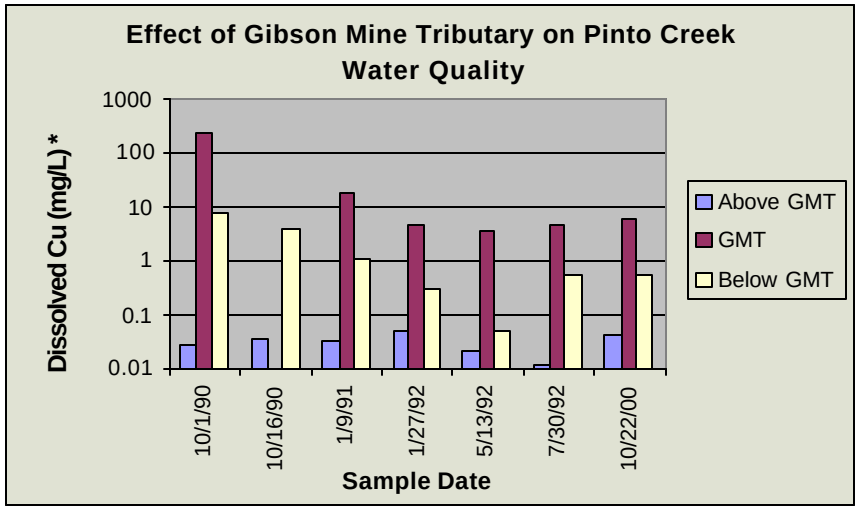
No Action Alternative. Reclamation activities would not be implemented at the Gibson Mine site under the No Action Alternative, resulting in no impacts to surface water resources. This means that solutions from the Gibson Mine PLS pond and runoff from the leach pad would continue to exert periodic, negative impacts on the water quality of Pinto Creek.

The No Action Alternative also would lead to no environmental consequences to water quality as a result of wellfield discharges, because these discharges would not occur. However, failure to implement the wellfield mitigation plan would result in adverse impacts to riparian vegetation, wetlands, and Waters of the U.S. because stream flows would not be augmented in Haunted Canyon, Powers Gulch, or Pinto Creek.

Proposed Action Alternative. Under the Proposed Alternative, removal and relocation of the leach pad materials and the PLS and raffinate ponds at the Gibson Mine would be expected to improve water quality in Pinto Creek. The extent of improvement, as measured by decreases in the loads of copper, acid,

and total hardness, is expected to be significantly greater than the constituent loads that would be added to Pinto Creek through potential discharges from the proposed Carlota facilities.





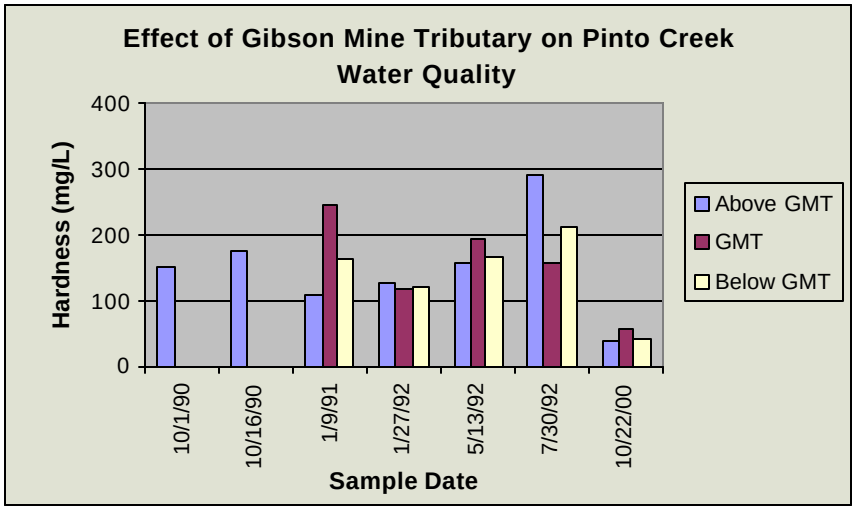


Figure 3-4. Water quality in upper Pinto Creek and near the mouth of the Gibson Mine tributary. Bar charts show analyses of samples collected from above and below the tributary confluence on 7 days. Data are provided in Appendix A, Table A-2.

The proposed Carlota facilities would discharge to Powers Gulch from 6 storm water retention ponds collecting runoff from waste rock dumps for storms producing runoff that exceeds the volume of the 10-year, 24-hour event (4.20 inches of rainfall; EPA [2000a]; see Figure 2-3). A seventh pond collecting runoff and seepage from waste rock materials would discharge to Pinto Creek under conditions that exceed the 100-year, 24-hour storm event (6.20 inches of rainfall; EPA [2000a]; see Figure 2-3). As established in the final NPDES permit for these outfalls, any discharge from these facilities must meet all applicable water quality standards. EPA (2000a) estimated the total load of dissolved copper from the 7 outfalls at 0.094 kg/day for the 10-year, 24-hour storm event and at 2.014 kg/day for the 100-year, 24-hour storm event.

The load of dissolved copper measured above the mouth of the Gibson Mine tributary on March 9, 1995 (1.71 kg/day; see Table A-2) exceeds the load of dissolved copper that is estimated to be released from all proposed Carlota outfalls under conditions of the 10-year 24-hour storm event and it is only slightly less than that which would be released during the 100-year, 24-hour storm event. The magnitude of the storm event preceding the March 9, 1995 measurements has not been quantified. However, ADEQ measured the flow in Pinto Creek at 7 cfs on the day that the Gibson Mine tributary was sampled (ADEQ, 1995). Because this flow is substantially lower than the flow estimated by EPA (2000a) for Pinto Creek above the Gibson Mine tributary under conditions of the 10-year, 24-hour storm (1037 cfs), it is assumed that the March 1995 storm event was of comparatively small magnitude. Considering also that the concentration of dissolved copper measured above the mouth of the Gibson Mine tributary on March 9, 1995 is the lowest recorded for 6 samples collected from this reach (see Appendix A, Table A-2), it is likely that the copper load flowing from the Gibson Mine tributary would be substantially higher than 1.71 kg/day under a 10-year, 24-hour storm event. The available water quality data for the Gibson Mine area indicate that copper loads in the Gibson Mine tributary are derived mostly from the leach pad and its associated solution ponds. Consequently, the proposed action would be expected to have a significant positive impact on the water quality of Pinto Creek.

Impacts to surface water quality would not be expected by discharging ground water to Haunted Canyon, Powers Gulch or Pinto Creek under the conditions specified by the wellfield mitigation program. Table A-3 in Appendix A summarizes analytical data for the stream reaches that would be potentially affected by discharges associated with the wellfield mitigation program. The table also presents data for ground water from the wellfield alluvial and bedrock aquifers and summarizes applicable water quality criteria. Analytical data

from the three bedrock production wells and Haunted Canyon provide the best estimates of water quality for the proposed supplemental water source and the anticipated receiving waters. Table A-3 shows that the alluvial and bedrock aquifer waters are chemically similar to surface water in Haunted Canyon. Samples collected from the bedrock aquifer, however, indicate that this aquifer is at a higher temperature than the alluvial ground water and Haunted Canyon surface water (Table A-4). Depending on the amount of cooling that occurs during conveyance, the mechanism of discharge and the extent of mixing with surface waters, the receiving waters could potentially be impacted by increased temperature if bedrock ground water is discharged directly to the stream. However, the wellfield discharge is required to meet Arizona water quality standards, which preclude an increase of ambient temperature by more than 3° Celsius. The reported detection levels for the available data are, in many cases, too high to permit evaluations of the potential for exceedances of water quality criteria or to determine whether constituent concentrations in the receiving waters would be raised above their present levels. This is true for cyanide, phosphorus, antimony, beryllium, cadmium, copper, mercury, selenium, and thallium. However, Table A-3 shows that the alluvial and bedrock waters are chemically similar to the surface water in Haunted Canyon and the NPDES permit condition requires the wellfield discharge to meet all applicable water quality criteria. Consequently, chemical impacts to the receiving water would not be anticipated.

Monitoring and Mitigation. The need to mitigate for the reduction of surface flows in Haunted Canyon as the result of dewatering of the Carlota Copper mine was identified in the Final EIS. As a result, the Forest Service asked Carlota to develop a plan for a full scale wellfield pump test to determine the effect of dewatering on the shallow alluvial aquifer of Haunted Canyon and the need to supplement surface flows. The Final EIS included wellfield mitigation measures WR-2 through WR-4. Mitigation measure WR-4 states that any water discharged to Haunted Canyon or Pinto Creek from wellfield mitigation pumping would have to meet applicable Arizona surface water quality standards, including temperature.

Section I.A.11, Special Conditions, of the NPDES permit issued to Carlota on August 28, 2000, includes monitoring and mitigation measures for the wellfield discharge. Part I.A.(b)(i) of the permit requires Carlota to comply with the following:

> The following conditions apply to discharges resulting from the operation of the Carlota Wellfield Mitigation Program (outfall 008):

> (i) All discharges shall be conducted in accordance with the Wellfield Mitigation Program approved by the U.S. Forest Service on July 27, 1997 and any amendments thereto.

The wellfield discharge points are referenced as individual point source discharges on the cover page of the Carlota NPDES permit. Although specific locations are not stated, the point source designation for Outfall 008 as described on the cover page of the permit applies to all discharge points into Haunted Canyon or Pinto Creek from the wellfield mitigation program.

Section I.A.9(a) of the NPDES permit incorporates the numeric Arizona surface water quality standard for temperature stated in Arizona Administrative Code (A.A.C.) R18-11-109. Under A.A.C. R18-11-109, a discharge to a navigable water designated for aquatic and wildlife warm water fishery beneficial use cannot raise the instream temperature more than 3 °C. Insofar as the discharges from Outfall 008 are identified in the permit as point source discharges, the temperature requirement under A.A.C. R18-11-109 applies. Carlota has not applied for a mixing zone under Arizona surface water quality standards at A.A.C. R18-11-114. Consequently, the surface water quality standards for temperature apply at the point of discharge to Haunted Canyon or Pinto Creek.

Discharge or instream temperature monitoring was not included in the wellfield monitoring requirements of Section I.A.11.(b)(ii) of the NPDES permit. At the present time, specific temperature monitoring requirements are not included in the Carlota Wellfield Mitigation Program, dated July 27, 1997, referenced in Section I.A.11.(b)(ii) of the permit. In a letter dated March 27, 2001, EPA requested that the USFS, in cooperation with the Carlota Copper Co., amend the Wellfield Mitigation Program to include temperature monitoring.

The USFS concurred with EPA's request in a letter dated April 17, 2001. In this letter, Tonto National Forest agreed to include the following elements in the workplan prepared for additional wellfield and aquifer testing as required by mitigation measure WR-2:

1. Continuous and concurrent water temperature monitoring of the wellfield mitigation discharges to Haunted Canyon, Pinto Creek and Powers Gulch and ambient water temperatures in these creeks during the test phase of the wellfield mitigation program.

2. At a minimum, daily water temperature measurement of wellfield mitigation discharges and ambient instream water temperatures collected during the testing phase of the mitigation measure. If temperature

mitigation measures are necessary, the Forest Service and Carlota will develop a temperature testing program to determine the effectiveness of the mitigation measure(s).

3. Submission of the results of discharge and instream temperature monitoring to EPA as well as the Forest Service during the wellfield mitigation test phase.

Further, the Forest Service has agreed to revise the Ground and Surface Water Monitoring Plan (GWRC, 1997) following the full-scale wellfield testing required in mitigation measure WR-2 to include daily or weekly water temperature measurements of mitigation discharges and instream flows during periods of wellfield mitigation discharges to Haunted Canyon, Pinto Creek or Powers Gulch.

3.1.3.2 Ground Water

Affected Environment

A detailed description of the ground water resources that would be affected by the Carlota Copper Project is provided in Section 3.3.1.3 of the Final EIS (USFS, 1997). The abandoned Gibson Mine site is located in the upper watershed for Pinto Creek, approximately 5 miles south of the Carlota Copper project. The geologic setting of the upper Pinto Creek watershed is described in Section 3.2.1.2 of the Final EIS. Data characterizing ground water and the hydrogeology of the Gibson Mine site are not available; however, the hydrogeology of this area is anticipated to be similar to that described in the Final EIS for the bedrock complex, the Gila Conglomerate, and alluvium hydrostratigraphic units. For this reason, a detailed description of the affected environment ground water is incorporated into this EA by reference to the Final EIS.

The hydrogeology of the bedrock complex and the Gila Conglomerate is controlled by the porosity, permeability, and structure (i.e., fault and fracture zones) of the geologic materials that make up the complex. In general, ground water within these hydrostratigraphic units is stored and transmitted through a system of interconnected fractures that is believed to be highly variable across rock types (USFS, 1997).

Alluvium occurs as discontinuous ribbons within valley bottoms along Pinto Creek and its tributaries. Ground water flow through the alluvium occurs through interconnected pores that comprise an estimated 30 to 40 percent of the

rock (USFS, 1997). Interaction between alluvial ground water and surface water occurs in Powers Gulch, Haunted Canyon, and Pinto Creek, near the approximate locations identified under the proposed wellfield mitigation plan for the discharge of ground water to surface water. Aquifer testing indicates that a hydraulic connection exists between water pumped from the bedrock complex, water stored in the alluvium, and surface water (USFS, 1997). This connection is supported by the similar chemistries of the surface water, alluvial ground water, and bedrock ground water in the wellfield area (USFS, 1997; see Table A-3, Appendix A). In general, the alluvium is recharged during periods of high stream flow and as stream flow declines, water from the alluvium discharges or drains to the creeks. The extent of saturated alluvium in Haunted Canyon is very small, and base flow to the creek is assumed to be sustained by ground water leaking upward from the bedrock complex. In Pinto Creek, discharge from the alluvium is believed to play a significant role in sustaining base flow to the creek. Water quality of the alluvial ground water in the wellfield area is generally a calcium bicarbonate type, and analyses indicate that it consistently meets applicable Arizona Aquifer Protection Standards and federal primary and secondary MCLs for all constituents tested except total dissolved solids (TDS), antimony, lead, and manganese. Temperature data from ground water test wells in the wellfield area are shown in Appendix A, Table A-4.

Environmental Consequences

Potential impacts to ground water resources associated with Carlota Copper Project were previously analyzed in the 1997 Final EIS and are not addressed in this EA. This includes impacts from reductions to stream base flows in Haunted Canyon and Pinto Creek, as a result of pumping the proposed wellfield that were identified in the Final EIS. These impacts were described in Chapter 3, Section 3.3.2.1 of the Final EIS; mitigation measures were defined in Chapter 3, Section 3.15 (USFS, 1997).

No Action Alternative. Reclamation activities would not be implemented at the Gibson Mine site under the No Action Alternative, resulting in no impacts to existing ground water resources.

Failure to implement the identified wellfield mitigation plan under the No Action Alternati prevent mitigation of surface water flows and potentially affect recharge of the alluvial aquifer in reaches downstream.

Proposed Action Alternative. Impacts to ground water would not be expected under the Proposed Alternative at the Gibson Mine site. Removal of the PLS

pond, raffinate pond, and heap leach pad will reestablish historic drainage pathways across the site; however, these changes in site hydrology would not be expected to significantly impact existing ground water conditions or hydrogeology.

No impacts to ground water quality would be expected by implementing the wellfield mitigation program.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Vegetation and Wetlands

Affected Environment

A detailed description of vegetation and wetlands that would be affected by the Carlota Copper project is provided in Section 3.5 of the Final EIS (USFS, 1997). For this reason, a detailed description of the affected environment vegetation and wetlands is incorporated into this EA by reference to the Final EIS.

Activities and structures associated with copper mining (1908 to 1919) and leaching of low grade ore (1960s and 70s) disturbed the natural vegetation that historically occurred at the Gibson Mine site and filled wetlands or other Waters of the U.S. that may have occurred at the site. The Gibson Mine site is assumed to have once been comprised of the interior chaparral vegetation association -- relatively dense stands of close-canopied evergreen shrubs, usually of uniform height. This is the vegetation association occurring on adjacent properties. Dominant species of this association include one-seed juniper (*Juniperus monosperma*), pointleaf manzanita (*Arctostaphylos pungens*), and shrub live oak (*Quercus turbinella*). The area of the Gibson Mine site that includes the PLS pond, raffinate pond, leach pad, and most of the proposed disposal area are currently devoid of vegetation. The remainder of what once composed the active mine area is highly disturbed, with a low density of vegetation and a few mature scrub bushes and trees, mostly oaks and junipers. The rest of the site is covered by very dense oak/juniper scrub or roads. No hydrophilic, mesic or riparian vegetation species were observed at the Gibson Mine site during a field visit conducted on December 12, 2000 (SAIC, 2001). The Gibson Mine tributary does not develop stable bed and banks until well downstream of the Gibson Mine (SAIC, 2001). As a result, jurisdictional wetlands do not occur at the Gibson Mine.

The approximate locations of discharge points on Powers Gulch, Haunted Canyon, and Pinto Creek for the wellfield mitigation program contain riparian vegetation and wetlands, as described in Section 3.5 of the Final EIS (USFS, 1997).

Environmental Consequences

Potential impacts to vegetation and wetlands associated with the proposed Carlota Copper mine project were previously evaluated in the 1997 Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative would not result in impacts to vegetation, wetlands, or Waters of the U.S. at the Gibson Mine site because no reclamation activities would take place at the site. However, this alternative would be expected to continue to cause adverse impacts to downstream vegetation, wetlands, and Waters of the U.S. through the unrestricted loading of dissolved copper and other contaminants to the Gibson Mine tributary and Pinto Creek. Historic mining activities removed the majority of vegetation in the active mining area and filled any wetlands and Waters of the U.S. that may have historically occurred on the site. Under this alternative, the leach pad, PLS pond, and raffinate pond would remain at their existing locations and continue to interfere with surface water runoff and site drainage.

The No Action Alternative would be expected to adversely impact wetlands, Waters of the U.S., and riparian vegetation in and adjacent to Haunted Canyon, Powers Gulch, and Pinto Creek. The Final EIS (USFS, 1997) identified potential reductions to stream base flows in Haunted Canyon and Pinto Creek from pumping the proposed wellfield (Figure 2-3). These impacts are described in Chapter 3, Section 3.3.2.1, and mitigation measures are defined in Chapter 3, Section 3.15 of the Final EIS (USFS, 1997). Failure to implement the identified wellfield mitigation plan would result in adverse impacts to riparian vegetation, wetlands, and Waters of the U.S. because stream flow augmentation in Haunted Canyon, Powers Gulch, or Pinto Creek would not occur. Pumping of the wellfield could result in stream flows falling below minimum values causing potential adverse impacts to wetlands, Waters of the U.S., and riparian vegetation.

Proposed Action Alternative. The Proposed Alternative is not expected to impact wetlands, Waters of the U.S., and vegetation at the Gibson Mine site in a significant manner. However, the Proposed Alternative is expected to positively impact wetlands, vegetation, and Waters of the U.S. downstream from the

Gibson Mine site by improving drainage conditions and improving the quality of surface water runoff from the Gibson Mine site (*see* Section 3.1.3). Removal of the PLS pond, raffinate pond, and heap leach pad will not disturb existing vegetation, because these areas are barren. Historic drainage pathways across the site would be reestablished after the PLS pond, raffinate pond, and leach pad are removed. Leach pad material would be placed on an already disturbed area on the Gibson Mine site encompassing approximately one-half acre. The newly removed leach material would be capped with non-mineralized local soil. Some vegetation could be adversely impacted around the edges of the disposal area and around the borrow pit. Heavy brush would need to be cleared around the perimeter of the disposal site; the width of the cleared area would be approximately 10 feet. Additionally, a temporary road would need to be constructed between the leach pad and the proposed disposal area. Road construction would require clearing of scrub oak and juniper along the road alignment between the leach pad and proposed disposal area, a distance of approximately 120 feet. Reseeding of the cap has not been proposed; however, some vegetation could be established over time on the surface cap by natural recruitment.

The Proposed Alternative is expected to have a positive impact on wetlands and riparian vegetation in certain reaches of Haunted Canyon, Powers Gulch, and Pinto Creek. Under the Proposed Alternative, the NPDES permit condition allowing the discharge of ground water to Waters of the U.S. would be expected to maintain wetlands and riparian vegetation at their existing condition. Ground water will be discharged to Haunted Canyon, Powers Gulch, and Pinto Creek to ensure that monthly minimum stream flow values, as identified by the wellfield mitigation program, are met.

3.2.2 Wildlife and Threatened and Endangered Species

Affected Environment

A detailed description of wildlife and threatened and endangered (T&E) and special status species affected by the Carlota Copper Project is provided in Section 3.5 of the Final EIS (USFS, 1997). For this reason, a detailed description of the affected environment for wildlife and threatened, endangered, and special status species is incorporated into this EA by reference to the Final EIS.

Wildlife, T&E, and special status species occurring in the vicinity of the Gibson Mine site are expected to be similar to those found near the Carlota Copper Project (*see* Section 3.5 of the Final EIS). The Gibson Mine, located

approximately 5 miles south of the proposed Carlota Copper Project area, has similar ground cover, elevation, and soil types. Table 3-3 lists the special status plant and wildlife species that could potentially occur in the Carlota Project area. The proposed wellfield mitigation sites are included in the Carlota Project area, as presented in the Final EIS.

The Final EIS identified the Arizona Hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*) as the only special status plant species occurring in the Carlota Copper Project species occupies upland areas in the vicinity of the proposed Carlota Mine pits and project Arizona hedgehog cactus was not identified in riparian areas along Haunted Canyon, Pinto Powers Gulch.

The Final EIS determined that the Maricopa tiger beetle (*Cicendela oregona maricopa*), Ar toad (*Bufo microscaphus microscaphus*), lowland leopard frog (*Rana yavapaiensis*), common black-hawk (*Buteogallus anthracinus*), yellow-billed cuckoo (*Coccyzus americanu* and loggerhead shrike (*Lanius ludovicianus*) are the only species of concern with the poter impacted by the Carlota Copper Project. The Maricopa tiger beetle uses the stream channe Creek and Powers Creek for foraging. The Arizona toad and lowland leopard frog were ide several locations along Pinto Creek. These species potentially use flowing portions of Pint Gulch, West Powers Gulch, and Haunted Canyon as breeding habitat. Pinto Creek may pr or nesting habitat for the common black-hawk. Yellow-billed cuckoo are found in riparian Pinto Creek, downstream from the Carlota Copper Project area. The dry-slope desert brus juniper/grassland communities in the Carlota Copper Project area represent suitable habi loggerhead shrike.

Table 3-3. Special Status Plant and Wildlife Species Potentially Occurring in the Carlota Copper Project Area

Common Name	Scientific Name	Status
PLANTS		
Arizona agave	*Agave arizonica*	LE, S
Hohokam agave	*Agave murpheyi*	C2, S
Tonto basin agave	*Agave delamateri*	C2, S
Arizona hedgehog cactus	*Echinocereus triglochidiatus var. arizonicus*	LE, SE, S
Mogollon fleabane	*Erigeron anchana*	C2
Apache wild buckwheat	*Eriogonum apachense*	C2
San Carlos wild buckwheat	*Eriogonum capillare*	C2, S
Fish Creek rock daisy	*Perityle saxicola*	C2, S

Table 3-3. Special Status Plant and Wildlife Species Potentially Occurring in the Carlota Copper Project Area

Common Name	Scientific Name	Status
INSECTS		
Maricopa tiger beetle	*Tcicendela oregona maricopa*	C2
AMPHIBIANS AND REPTILES		
Arizona toad	*Bufo microscaphus microscaphus*	C2
Chiricahua leopard frog	*Rana chiricahuensis*	C, SC, S
lowland leopard frog	*Rana yavapaiensis*	C2, SC, S
common chuckwalla	*Sauromalus obesus*	C2
desert tortoise	*Gopherus agassi . zi .*	C2, SC, S
northern leopard frog	*Rana pipiens*	SC
Mexican garter snake	*Thamnophis eques*	C2, SC, S
narrow-headed garter snake	*Thamnophis rufipunctatus*	C2, SC, S
BIRDS		
southwestern willow flycatcher	*Empidonax traillii extimus*	LE, SE
buff -breasted flycatcher	*Empidonax fulvifrons*	C2, SE, S
loggerhead shrike	*Lanius ludovicianus*	C2
yellow-billed cuckoo	*Coccyzus americanus*	ST
northern goshawk	*Accipiter gentilis*	C2, SC,
common black-hawk	*Buteogallus anthracinus*	SC, S
American peregrine falcon	*Falco peregrinus anatum*	LE, SC, S
ferruginous pygmy owl	*Glaucidium brasilianum cactorum*	PT, SE, S
bald eagle	*Haliaeetus leucocephalus*	LE, SE, S
Mexican spotted owl	*Strix occidentalis lucida*	LT, ST, S
MAMMALS		
California leaf-nosed bat	*Macrotus californicus*	C2, SC, S
Mexican long-tongued bat	*Choeronycteris mexicana*	C2, ST, S
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	LE, SE, S
south western cave myotis	*Myotis velifer brevis*	C2, S
occult little brown bat	*Myotis Occultus*	C2, S
red bat	*Lasiurus borealis*	SC, S
southem yellow bat	*Lasiurus ega*	SC, S
spotted bat	*Euderma maculatum*	C2, SC, S
greater western mastiff bat	*Eumops perotis*	C2, S
Yavapai Arizona pocket mouse	*Perognathus amplus amplus*	C2
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	C2
Source: USFS, 1997		
Status:		

Table 3-3. Special Status Plant and Wildlife Species Potentially Occurring in the Carlota Copper Project Area

Common Name	Scientific Name	Status

Federal (U.S. Department of the Interior 1992, 1993)
LE = Taxa listed by the U.S. Fish and Wildlife Service as Endangered under the Endangered Species Act (ESA).
LT = Taxa listed by the U.S. Fish and Wildlife Service as Threatened under the ESA.
PE = Taxa proposed for listing as Endangered under the ESA.
PT = Taxa proposed for listing as Threatened under the ESA.
C = Candidate, taxa for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
C2 = Category 2 Candidate. Taxa with the C2 designation were listed as such at the initiation of the Carlota EIS analysis. Since that time, the U.S. Fish and Wildlife Service has issued a more recent listing of candidate species (Federal Register 61: 7596-7613, February 28, 1996). As a result of this update, none of the plant and wildlife species addressed by the EIS are listed as candidate (C2) species. Chiricahua leopard frog is the only species in *Table 3*-48 that still has a candidate (C) designation (see above). Species that were listed as C2 candidates but are not listed as sensitive (Mogollon fleabane, Arizona toad, common chuckwalla, loggerhead shrike, and Yavapai Arizona pocket mouse) no longer have any special federal designation.

State (Arizona Game and Fish Department 1988)
SE= State Endangered as listed on the Arizona Game and Fish Department's list of Threatened Native Wildlife (TNW) in Arizona. Species in imminent danger of extinction within Arizona.
ST = State Threatened as listed on the TNW list. Species with identified, serious threats and populations lower than they were historically and/or extremely local and small.
SC = State Candidate as listed on the TNW list. Species with known or suspected threats, but for which substantial population declines from historical levels have not been documented.

Forest Service (USDA Forest Service 1988)
S = Classified as "sensitive" by the Regional Forester when the species occurs on lands managed by the Forest Service.

Environmental Consequences

Potential impacts to wildlife and T&E species associated with the proposed mine project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. Existing conditions at the Gibson Mine site would remain unchanged under the No Action Alternative. Surface water runoff from the Gibson Mine site would continue to cause unrestricted loading of dissolved copper and other contaminants to the Gibson Mine tributary and Pinto Creek. These metal loads could indirectly affect the Arizona toad, which is susceptible to degraded water quality.

The No Action Alternative may directly and indirectly impact wildlife, wildlife habitat, aquatic species, and T&E and other special status species in Haunted Canyon, Powers Gulch, and Pinto Creek. The Final EIS (USFS, 1997) identified potential reductions to stream base flows in Haunted Canyon and Pinto Creek

from pumping the wellfield (Figure 2-3). Potential direct and indirect impacts to special status species arise from lowered baseflows in Haunted Canyon, Powers Gulch, and Pinto Creek and continued degradation of water quality in Pinto Creek. Lowered baseflows could directly impact the Maricopa tiger beetle, Arizona toad, and lowland leopard frog by reducing available habitat for foraging and breeding. The yellow-billed cuckoo and common black-hawk could be indirectly impacted by the No Action Alternative if lower baseflows decrease the acreage of riparian habitat adjacent to the impacted streams.

Proposed Action Alternative. Partial reclamation of the Gibson Mine site would eliminate unrestricted loading of copper and other contaminants to Pinto Creek. This action is expected to improve water quality in Pinto Creek over the existing condition.

Partial reclamation of the Gibson Mine site would not directly or indirectly impact the Arizona agave (*Agave arizonica*) and Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*) or other special status species. A site visit to the Gibson Mine site on December 12, 2000 by the U.S. Forest Service and representatives from Carlota Copper Company determined that these plant species do not occur at the Gibson Mine site (USFS, 2000). USFS (2000) reported that soil types in the vicinity of the Gibson Mine are favorable for the Arizona agave, although no individuals were identified in the area of the proposed partial reclamation or near the mine site in general. The types of soils that occur in this area are unfavorable for the Arizona hedgehog cactus. A copy of the USFS site report is included in Appendix B. No other T&E or special status species are expected to occur in the immediate vicinity of the Gibson Mine site. None of the aquatic species nor pisciverous birds would be adversely impacted because there is no water on the site. The Gibson Mine site does not contain suitable habitat for the loggerhead shrike.

The Proposed Alternative, the NPDES permit condition allowing the discharge of ground water to Waters of the U.S. and partial reclamation of the Gibson Mine site, would mitigate potential impacts to special status species. The wellfield mitigation plan would ensure that base flows in Haunted Canyon, Powers Gulch, and Pinto Creek do not drop below defined monthly minimum streamflows. Further, riparian habitat in these reaches would not be reduced below the existing condition.

3.3 CULTURAL ENVIRONMENT

3.3.1 Historical and Archaeological Resources

Affected Environment

A detailed description of the affected cultural resource environment of the Carlota Copper Project is provided in Section 3.6.1 of the 1997 Final EIS (USFS, 1997). This included the area that would be affected by the proposed wellfield, but did not include the Gibson Mine site.

To evaluate the affected environment of the Gibson Mine site, Stantec Consulting, Inc. (SCI), conducted a cultural resource pedestrian survey of a portion of the mine site on December 13, 2000. The surveyed area total approximately 20 acres in area. The results of this survey are presented in Giacobbe and Geller (2001) and are summarized herein.

The surveyed area is located in Township 1 South, Range 14 East, Section 21 (Gila and Salt River Baseline and Meridian; Figure 2-1). The SCI survey was performed to inventory and assess the cultural resources that could be potentially impacted by the proposed partial reclamation of the Gibson Mine site. The survey resulted in 100% ground coverage and was accomplished with straight and zig-zag, 10 to 15 meter transects crossing the project area. Ground visibility, which varied from 50 to 100 percent, was occasionally obscured by vegetation and mining debris.

Two historic archaeological sites, AZ V:9:422 (ASM) and AZ V:9:423 (ASM), and six historic isolated occurrences were identified within the survey area. These cultural resource manifestations were recorded, analyzed and mapped (Giacobbe and Geller, 2001). The isolated occurrences observed do not meet Arizona State Museum (ASM) site criteria, and field analysis and mapping was considered sufficient to exhaust their data potential. The archaeological sites identified within the survey area include a historic-era copper mine (the Gibson Mine), and a small historic-era campsite. No prehistoric cultural resources were observed during survey, and it is unlikely that prehistoric cultural resources are extant within the surveyed area.

Site AZ V:9:422 (ASM) is the Gibson Mine itself. This site is a large, expansive mining venture which includes mine shafts, adits, treatment and processing facilities, and other associated features which cover from 81,000-162,000 m^2 (20 to 40 acres). The site includes the primary Gibson mine shaft, a complex system of

additional adits and shafts, several historic artifact scatters, a large, unidentified processing facility structural remnant, and several additional associated features. This site represents the remains of a mining venture which began operation in the first decade of the 20th century, and is associated with the Bellevue campsite/townsite.

Site AZ V:9:423 (ASM) is a small historic-era campsite located in the southwest portion of the project area. The size of the site is estimated at 240 square yards or 0.05 acres (65 feet north to south, and 33 feet east to west). Much of the ground surface was obscured by a thick growth of vegetation and the actual extent of the site may be larger. The site included at least two filled mine shafts or prospects, a small historic artifact scatter, a small circular depression (possibly a hearth remnant), and a small cleared area (Giacobbe and Geller, 2001). This site likely represents the remains of an expedient campsite associated with early 20th century mining activities in the area, and possibly the Bellevue townsite.

Based on the artifact distribution and the depositional context of the sites, SCI concluded that both sites are potentially eligible for nomination to the National Register of Historic Places under Criterion D. Criterion D applies to properties that are likely to yield information important to the prehistory or history of the region. Additional information regarding a part of the area's early mining history, including the existence of structures, additional mine shafts, and other features, potentially could be obtained by studying the depositional character of site locations and conducting archival research.

Environmental Consequences

Potential impacts to the cultural resources associated with the proposed Carlota Copper Project were previously evaluated in the Final EIS (USFS, 1997) and are not addressed in this EA.

No Action Alternative. The No Action Alternative would not result in additional impacts to the cultural resources of the Gibson Mine site because no reclamation activities would occur. Early historic mining activities provided the source for the observed significant cultural resources within the project area. Subsequent recent (non-historic) mining activities may have negatively impacted the earlier historic cultural resources of the project area and, in addition, may have removed evidence of prehistoric occupation.

Under the No Action Alternative, discharges of ground water to Waters of the U.S. would not occur, resulting in no impacts to cultural resources.

Proposed Action Alternative. The removal of the PLS pond located at the toe of the leach pad and the removal of the raffinate pond located east of the leach pad are not likely to adversely affect any cultural resources. The excavation and relocation of the leach pad material away from the immediate drainage and the covering and removal of the leach pad material with non-mineralized local fill and soil and associated earth work is not likely to adversely impact site AZ V:9:423 (ASM), the historic-era campsite, because this campsite is located outside of the boundary of the proposed relocation site for the leach pad material. Carlota Copper (2001) has stated that it can and will avoid this site during reclamation activities and will take precautionary measures to ensure that adverse impacts do not occur to the site. These measures include identifying the site using flagging or netting and monitoring of the site by trained personnel prior to and following relocation to ensure that the campsite is properly marked and identified and to confirm that it was avoided during reclamation. In a letter dated March 27, 2001, EPA notified the State Historic Preservation Officer that "[b]ased on this assurance, EPA is writing to inform you that the partial reclamation will have no adverse effect on cultural resources in the project area." On April 13, 2001, the State Historic Preservation Officer concurred with EPA's determination that the partial remediation of the Gibson Mine is not likely to adversely affect cultural or historic resources.

The Gibson Mine site [AZ V:9:422 (ASM)] and the Bellevue townsite/campsite are outside of the area where partial reclamation activities would be conducted. It is anticipated that these sites can and will be avoided and that reclamation activities would not adversely affect these potentially significant historic properties.

The Final EIS did not identify any impacts to cultural resources associated with the development of the wellfield. It is anticipated that no additional impacts to cultural resources would occur resulting from the discharge of ground water to Waters of the U.S. at the proposed discharge locations. If potential cultural resource sites are observed during implementation of wellfield mitigation program, these sites would be avoided to prevent ground disturbance and impacts to the historical context of the site.

3.3.2 Land Use and Infrastructure

Affected Environment

A detailed description of land use and infrastructure affected by the Carlota Copper project is provided in Section 3.8 of the Final EIS (USFS, 1997). For this

reason, a detailed description of the affected environment land use and infrastructure is incorporated into this EA by reference to the Final EIS.

The Gibson Mine site contains an inactive copper mine that is located entirely on private property within the Tonto National Forest. The current use of the Gibson Mine site is as an inactive, abandoned mine. Access to this site is gated and locked by the property owner. The site is adjacent to administrative boundaries of the Tonto National Forest. Adjacent Forest Service lands are primarily used for recreation, such as hunting, trapping, horseback riding and hiking, and for livestock grazing.

The discharge points for the surface water augmentation program are located in Haunted Canyon, Powers Gulch, and Pinto Creek. Discharge points occur on public land within the administrative boundary of the Tonto National Forest. These lands are also primarily used for recreation, such as hunting, trapping, horseback riding and hiking, and for livestock grazing.

Environmental Consequences

Potential changes in land use associated with the proposed Carlota Copper Project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative would not result in impacts to current land use and infrastructure at the Gibson Mine site because no reclamation activities would occur. The Gibson Mine site would remain an inactive mine site in private ownership.

Under the No Action Alternative, discharges of ground water to Waters of the U.S. would not occur, resulting in no impacts to current land use or infrastructure.

Proposed Action Alternative. The partial reclamation of the Gibson Mine site would require temporary use of heavy equipment to relocate the leach pad material and remove the process ponds. Reclamation activities would not require the construction of new access roads or power lines and would not affect grazing. Impacts to current land-use would not be expected from these reclamation activities or would be temporary and insignificant. The Gibson Mine site would remain in private ownership.

A detailed design of the pipeline system necessary to bring water to the approximate discharge locations is not available. It is assumed that a piping system would be sited along the ground surface from the wellfield to the discharge locations in Haunted Canyon, Powers Gulch, and Pinto Creek. Long-term adverse impacts to land use are not expected because the associated piping would be removed after completion of the Carlota Copper Project.

The Proposed Action is not expected to adversely impact other land uses such as grazing, or recreation.

3.3.3 Hazardous and Solid Waste

Affected Environment

A detailed description of hazardous and solid waste associated with the Carlota Copper project is provided in Section 3.14 of the Final EIS (USFS, 1997). For this reason, a detailed description of the affected environment hazardous and solid waste is incorporated into this EA by reference to the Final EIS.

Depending on precipitation and runoff, the PLS pond at the Gibson Mine site occasionally contain leachate and rainwater with high concentrations of copper, acid, sulfate and other constituents (Table A-1). The PLS pond is 62 feet by 44.5 feet by 3.4 feet deep, with an estimated volume of 60,200 gallons (SHB AGRA, 1993). The raffinate pond is largely comprised of rainwater with residual copper and other chemical constituents. The raffinate pond is 88 feet by 61 feet by 5.2 feet deep, with an estimated volume of 160,800 gallons. Water quality analyses of the PLS pond samples collected in 1990, 1992, 1995, and 1999 showed that pH ranges between 2.50 and 3.19 standard units (s.u.); pH of the raffinate pond was measured in 1990 at 2.40 s.u. (Mining & Environmental Consultants, 1993b; ADEQ, 1995; 1999; Table A-1). The leach pad consists of approximately 20,000 tons of ore that consists of copper oxide and sulfide minerals.

The contents of the Gibson Mine ponds and leach pad are wastes that were generated by mineral beneficiation operations. Mineral beneficiation wastes are exempt from regulation as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA) under the Mining Waste Exclusion. This Exclusion (50 FR 40292, October 2, 1985) was established in response to RCRA §3001(b)(3), the so-called "Bevill Amendment."

Hazardous or solid wastes were not identified in the wellfield mitigation program project area (USFS, 1997).

Environmental Consequences

Hazardous and solid waste associated with the proposed Carlota Copper Project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. Impacts to the environment, in the form of continued releases of deleterious water from the Gibson Mine site, would continue to occur under the No Action Alternative. This is because the Gibson Mine leach pad, PLS pond, and raffinate pond would not be removed under the No Action alternative. The process ponds will continue to collect rainwater and seepage from the leach pad. These ponds will continue to pose a threat to the environment in the event that the geotextile liners become punctured or otherwise degraded, or the ponds overflow during or following a precipitation event. The leach pad will remain exposed to the environment and pollutants will continue to be mobilized by wind, rain, and runoff from the site.

Under the No Action Alternative, discharges of ground water to Waters of the U.S. would not occur, resulting in no impacts from hazardous or solid wastes.

Proposed Action Alternative. The Proposed Alternative is expected have a positive impact on water quality downstream from the site (see Section 3.1.3). Under the Proposed Alternative, the leach pad, PLS pond, and raffinate pond would removed and these contaminant sources would be eliminated. The leach pad will be relocated away from the Gibson Mine tributary and capped with non-mineralized local soil to minimize the potential for pollutants to be mobilized by wind or rain. The process ponds will be pumped out, deconstructed, and all materials will be disposed of at an approved disposal facility.

Impacts from hazardous or solid wastes would not be expected resulting from discharges of ground water to Waters of the U.S.

3.3.4 Noise

Affected Environment

A detailed description of noise in the vicinity of the Carlota Copper Project is provided in Section 3.12 of the Final EIS (USFS, 1997). The EIS description includes the area around the wellfield mitigation project. For this reason, a

detailed description of noise in the affected environment is incorporated into this EA by reference to the Final EIS.

The Gibson Mine site is located on a private inholding in the Tonto National Forest, approximately 6 miles west-southwest of Miami, Arizona. The mine is currently inactive and, as such, is not a noise generator. Noise generators in the vicinity of the site are largely limited to natural sounds (i.e., birds, wildlife, wind). A ranch house approximately one-half mile from the site is the only noise receptor in the immediate vicinity of the site, although hikers, equestrians, and other recreators may temporarily be in the vicinity of the site.

Environmental Consequences

Noise impacts from the proposed mine project were previously evaluated in the Final EIS and are not addressed in this EA. In addition, noise impacts associated with development and pumping of the wellfield were evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. Ambient noise levels would not increase at the Gibson Mine site under the No Action Alternative because the Gibson Mine site would remain inactive.

Under the No Action Alternative, ambient noise levels would not increase in the vicinity of the wellfield mitigation program, because this program would not be implemented.

Proposed Action Alternative. The Proposed Alternative would result in temporary increases in ambient noise levels at the Gibson Mine site. Activities associated with the Proposed Alternative would require the use of construction equipment to deconstruct the leach pad and process ponds at the Gibson Mine site. Construction equipment generally operates at sound levels between 70 and 90 dBA. Other sources of noise include vehicle traffic to and from the sites during the proposed activities. Activities associated with the Proposed Alternative would be temporary in nature and noise levels are expected to return to pre-activity levels upon completion of the reclamation activities.

The Proposed Alternative would result in increases in ambient noise levels at the site of the wellfield mitigation program. Activities associated with the Proposed Alternative may require the use of construction equipment to install transmission pipes for the wellfield mitigation program. These activities would

be temporary in nature and noise levels are expected to return to pre-activity levels upon completion of the installation activities.

3.3.5 Visual and Aesthetic Resources

Affected Environment

The Gibson Mine site does not currently provide any significant aesthetic values. The site is not vegetated and largely comprises waste rock piles, process ponds, abandoned mining equipment and miscellaneous structures. Vegetation surrounding the site can be classified as belonging to the interior chaparral vegetation association (*see* Section 3.2.1).

The area surrounding the wellfield mitigation discharge points comprises wetlands, Waters of the U.S., and riparian vegetation (*see* Section 3.2.1). Haunted Canyon, downstream from Powers Gulch, contains riparian areas with a dense vegetative canopy. The northern and eastern slopes of this drainage are composed of a mixture of pinon-juniper and chaparral plant species. These slopes contain relatively high plant diversity and provide significant aesthetic value. The Pinto Creek drainage also contains a riparian zone with overstory composed of sycamore, ash, walnut, and other tree species.

Environmental Consequences

Impacts to visual and aesthetic resources associated with the proposed mine project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. Aesthetic and visual resources at the Gibson Mine site would not change under the No Action Alternative.

Aesthetic resources in and around Haunted Canyon, Powers Gulch, and Pinto Creek could potentially be adversely impacted by the No Action Alternative. Ground water pumping associated with the Carlota Copper Project has the potential to reduce base flow in Haunted Canyon and Pinto Creek. Reductions in base flows could precipitate a change in plant species along the creeks and wetlands from riparian plants to upland species. Lower flow rates in Haunted Canyon, Powers Gulch, and Pinto Creek could also provide less visual appeal, particularly when accompanied by changes in the surrounding plant communities.

Proposed Action Alternative. Partial reclamation of the Gibson Mine site may slightly improve the visual aesthetics of the site, but visual resources are not expected to significantly improve over the No Action Alternative. The reclaimed site would not be revegetated, although natural recruitment may occur over time, and mining structures other than the leach pad and process ponds would remain. Construction activities associated with the partial reclamation of the Gibson Mine site would have short-term negative impacts to aesthetic resources. These impacts arise from the presence of construction equipment and associated dust and exhaust emissions. These impacts are expected to be temporary and insignificant, lasting only as long as construction activities.

The wellfield mitigation program of the Proposed Alternative is expected to maintain the visual aesthetics of Haunted Canyon, Powers Gulch, and Pinto Creek at or near their current levels. Maintenance of base flow under the stream flow augmentation program would not significantly change the existing condition but could potentially mitigate aesthetic resources by maintaining stream flow and soil moisture in the riparian zone. A design for the ground water conveyance pipeline has not been designed. Presumably this pipeline may be sited on the ground surface and would be visible to passers-by, thereby detracting from the visual aesthetics of the area. Within the context of the site area, these disturbances would not be considered substantial.

3.3.6 Socioeconomics

Affected Environment

A detailed description of socioeconomic aspects of the Carlota Copper project are provided in Section 3.7 of the Final EIS (USFS, 1997). For this reason, a detailed description socioeconomics of the affected environment is incorporated into this EA by reference to the Final EIS.

Environmental Consequences

Socioeconomic impacts associated with the proposed mine project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative would not have any impact on the economic and social conditions in the Gibson Mine area or Gila County. Nobody is employed or lives at the Gibson Mine site.

The No Action Alternative would not have any impact on the economic and social conditions at the wellfield mitigation site or Gila County. Nobody is employed or lives at the wellfield site.

Proposed Action Alternative. The Proposed Alternative would not have any significant impact on the economic and social conditions in Gila or Pinal Counties. Any employment that might be required to complete the reclamation activities or implement the stream flow augmentation program would be temporary and short-lived.

3.3.7 Recreation

Affected Environment

A detailed description of affected environment for recreation is provided in Section 3.9 of the Final EIS (USFS, 1997). For this reason, a detailed description of affected environment recreation is incorporated into this EA by reference to the Final EIS.

The Gibson Mine is located on private property and is not legally accessible for recreational activities. Access to the site is controlled by a locked gate and at least a partial perimeter gate. The area around the Gibson Mine site is not developed for recreation but may see hunting, horseback riding, sightseeing, hiking, birdwatching, or other recreational uses.

The Powers Gulch and Haunted Canyon areas are commonly used for horseback riding and other recreational activities.

Environmental Consequences

Recreation impacts associated with the proposed Carlota Copper Project, including development and pumping of the wellfield, were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative is not expected to have any recognizable impact on outdoor recreation at the Gibson Mine site because the proposed reclamation activities would not take place. The Gibson Mine is located on private property and is not developed or suitable for recreation.

The No Action Alternative is not expected to have any recognizable impact on outdoor recreation at the wellfield mitigation site. Under the No Action

Alternative, the transmission pipe for the wellfield mitigation program would not be installed.

Proposed Action Alternative. The Proposed Action Alternative is not expected to have any significant impact on outdoor recreation at the Gibson Mine site. Partial reclamation of the Gibson Mine is expected to positively benefit downstream water quality (Section 3.1.3) and improvements in water quality are expected to have positive benefits on vegetation and wildlife habitat (Sections 3.2.1, 3.2.2). Secondary positive impacts to recreation could, therefore, result from the partial reclamation.

The Proposed Action Alternative is not expected to have any significant impact on outdoor recreation at the wellfield mitigation site. The wellfield mitigation program encompasses a small geographic area and is not expected to directly impact recreation. The wellfield mitigation component of the Proposed Alternative could have an indirect positive benefit on recreation to the extent that surface water augmentation maintains the existing aesthetic character of the area (*see* Section 3.3.5).

3.3.8 Wilderness and Wild and Scenic Rivers

Affected Environment

Detailed descriptions of the affected environment for wilderness and wild and scenic rivers in the area of the proposed Carlota Copper Project are provided in Section 3.10 of the Final EIS (USFS, 1997). For this reason, a detailed description of affected environment wilderness and wild and scenic rivers is incorporated into this EA by reference to the Final EIS. The nearest wilderness area is the Superstition Wilderness, located approximately 2 to 3 miles west of the proposed project area.

The Gibson Mine tributary is an ephemeral drainage that has not been recommended for designation under the National Wild and Scenic River program.

Pinto Creek is an intermittent stream with short perennial reaches from the confluence of Pinto Creek and Haunted Canyon to a point approximately 5 miles downstream. At this point, Pinto Creek becomes perennial for the next 8 to 9 miles. This segment was included in a study of rivers and streams potentially eligible for inclusion in the National Wild and Scenic Rivers System. This segment is considered eligible for inclusion based on “outstandingly

remarkable" scenic, riparian, and ecological values and was determined by the U.S. Forest Service to be potentially eligible for classification as "Scenic." The designation will be considered at the next revision of the *Tonto National Forest Plan* (USFS 1997).

Environmental Consequences

Impacts to wilderness and wild and scenic rivers resulting from the proposed Carlota Copper Project were previously evaluated in the Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative would have no impact to wilderness or wild and scenic rivers at the Gibson Mine site.

The No Action Alternative could potentially jeopardize the qualities that make the 8-mile perennial section of Pinto Creek eligible for a "Scenic" designation. Failure to implement stream flow augmentation could potentially impact the remarkable scenic, riparian, and ecological values. Similarly, partial reclamation of the Gibson Mine site would not occur under the No Action alternative. Surface water runoff from the Gibson Mine site would continue to cause unrestricted loading of dissolved copper and other contaminants to the Gibson Mine tributary and Pinto Creek. The existing condition could potentially cause adverse impacts on downstream wildlife, wildlife habitat, and aquatic species; including the segment of Pinto Creek eligible for the scenic designation.

Proposed Action Alternative. Partial reclamation of the Gibson Mine under the Proposed Alternative would ensure that Pinto Creek is no longer subjected to unrestricted copper loading. As such, the Proposed Alternative could lead to minor improvements in the scenic, riparian, and ecological values of downstream reaches of Pinto Creek, including the 8-mile perennial reach of that will be considered for Scenic River designation by the Tonto National Forest.

Stream flow under the wellfield mitigation program under the Proposed Alternative would ensure that minimum monthly stream flow is maintained on Pinto Creek. Consequently, the Proposed Alternative would mitigate potential impacts to the scenic, riparian, and ecological values of downstream reaches of Pinto Creek, Powers Gulch and Haunted Canyon, including the 8-mile perennial reach of Pinto Creek that will be considered for Scenic River designation by Tonto National Forest.

3.3.9 Transportation

Affected Environment

A detailed description of the affected environment for transportation in the area of the proposed Carlota Copper Project is provided in Section 3.13 of the Final EIS (USFS, 1997). For this reason, a detailed description of affected environment transportation issues are incorporated into this EA by reference to the Final EIS.

Environmental Consequences

Impacts to transportation resulting from the proposed Carlota Copper Project were previously evaluated by the Final EIS and are not addressed in this EA.

No Action Alternative. The No Action Alternative would not produce any effect on transportation in the Gibson Mine area because the proposed reclamation activities would not take place.

The No Action Alternative would not produce any effect on transportation in the wellfield mitigation area because the proposed transmission pipe installation would not take place.

Proposed Action Alternative. The Proposed Action Alternative is not expected to have any significant effect on transportation in the Gibson Mine area. The Proposed Action would require trucking material from the Gibson Mine site to a disposal site and transportation of workers to the mine area. Neither of these activities represents a significant impact to traffic flow and safety. The transport of contaminated materials from the Gibson Mine site to an off-site disposal facility would pose a risk for spills. However, this risk would be quite low and would be sufficiently mitigated by standard practices for hiring and supervising qualified and experienced contractors for this type of work.

The Proposed Action Alternative is not expected to have any effect on transportation in the wellfield mitigation area. The Proposed Action would require trucking pipe to the wellfield mitigation site and transportation of workers to the job site. Neither of these activities represents a significant impact to traffic and safety.

3.4 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This section discusses local short-term impacts and resource consumption resulting from the Proposed Action, the maintenance and enhancement of long-term productivity and the relationship between the two.

Short-term impacts of the Proposed Action Alternative are those that could occur for the duration of activities associated with the partial reclamation of the Gibson Mine site, as well as the duration of periodic discharges to Waters of the U.S. under the wellfield mitigation program described in the Final EIS.

3.4.1 Partial Reclamation of Gibson Mine

Under the Proposed Alternative, short-term adverse impacts to air quality would be expected from the partial reclamation of the Gibson Mine site. Fugitive dust and vehicle emissions could impact PM_{10} concentrations, air quality and visibility in an area near the Gibson Mine site. These impacts and energy consumption would occur only during the short duration of the partial reclamation activities and would cease after completion of the project.

The reclamation activities also may lead to transient increases in ambient noise due to equipment operation. The potential for impacts to occur from a spill of contaminated materials being transferred from the Gibson Mine to an approved off-site disposal location also is slightly increased for the short term. These impacts would cease upon completion of the reclamation project.

Other adverse short-term impacts would not be expected from the partial reclamation of the Gibson Mine site.

3.4.2 Discharge Of Ground Water to Waters of the U.S.

Under the Proposed Action Alternative, a direct discharge of wellfield bedrock ground water could potentially cause impacts to ambient surface water temperatures because the temperature of the water in the bedrock aquifer is higher than that of alluvial ground water and surface water. However, the wellfield discharge is required to meet applicable Arizona water quality standards at the point of discharge. This means that the discharge cannot raise ambient surface water temperature by more than 3° Celsius. Consequently, short-term adverse impacts are not expected to occur as a result of wellfield discharges.

Additional minor short-term impacts to vegetation and visual aesthetics could occur if a piping system were sited along the ground surface from the wellfield to the discharge locations. These impacts would cease upon completion of the Carlota Copper Project.

Additional short-term adverse impacts would not be expected from the discharge of surface water to Waters of the U.S..

3.4.3 Maintenance and Enhancement of Long-Term Productivity

Long-term productivity of Pinto Creek and portions of its tributaries would improve as a result of the two conditions that constitute the Proposed Action because they have been proposed to enhance water quality. The productivity of riparian vegetation, wetlands, aquatic life, and Waters of the U.S. would increase due to periodic discharges of ground water to augment stream flows in Haunted Canyon, Powers Gulch, or Pinto Creek and reduced contaminant loads in Pinto Creek.

3.4.4 Relationship Between Short-Term Impacts and Long-Term Productivity

Long-term improvements in water quality and associated productivity gains created by the Proposed Action Alternative would have some minor adverse short-term impacts which have been discussed in this document.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED WITH THE PROPOSED ACTION

Implementation of the Proposed Action would commit resources in the form of energy, labor, materials, lands and funds. These commitments would be irreversible and irretrievable, but would not be considered wasteful or inefficient.

The use of ground water for maintenance of minimum surface water flows would be considered beneficial within the context of this project.

3.6 SECONDARY AND CUMULATIVE IMPACTS

Secondary impacts are those that are caused by an action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8). Cumulative impacts are effects that may be incrementally minor, but when considered in combination with other similar impacts may accumulate to more substantial proportions at the local, regional, state or national level. Cumulative impacts result from a proposed action in combination with other past, present, and reasonably foreseeable future actions.

Secondary impacts of the Proposed Action would occur downstream and would be beneficial. These impacts relate to water quality improvement and associated habitat benefits.

Incremental impacts from the Proposed Action that may contribute to cumulative impacts set forth in the previous EIS include:

Minor air pollutant emissions
Site disruption, vegetation removal and habitat disturbance

No cumulative impacts of any significance would be expected at the regional, state or national level.

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APPENDIX A

Supplemental Water Quality Data

Table A-1. Water Quality in the Gibson Mine Area

Gibson Mine Tributary Above Gibson Mine

Station	Date	Flow gpm	pH	Hardness	Cu-diss mg/L	Cu-total	Cu-load *	Data Source
10	1/27/92		6.17	28		0.101		1
3/A	3/9/95	17	5.97	27	0.11	0.23	0.01	2
200' above	9/15/99					4.3		4

Gibson Mine Solution Storage Ponds

Station	Date	Flow gpm	pH	Hardnesmg/L	Cu-diss mg/L	Cu-total mg/L	Cu-load * kg/day	Data Source
PC-D (raffinate pond)	10/16/90		2.40			1100		1
PLS (PLS pond)	11/16/90		2.50	2171		814		1
14 (PLS pond)	1/27/92		2.86	2050		790		1
6/E (PLS pond)	3/9/95	0.5	3.19			654		2
PLS (PLS pond)	9/15/99		3.10	3300	1600	1600		4

Gibson Mine Tributary Below Gibson Mine

Station	Date	Flow gpm	pH	Hardness	Cu-diss mg/L	Cu-total	Cu-load *	Data Source
PC-GM-D	10/1/90		3.63		229	229		1
PC-8P-90	10/16/90		4.28	169	119	124		1
18	1/27/92		4.50	360		157		1
1	7/30/92		5.34	105	4.9	5.0		1
8/F	3/9/95	41	5.31	416	30.3	30.8	6.77	2
12/G	3/9/95	88	5.74	310	16.6	16.4	7.96	2
Culvert 100'	9/15/99		5.90	120	11	24		4

Data Source: 1 = ADEQ, 1993; 2 = ADEQ, 1995; 3 = ADEQ, 2000; 4 = EPA, 1999
* Computed using dissolved copper concentrations.

Table A-2. Water Quality in Upper Pinto Creek

Pinto Creek Above Gibson Mine Tributary

Station	Date	Flow gpm	pH	Hardness mg/L	Cu-diss mg/L	Cu-total mg/L	Cu-load* kg/day	Data Source
PC-U	10/1/90		7.53	152	0.026	0.017		1
PC-1	10/16/90		6.68	175	0.035	0.019		1
3	1/9/91		7.64	110	0.032	0.038		1
22	1/27/92		8.12	128		0.049		1
8	5/13/92		8.27	158	0.02	nd		1
4	7/30/92		8.52	290	0.012	nd		1
PC above Gibson	10/22/00		7.10	36	0.04	0.055		3

Gibson Mine Tributary Above Pinto Creek

Station	Date	Flow gpm	pH	Hardness mg/L	Cu-diss mg/L	Cu-total mg/L	Cu-load* kg/day	Data Source
PC-GM-FD	10/1/90		3.85	n/a	236	249		1
1	1/9/91		5.30	244	17.6	17.5		1
21	1/27/92		6.10	117		4.4		1
7	5/13/92		6.40	193	3.34	2.92		1
2	7/30/92		5.62	157	4.4	5.9		1
13/H	3/9/95	172	6.36	68	1.82	2.24	1.71	2
Gibson Trib	10/22/00		5.30	57	5.9	5.9		3

Pinto Creek Below Gibson Mine Tributary

Station	Date	Flow gpm	pH	Hardness mg/L	Cu-diss mg/L	Cu-total mg/L	Cu-load* kg/day	Data Source
PC-D	10/1/90		6.55	n/a	7.9	10.3		1
PC-2	10/16/90		6.39	n/a	3.76	4.18		1
2	1/9/91		7.21	163	1.13	1.65		1
23	1/27/92		8.03	121		0.308		1
9	5/13/92		8.33	166	0.048	0.051		1
3	7/30/92		7.94	210	0.55	0.32		1
PC below Gibson	10/22/00		7.20	39	0.56	0.64		3

Data Source: 1 = ADEQ, 1993; 2 = ADEQ, 1995; 3 = ADEQ, 2000; 4 = EPA, 1999
* Computed using dissolved copper concentration.

Table A-3. Selected Water Quality Data for Pinto Creek, Haunted Canyon and Ground Water in the

Constituent	Units	Pinto Creek below Haunted Canyon (PC-7 & PC-7.5 Avg.)	Haunted Canyon (HC-2 Avg.)	Well Field (Average Values)		Pinto Creek Water Quality Standards					
						Aquatic Wildlife (warm water fishery)		FBC	FC	AgI	AgL
				Alluvium [a]	Bedrock [b]	Acute	Chronic				
Physical Parameters											
Dissolved Oxygen	mg/L	7.4	4.7			6.0					
Total Dissolved Solids	mg/L @ 180 °C	1093	326	366	309						
Total Hardness	mg/L as CaCO3	829	217								
Turbidity	NTU		0.8			50	50	50			
Temperature	°C	16.7	17	16	26.8	±3.0	±3.0				
Major Cations and Anions											
Calcium	mg/L	247	59.9	70.2	54.5						
Magnesium	mg/L	47.1	15.5	16.4	11.2						
Potassium	mg/L	6	7	7.0	4.9						
Sodium	mg/L	42.3	13.7	14.0	23.0						
Bicarbonate	mg/L	209	223	228	272						
Chloride	mg/L	38.8	8.6	10.3	10.5						

Table A-3. Selected Water Quality Data for Pinto Creek, Haunted Canyon and Ground Water in the

Constituent	Units	Pinto Creek below Haunted Canyon (PC-7 & PC-7.5 Avg.)	Haunted Canyon (HC-2 Avg.)	Well Field (Average Values)		Pinto Creek Water Quality Standards					
						Aquatic Wildlife (warm water fishery)		FBC	FC	AgI	AgL
				Alluvium [a]	Bedrock [b]	Acute	Chronic				
Sulfate	mg/L	495	52.1	80	15						
Inorganic Nonmetals											
Boron	mg/L	<0.1	<0.1	<0.1	<0.1			12.6		1.0T	
Cyanide	mg/L	<0.04	<0.1	<0.1	<0.1	0.041T	0.0097T	2.8T	210T		0.2T
Fluoride	mg/L	0.6	0.2	<0.5	0.28			8.4			
Nitrate	mg/L	<0.4	1.2	<5.0	4.0			22.4			
Nitrite	mg/L	<0.1	<0.1	<0.5	<0.1						
pH	S.U.	7.3	7.5	7.1	7.3	6.5-9.0	6.5-9.0	6.5-9.0		4.5-9.0	6.5-9.0
Sulfides	mg/L	<0.1	<0.1		<0.1	0.1					
Total Nitrogen	mg/L					2.00	0.60				
Total Phosphorus	mg/L	<0.5	<0.5	<0.5		1.00	0.12				
Metals											
Aluminum	mg/L		<2D / <2T								
Antimony	mg/L	<2.0D / <2.0T	<2.0D / <2.0T	0.005	<0.2	0.088D	0.030D	0.056T	0.14T		

Table A-3. Selected Water Quality Data for Pinto Creek, Haunted Canyon and Ground Water in the

Constituent	Units	Pinto Creek below Haunted Canyon (PC-7 & PC-7.5 Avg.)	Haunted Canyon (HC-2 Avg.)	Well Field (Average Values)		Pinto Creek Water Quality Standards					
						Aquatic Wildlife (warm water fishery)		FBC	FC	AgI	AgL
				Alluvium [a]	Bedrock [b]	Acute	Chronic				
Arsenic	mg/L	<0.004D / <0.004T	0.006D / 0.006T	0.007	0.014	0.360D	0.190D	0.05T	1.45T	2.0T	0.2T
Barium	mg/L	<1.0D / <1.0T	<1.0D / <1.0T	<1	<1			9.8D			
Beryllium	mg/L	<0.0009D / <0.0009T	<0.1D / <0.1T	<0.1	<0.1	0.065D	0.0053D	0.004T	0.0002T		
Cadmium [c]	mg/L	<0.005D / 0.011T	<0.005D / <0.005T	<0.005	<0.005	0.024D	0.001D	0.07T	0.041T	0.05T	0.05T
Chromium	mg/L	<0.05D / <0.05T	<0.05D / <0.05T	<0.05	<0.05					1T	1T
Cobalt	mg/L	<0.1D / <0.1T	<0.1D / <0.1T	<0.1							
Copper [c]	mg/L	<0.5D / <0.5T	<0.5D / <0.5T	<0.5	<0.1	0.0179D	0.0119D	5.2D		5.0T	0.5T
Iron	mg/L	<0.3D / <0.3T	<0.3D / <0.3T	<0.3	0.5						
Lead [c]	mg/L	<0.005D / <0.005T	0.004D / 0.008T	0.007	0.008	0.083D	0.003D			10.0T	0.1T
Manganese	mg/L	<0.05D / 0.7T	<0.05D / <0.05T	0.05	0.05			19.6T		10.0	
Mercury	mg/L	<0.0006D / <0.0006T	<0.001D / <0.001T	<0.001	<0.001	0.0024D	0.00001D	0.042T	0.0006T		0.01T
Molybdenum	mg/L	0.021D / 0.021T	0.005D / <0.1T	0.007	0.005						
Nickel [c]	mg/L	<0.1D / <0.1T	<0.1D / <0.1T	<0.1	<0.1	1.430D	0.159D	2.8T	0.73T		

Table A-3. Selected Water Quality Data for Pinto Creek, Haunted Canyon and Ground Water in the

Constituent	Units	Pinto Creek below Haunted Canyon (PC-7 & PC-7.5 Avg.)	Haunted Canyon (HC-2 Avg.)	Well Field (Average Values)		Pinto Creek Water Quality Standards					
						Aquatic Wildlife (warm water fishery)		FBC	FC	AgI	AgL
				Alluvium [a]	Bedrock [b]	Acute	Chronic				
Selenium	mg/L	<0.005D / <0.005T	<0.005D / <0.005T	<0.005	0.001	0.02T	0.002T	0.7T	9.0T	0.02T	0.05T
Silver [c]	mg/L	<0.005D / <0.005T	<0.01D / <0.01T	<0.01	<0.01	0.004D					
Thallium	mg/L	<0.002D / <0.002T	<0.1D / <0.1T	<0.1	<0.1	0.70D	0.15D	0.012T	0.041T		
Zinc [c]	mg/L	<0.1D / 0.1T	<0.1D / 0.059T	0.06	0.12	0.118D	0.107D	42.0T	22.0T	10.0T	25.0T

[a] Alluvial Wells = AMW-21 and AMW-23

[b] Bedrock Wells = TR-1, TR-2 and TR-3

[c] Acute and chronic warm water fishery values computed at hardness of 101 mg/L

D=Dissolved fraction; T=Total fraction

FBC = Full body contact; FC = Fish Consumption; AgI = Agricultural irrigation; AgL = Agricultural livestock watering

Table A-4. Comparison of Temperature in Haunted Canyon Surface Water and Ground Water from Well Field Area Test Wells

Month	Surface Water Station HC-2			Ground Water Test Wells in Well Field Area		
	Average	Minimum	Maximum	TW-1	TW-2	TW-3
January	11.3	8.0	14.1	26.8*		
February	11.4	7.5	13.9			
March	12.6	9.3	15.5			
April	15.5	12.9	17.4	25	23	26.5
May	17.6	14.6	19.3			
June	20.6	19.3	22.0			
July	22.6	21.4	24.5			
August	23.0	21.5	24.3	25	24	
September	20.4	19.6	21.3			29
October	16.7	15.0	19.7			29
November	13.9	11.0	16.2		23.5	
December	10.2	8.2	14.1			31

All temperatures in degrees Celsius (°C).
Data Source: 1993 through 1998 water monitoring data; Groundwater Resources Consultants, Inc., 1998.
Groundwater temperatures represent measured values occurring in the month indicated.
* Average value computed from two measurements.

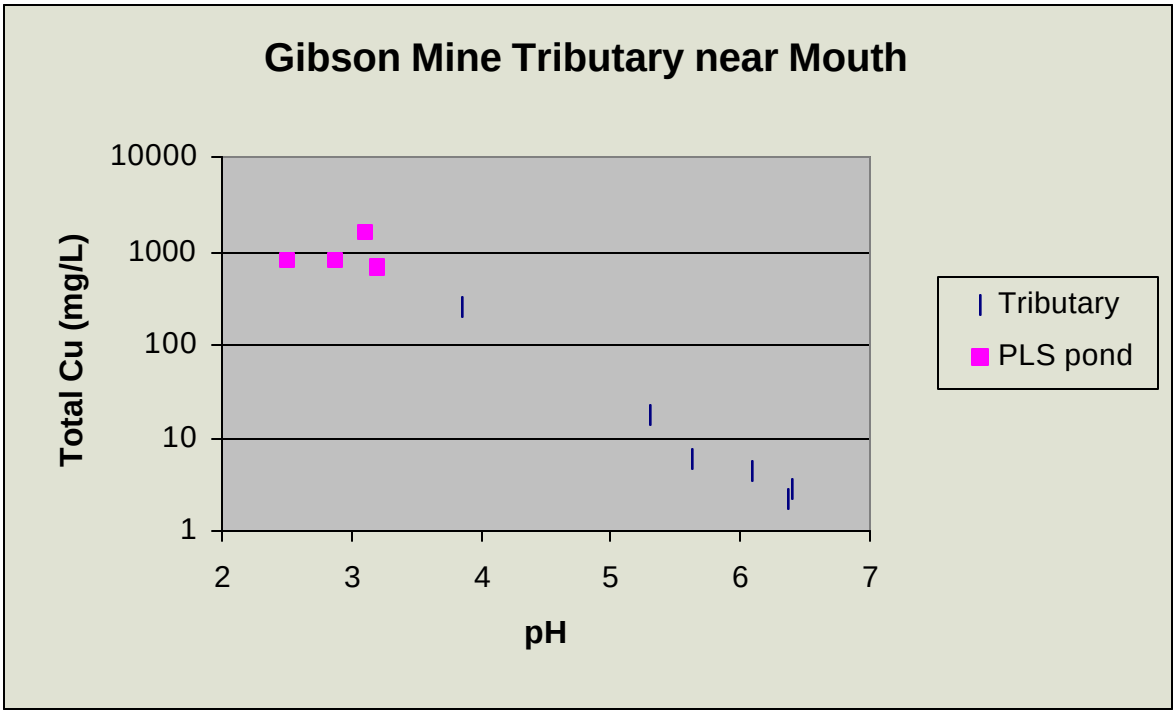

Figure A-1. Variation in pH and total copper concentration measured near the mouth of the Gibson Mine tributary and in the Gibson Mine PLS pond. Data are provided in Tables A-1 and A-2.

APPENDIX B

Consultation and Coordination