

## Pinal Creek

### Water Quality Assurance Revolving Fund ([WQARF](#)) Site

#### Boundaries:

The Pinal Creek WQARF (site) is located in the Globe-Miami area of Gila County, Arizona and has irregular boundaries. Within the southern portion of the site, the boundary follows and includes the entire mine sites of Freeport- McMoRan Miami Inc (FMI). These sites were formerly known as the Phelps Dodge Miami Mine and the Inspiration Mine. It also includes the mine sites of [BHP Copper, Inc.](#) (The [Miami Mine](#), the Copper Cities Mine, the Old Dominion Mine and related properties and the Solitude [Tailings](#)).

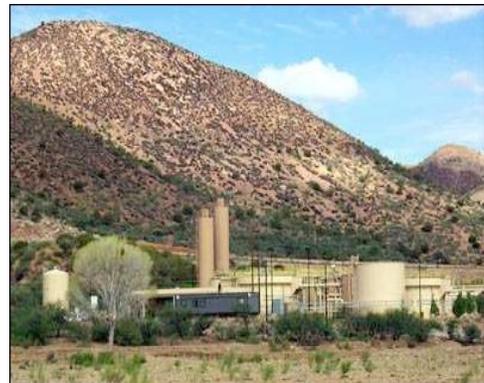
The southern boundary follows the southern margin of the floodplain of Bloody Tanks Wash through the town of Miami and the community of Claypool, and then turns south to include the BHP Solitude Tailings. The boundary follows the eastern margin of the floodplain of Russell Gulch and Miami Wash northward to the confluence with Pinal Creek. The boundary parallels both sides of upper Pinal Creek to the City of Globe, including the [Old Dominion Mine](#) and related mine properties in the Globe Hills.

North of the confluence of Miami Wash and Pinal Creek, the boundary parallels Pinal Creek on both sides including the floodplain of Pinal Creek plus a margin approximately 1,000 feet wide surrounding the floodplain as far north as Inspiration Dam. North of Inspiration Dam, the boundary follows the floodplain of Pinal Creek. The northern boundary terminates at the Salt River.

The site's geographic boundaries depicted on the [site map](#) represent the Arizona Department of Environmental Quality's (ADEQ) interpretation of data available at the time the map was constructed. The map is intended to provide the public with basic information as to the estimated extent of known contamination as of the date of map production. The actual extent of contamination may be different. Therefore, the boundaries for the site may change in the future as new information becomes available.

#### Site Status Update:

ADEQ continues to review source control [remedial investigations](#) (RIs) and [feasibility studies](#) (FSs) at the FMI and BHP Copper mining and processing facilities. Source control [remedial actions](#) are being implemented at all FMI and BHP Copper mining facilities. The site-wide stream sediment investigation is currently under review. FMI has submitted an addendum to their original feasibility study that addresses the Webster Gulch facilities including Webster Gulch tailings piles, the former Webster Lake bed, storm water management of the Lost Gulch arm of Webster Lake, Webster Lake sediments and [capping](#) and re-vegetation of the various piles and closed facilities.



**Lower Pinal Creek Treatment Plant**

FMI has begun construction on the Webster Lake In-fill Reclamation Project and the 27/28 Leach Dump In-fill Project. The Webster Lake Infill Project provides for backfilling of the former Webster Lake including an under-drain, isolation of lake sediments, re-grading of backfill, waste rock piles and tailings piles, surface water drainage, capping and re-vegetation of the lake bed, waste rock piles, and tailings piles. The 27/28 Leach Dump Infill Project will include a new leach solution impoundment for the 27/28 Leach Dump and capping, re-grading and re-vegetation of various waste rock piles.

FMI continues work on the Webster Lake In-fill Reclamation Project which is scheduled for completion in late 2014. FMI has also started reclamation projects at the #1, #5 Leach stockpiles and the #16 Waste Rock stockpiles. Future reclamation projects at various leach, waste rock and tailings stockpiles are in the planning stage, which runs through to 2021.

FMI is providing funding and technical assistance to the Town of Miami on their new wastewater treatment plant which is being constructed at the base of the #3 Tailings Pile adjacent to Miami Wash. The new plant will discharge treated wastewater for mine reuse, groundwater recharge and irrigation of the local golf course.

BHP Copper has submitted the RI report for the Solitude Tailings Impoundment which is currently under review. The tailings piles will have to be regraded, revegetated and significant improvements to the surface water conveyances will be conducted. Site-wide groundwater, surface water, and discharge monitoring are on-going. Approximately 80 to 100 wells, four surface water sites, and treated effluent from the Lower Pinal Creek (LPC) Treatment Plant are monitored on a monthly basis.

## **Community Involvement Activities:**

Community outreach activities for this site are conducted by the Pinal Creek Group with ADEQ oversight and support. An open house was held in October 2002 prior to initiation of the remedial construction at the BHP Copper Inc.-Old Dominion Mine. The [Pinal Creek Group](#) routinely generates newsletters, press releases, and fact sheets, conducts briefings for interested parties, conducts tours of treatment facilities, and participates in interviews on local radio stations.

## **Site History:**

**1878-1970:** Mining and mineral processing began in the Globe-Miami area in 1878 with the discovery of silver in the Globe Hills. By 1893, copper had replaced silver as the main commodity produced in the district, and continues to be today. Releases of contaminants from mine and processing sites started shortly after mining, milling, and smelting began.

Groundwater contamination was first discovered in the 1930s in the [alluvial aquifer](#) of Miami Wash. In the 1940s, groundwater contamination was discovered in the alluvial aquifer of Bloody Tanks Wash. The first public supply wells were contaminated in the late 1940s, and private wells along LPC were first impacted in the 1970s.

**1979-1981:** The first area-wide investigation of groundwater and surface water contamination was conducted in 1979-1981. Widespread groundwater and surface water contamination was documented. Releases of contaminants and hazardous substances have occurred from all of the major mining and processing sites from a variety of different sources, including, but not limited to, process solution impoundments, tailings piles, leach dumps, waste rock piles, spills, and as storm water runoff. Erosion of waste piles, especially tailings piles, has also resulted in the release of contaminants to water courses. Particulate fallout of wind-blown tailings and from copper smelters in the area has also contributed to the spread of contamination at the site.

**1986-1990:** Source control actions began in 1986 under order from EPA for violations of the [Clean Water Act](#). In 1989, the site was listed on the old WQARF Priority List by the state of Arizona. In 1989, the Pinal Creek Group (a consortium of Phelps Dodge, BHP Copper Inc., and Inspiration Consolidated Copper Co.) was formed to conduct the RIs and begin remedial actions. The groundwater RI began in 1990. In 1990, the [interim remedial action](#) (IRA) began which consisted of groundwater extraction from the alluvial aquifer at four locations.

**1994:** The Pinal Creek Group began a private well testing and replacement program, which continues today.

**1997:** Ecological and Human-Health risk assessments and the groundwater FS and Recommended Remedial Action Plan (RRAP) were completed by 1997. The RRAP proposed groundwater extraction at two locations, upstream and downstream containment of the plume, construction of two lime neutralization treatment plants, private well replacement, source control, and special well construction and abandonment requirements.

**1997-1998:** A [consent decree](#) governing the clean up was signed in 1997, and approved by the U.S. District Court in 1998. A WQARF administrative order to implement an [early response action](#) (ERA) was signed in 1998 to expedite construction of the LPC treatment plant, begin groundwater extraction at the leading edge of the acid-metal plume, and prevent further degradation of the perennial reach of Pinal Creek.

Initial source control remedial investigations and associated FSs were completed by 1998. Numerous source and exposure control actions have been implemented at the various mine Sites, including facility upgrades, groundwater extraction, groundwater containment, removal from service of solution impoundments, capping/covering of tailings, management controls, institutional controls, storm water controls and many others.

In October 1998, the site was placed on the [WQARF Registry](#) with an eligibility and evaluation score of 97 out of 120.

**1999:** In November, the LPC Treatment plant was completed and groundwater extraction at the leading edge of the acid-metal plume began.

**2001:** In January, a groundwater barrier (soil-cement-bentonite slurry wall) was constructed across LPC, which serves as the downstream containment of the plume. Full scale groundwater extraction began just above the barrier for neutralization and metal removal in the LPC Treatment Plant. In May, a second treatment plant (Diamond H Treatment Plant) was completed

to treat water captured from the Kiser Basin (upstream) containment. In June, a groundwater well field (Kiser Basin well field) that serves as the upstream containment of the acid-metal plume was completed, and groundwater extraction began.

**2002:** Remedial construction of the engineered cap of the BHP Copper Old Dominion Mine tailings and waste rock began to prevent acid-metal runoff from reaching upper Pinal Creek began.

**2003-2005:** Investigations into soil and stream sediment contamination began. The Phase I sampling of soil and stream sediment was completed in April 2004. The results of the Phase I soil and stream sediment investigations were submitted in November 2005. A risk assessment was included as part of that submittal.

Major construction was completed and revegetation of the piles began during the spring of 2004. Runoff sampling conducted during 2003 after capping of waste rock and tailings piles has documented major improvements in runoff water quality.

In spring 2004, revegetation of the BHP Copper Old Dominion Mine waste rock and tailings was completed. In early summer of 2004, a failure of the Diamond H pit wall threatened the Diamond H Treatment Plant which was subsequently deconstructed. A temporary batch plant was constructed nearby to allow for continued treatment of acid-metal groundwater from the Kiser Basin containment well field. In late 2004, a new location for the treatment plant was selected and in September 2005 design plans were prepared and submitted for review. The plant was relocated near the southeast corner of the Diamond H Pit. Stability analyses were conducted and the critical components of the plant will be constructed outside of any areas of high for slope and rock failure.

**2005:** In February, the Pinal Creek Group submitted a request to the [ADEQ Water Quality Division](#) to change the designate uses of a portion of perennial Pinal Creek. The request was to change the creek from aquatic and wildlife warm water to an aquatic and wildlife effluent-dominated stream. The Pinal Creek Group also requested dropping the fish consumption designation. In September, the Pinal Creek Group submitted a formal petition for the removal of the fish consumption designation from a portion of perennial Pinal Creek. Also submitted at that time, was a use attainability analysis for the fish consumption use. That same month, the Pinal Creek Group submitted a formal petition to re-classify a portion of Pinal Creek as effluent-dependent water.

In the spring, Bloody Tanks Wash, which is adjacent to the BHP Copper-Miami, was widened. The retaining wall that separated Bloody Tanks Wash from the former Miami Tailings No. 2 was removed and the tailings behind the wall were relocated onto the remaining tailings leftover from the previous reprocessing operation. The remaining tailings at the BHP Miami Unit lie outside of the 100-year floodplain.

During the summer, reclamation started of the remaining tailings at the BHP Copper-Miami Unit. The tailings began to be capped with clean fill, consolidated, regraded, and storm water channels and storm water and sediment ponds were being constructed. In the late part of summer, BHP began a site characterization/remedial investigation of the Solitude Tailings Impoundment located in Solitude Canyon (a tributary of Russell Gulch). The investigation

included soil [borings](#), test pits and groundwater [monitor well](#) installation. Samples were collected for chemical analysis, [agronomic testing](#), geotechnical testing and stability analysis.

**2006:** Early in the year, the capping and revegetation of the BHP Miami Unit No. 2 Tailings was completed. In mid-2006, Phelps Dodge-Miami began reclamation of the slag pile along Bloody Tanks Wash. The pile was re-graded, capped and re-vegetated.

As of April, approximately 105 million pounds of [heavy metals](#) (aluminum, beryllium, cadmium, cobalt, copper, iron, lead, manganese, nickel, and zinc) were removed from aquifers at the site. This water was treated and released to Pinal Creek, reused at the mines, or evaporated at the mines. The perennial and ephemeral reaches of Pinal Creek, Miami Wash, and Bloody Tanks Wash were removed from the State's list of impaired water bodies.

**2007:** During calendar year, approximately 2,144,911 pounds of heavy metals were removed by the LPC Water Treatment Plant.

**2008:** BHP has completed the removal and/or capping of numerous waste rock piles in the Copper Gulch drainage. Several piles were re-located to the BHP Miami [In-Situ](#) Mining facility where the waste rock will be leached within the confines of the hydrologic sink of the In-Situ and TJ pit.

**2009:** Freeport McMoRan, formerly Phelps Dodge, began construction on the Webster Lake Infill Project and the 27/28 Leach Dump Infill Project.

**2010:** The Pinal Creek Group has re-assessed the Pinal Creek flood elevations in the floodplain in response to flooding during the winter of 2009-2010 and in response to work conducted by a floodplain neighbor who was impacted by winter flooding. The work started in 2010 threatened to divert floodwaters towards the Pinal Creek Water Treatment Plant and potentially cause erosion and damage to embankments constructed by the Pinal Creek Group. The Army Corps of Engineers investigated the area which resulted in a work stoppage in the floodplain and the requirements for the neighbor to obtain a Clean Water Act 404 Permit.



**Water Treatment Plant at  
Lower Pinal Creek**

**2011 - 2012:** FMI continues with construction of the Webster Gulch Reclamation Plan which, includes grading, covering, capping and revegetation of waste piles, flood routing of surface flows, and construction of subsurface drains.

## Contaminants:

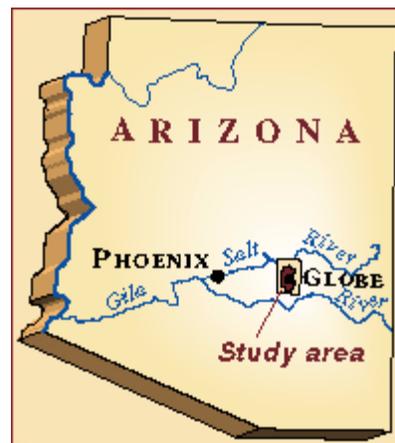
The major contaminants of concern at this site include [aluminum](#), [arsenic](#), [beryllium](#), [cadmium](#), [copper](#), [cobalt](#), iron, [manganese](#), [nickel](#), [sulfate](#), [zinc](#), and [sulfuric acid](#) (acidity). Other contaminants of concern include radiochemicals ([uranium](#), [radium](#)), [fluoride](#), [chromium](#), [lead](#), [mercury](#), and high levels of dissolved solids. Contaminants of concern at the site may change as new data become available.

## Public Health Impact:

Direct exposure to the contaminants could occur from the consumption of contaminated surface water or groundwater, or from the ingestion or inhalation of contaminated soil particles. Water provided by the local water suppliers (the [Arizona Water Company](#), the [City of Globe](#) and others) comes from the deeper regional aquifer and meets both state and federal water quality standards. Residents in unincorporated portions of the county rely on private wells. The Pinal Creek Group has implemented a private well replacement program since 1994 and offers free testing of private wells in the site. Approximately 90 wells have been replaced to date.

## Site Hydrogeology:

The Pinal Creek Basin is bounded by the Pinal Mountains to the south and by the Apache Peaks and Globe Hills to the east. The setting is a typical basin and range structure that has northwest-trending ranges of igneous and metamorphic rocks separated by a valley that is filled with alluvial deposits. Consolidated and semi-consolidated basin-fill deposits (known as the Gila Conglomerate) that occur in Pinal Creek were created by late Cenozoic block faulting. Unconsolidated alluvium overlies the Gila Conglomerate and ranges from 300 to 800 meters wide and may be as thick as 50 meters. Major surface water bodies in the basin include Bloody Tanks Wash and Russell Gulch, which join to form Miami Wash, which flows northward into Pinal Creek.



There are two principal aquifers in the basin: the regional Gila Conglomerate [aquifer](#) and the shallow [alluvial](#) aquifer. The Gila Conglomerate aquifer is the main source of water for domestic and industrial use. The Gila Conglomerate contains significant quantities of calcium carbonate which can neutralize acidic water, and is much less permeable than the alluvial aquifer, both of which have helped to protect it from extensive contamination. Contamination by acid-metal bearing water is largely localized within the alluvial aquifer.

Surface water in the basin is mostly ephemeral occurring only in response to precipitation events. Perennial flow in Pinal Creek begins at the north end of the channel where the groundwater table intersects the surface due to a truncation of the alluvial and Gila Conglomerate aquifers by [bedrock](#).

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\*In Arizona, but outside the Phoenix area, call toll-free at (800) 234-5677.

**Information Repository:**

Interested parties can review select site documents at the [Miami Memorial Library](#) located at 1052 Adonis in Miami, AZ, 85539 (928) 473-4403. BHP Copper-Old Dominion Mine files can be found at the [Globe Public Library](#) located at 339 S. Broad Street in Globe, AZ, 85501 (928) 425-6111.

The complete official site file is in Phoenix at the ADEQ Central Office located at 1110 W. Washington Street, Phoenix, AZ, 85007. To arrange a time to review the site file at the Phoenix office, please call the ADEQ Records Management Center with 24-hour notice at (602) 771-4380 or (800) 234-5677. Once all documents requested have been collected, you will be contacted for a review Monday through Friday from 8:30 A.M. to 4:30 P.M. at the ADEQ Records Management Center.