

ASARCO Hayden Plant [EPA Superfund Alternative Site](#)

Boundaries:

The ASARCO Hayden Plant Site (Site) is located about 100 miles southeast of Phoenix and about 50 miles northeast of Tucson, Arizona. The Site consists of the towns of Hayden and Winkelman, and the nearby [ASARCO](#) mining facility including the ASARCO smelter, concentrator, former Kennecott smelter and all associated [tailings](#) facilities. The project Site is located in the area surrounding the confluence of the Gila and San Pedro Rivers.



**11-Story Oxygen Flash Smelting
Furnace in Hayden**

Site Status Update:

The Site is currently administered through an Administrative Settlement Agreement and [Order on Consent](#) between the [U.S. Environmental Protection Agency](#) (EPA), ASARCO and the Arizona Department of Environmental Quality (ADEQ). Contamination at the Site is caused by historical mining operations including smelting and processing activities as well as ongoing mining operations.

EPA has completed a Phase I [remedial investigation](#) (RI) to understand the distribution of contamination. The Phase I RI is focused on residential exposure and risk assessment. The Administrative Order on Consent between ASARCO, ADEQ and EPA requires ASARCO to conduct a Phase II RI to define the air contamination, distribution and sources, remaining residential area soil contamination, and the industrial area soil contamination. The Phase II RI will help determine if any soil and air cleanup activities are warranted.

Community Involvement Activities:

EPA held public meetings on May 13 and 14, 2008 in Winkelman and September 11 and 12, 2008 in Hayden. Additional meetings were held for the public on July 21 and 22, 2009 in Hayden. Fact sheets with updated information have been issued to the public on [April 1, 2008](#), [August 28, 2008](#), [December 3, 2008](#), and [July 9, 2009](#).

Site History:

1880-1909: The [ASARCO Ray Complex](#) is composed of the Ray mine and the Hayden Smelter. The Ray Mine has extracted copper since approximately 1880. One of the first owners of the mine was Ray Copper Company. This company transitioned to Ray Consolidated Copper Company (RCCC) with the acquisition of Globe Mines Exploration Company, Ltd., and Gila and Ray Copper Mines in 1898 and 1906, respectively. [Winkelman](#) was founded in 1887 and [Hayden](#) was founded in 1909 as a company town to provide housing for workers supporting the mining and smelting operations. Tailings disposal in Impoundments AB/BC started in 1910 at a rate of approximately 4,000 tons per day (tpd).

1911-1960: ASARCO constructed its Hayden smelter facility in 1911 and began operations to process ore from the Ray Mine in 1912. In 1933, Kennecott bought the Ray Mine from RCCC. The ASARCO Hayden Smelter stopped receiving ore from Ray Mine in 1958, at which time [Kennecott](#) began operation of its own Hayden smelter. By 1952, tailings disposal in impoundments AB/BC increased to approximately 16,000 tpd, followed by an increase to 21,000 tpd in 1960. The ASARCO Hayden Smelter began receiving concentrates from Pima, Duval, Bagdad, Cyprus, Silver Bell, and Mission mines after 1958.



**ASARCO Hayden Plant
From Afar**

1972-1986: A slope failure occurred in 1972 that measured 500 feet across and 30 to 50 feet deep. Another failure occurred in 1973. At the time of failure, water was seeping out of failed portions of the impoundment. In 1974, the 1,000-foot double-shell concrete stack was built by ASARCO to discharge exhaust gases from the smelting operations, which replaced the 300-foot [reverberatory furnace](#) stack and 250-foot converter stack. In 1982, construction of Tailings Impoundment D began with an 8,700 feet long and 48 feet high starter dike.

The Kennecott smelter was shut down in 1982. ASARCO completed modernization of its Hayden smelter in 1983, which included construction of a second sulfuric acid plant to capture and reuse [sulfur dioxide](#) (SO₂) emissions produced during smelting, and construction of a wastewater treatment plant to recover process water from the sulfuric acid plant for reuse. After the modernization in 1983, ASARCO's smelter renewed processing ore from the Ray Mine, and ASARCO bought the Ray Mine Division from Kennecott in 1986.

2002: ADEQ, on behalf of EPA, performed an expanded Site investigation which primarily included soil sampling around the conveyor belt that runs near homes and disperses ore dust in residents' yards. Residential yards were sampled on Smelter Road, Hillcrest Avenue, Sunnyslope Road, Ray Avenue, Velasco Avenue, and Garfield Avenue. Of the 27 sample locations in Hayden:

- [Arsenic](#) levels exceeded the Residential [Soil Remediation Level](#) (R-SRL) of 10 milligrams per kilogram (mg/kg) at 26 locations (maximum of 67.4 mg/kg).
- [Copper](#) levels exceeded the former R-SRL of 2,800 mg/kg (note that the R-SRL was increased to 3,100 mg/kg in 2007) at 24 locations (maximum of 55,100 mg/kg).
- [Lead](#) levels exceeded the R-SRL of 400 mg/kg at three locations (maximum of 851 mg/kg).
- In addition, [cadmium](#), [mercury](#), and [zinc](#) levels in several samples were reported as elevated compared to the average background concentrations, but were not detected above their R-SRLs.

The expanded Site investigation concluded that the elevated concentrations of metals were the result of ASARCO operations.

In September, a [public health assessment](#) was performed for the Hayden Smelter Site by the [Arizona Department of Health Services](#) (ADHS) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry.

2004: A 2004 Removal Assessment by the [EPA Emergency Response Section](#) sampled soils in the Hayden, Kearney, and Winkelman areas to further evaluate impacts from Site operations. Kearney did not contain elevated levels of soil contamination. Soil samples were collected from a total of 51 locations in Hayden and 69 locations in Winkelman from randomly selected locations within an established grid. Of the 51 samples in the Hayden area:

- Arsenic exceeded the R-SRLs at all 40 locations (R-SRL of 10 mg/kg, maximum of 91 mg/kg);
- Copper at 29 locations (R-SRL of 2,800 mg/kg, maximum of 11,400 mg/kg); and
- Lead at one location (R-SRL of 400 mg/kg, concentration of 463 mg/kg).

In Hayden, sample locations revealing elevated copper and lead concentrations generally coincided with locations showing high arsenic concentrations. The highest concentrations typically concentrated close to the Conveyor 9 area near the Power House Wash at the concentrator operations and the former Kennecott smelter area. Of the 69 samples from the Winkelman area:

- Arsenic levels exceeded the R-SRL at 16 locations (maximum of 320 mg/kg);
- Copper exceeded the R-SRL at seven locations (maximum of 19,000 mg/kg); and
- Lead exceeded the R-SRL at three locations (maximum of 485 mg/kg).



Sampling in Backyard of Resident in Hayden

In Winkelman, elevated arsenic levels were generally located along and south of State Route 177. The study further concluded that the elevated concentrations of metals found throughout Hayden and Winkelman are likely the result of contamination dispersed from ASARCO operations.

The former Kennecott Copper Company (Kennecott) smelter area, located on the north edge of Hayden and north of the concentrator facility, underwent demolition work beginning in 2004. The 600-foot tall former Kennecott smelter stack was not demolished. The lime and filter plant facilities are still actively operated.

2008: Between March and June, ASARCO, [under EPA direction](#), removed soil from the 15 residential properties in Hayden and Winkelman that exhibited the highest concentrations of arsenic, lead and/or copper. ASARCO will be conducting additional yard soil sampling and cleanups under EPA direction in Hayden and Winkelman for yards with lower but significant contamination.

In August, EPA completed the Draft Phase I RI report that summarized results from the investigation that indicated the current and former ASARCO operations have resulted in

measurable impacts to soils, ambient (outdoor) air, and indoor dust, and to a lesser extent on groundwater, surface water and sediment. Data from the RI report were used to prepare the [Human Health Risk Assessment](#).

2009: Since December 2008, ASARCO continued conducting residential yard sampling and cleanup under EPA and ADEQ direction in Hayden and Winkelman. Residential cleanup activities were completed in Hayden and Winkelman in October.

2010: In December, EPA submitted agency comments to ASARCO's air monitoring and sampling portion of their draft RI/FS Workplan. Additional agency comments regarding the soil and water investigation will be forthcoming.

Contaminants:

Almost 100 years of smelting activities at this Site has deposited lead, arsenic, and copper across residential and industrial areas. Residential soil sampling in Hayden indicate the highest concentrations of lead, arsenic and copper are located on the north edge of town, near the old Kennecott smelter and on the east side near the concentrator and the number 9 conveyor. Arsenic soil concentrations in Hayden range from near background at 12.5 (mg/kg) to 540 mg/kg. Lead in Hayden ranges from near background (48 mg/kg) to 7,250 mg/kg. Copper varies from below a background of 1,270 mg/kg up to 39,700 mg/kg. In Winkelman, contamination is lower than Hayden and centered along the Highway 177 area and along the railroad tracks on the south side of town. Samples from the school complex on the north end of Winkelman indicate the school has relatively low soil concentrations with all concentrations below proposed remediation level.

Groundwater beneath the smelting and slag deposition areas of the Site is impacted by [selenium](#) and [molybdenum](#). Tailings impoundments along the Gila River have caused elevated levels of contaminants to be discharged into surface and groundwater.

Despite the 1,000-foot tall stack, air quality monitoring in the two towns measured elevated levels of arsenic, lead, copper, [cadmium](#) and [chromium](#) from site operations. For example, the average levels of arsenic in Hayden air is 0.0239 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) while areas unaffected by mining, such as the [Organ Pipe National Monument](#) area southwest of Tucson, have average concentrations of 0.0004 $\mu\text{g}/\text{m}^3$ or less. These concentrations indicate that the arsenic in Hayden air is about 60 times above what would be expected in an area unaffected by smelting activities. The high levels in Hayden were typically measured when the wind was blowing from the smelter towards town. In Winkelman, the average arsenic air concentration (0.00796 $\mu\text{g}/\text{m}^3$) is 20 times higher than the Organ Pipe area and is likewise elevated when the wind direction is from the smelter. The high arsenic concentrations are not always associated with high dust levels.

Public Health Impact:

ADHS performed a [health assessment](#) in 2002. Groundwater and soil were evaluated for exposure to arsenic.

Smelting activities at the Site has deposited lead, arsenic, and copper across residential and industrial soil areas. Residential areas are located close to industrial areas and therefore have a high level of exposure. These areas include: the concentrator over the fence from the public park/library/swimming pool area; the number 9 conveyor which travels over residential properties; and the smelter which is about 2,000 feet from Hayden and about 1,500 feet from the school complex near Winkelman.

Approximately 650 properties in the two towns have been sampled. Of these properties, just over 40% or 250 have required cleanup for arsenic, copper and/or lead. The remainder of the homes do not require cleanup. In addition to residential yard cleanups, other areas such as vacant lots, businesses and dirt alleys where citizens could be exposed to contamination have also been sampled and, if needed, cleaned up. EPA and ADEQ will work together to develop an air quality permit that will reduce these emissions from active smelter and concentrator operations to levels that are protective of public health.

Site Hydrogeology:

The Site is located within the Upper San Pedro groundwater basin. The major components of this system are the water bearing sands and gravels of the Gila River and San Pedro River flood plains that are recharged from groundwater flows within smaller tributary stream alluvium. Water level measurements in wells located along the San Pedro and Gila Rivers indicate that the depth to groundwater is generally within tens of feet below the channel elevation.

Groundwater elevation measurements taken in February and October 2006 indicate that the regional groundwater flow direction within Hayden and Winkelman is in a southerly direction towards the Gila River/San Pedro River confluence. The groundwater flow gradient is relatively high in the Hayden area, and the gradient is considerably lower in the Gila River flood plain. The groundwater flow direction between the two tailings impoundments is generally in a northwesterly direction, consistent with the surface water flow direction of the Gila River. The tailings impoundments do not appear to be causing large mounding of the water table, but the relatively low gradient in the vicinity is likely the result of recharge from Gila River surface water losses and tailings impoundments drain down.

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- *In Arizona, but outside the Phoenix area, call toll-free at (800) 234-5677.
- **Call EPA's toll-free message line at (800) 231-3075.
- ***In Arizona, but outside the Tucson area, call toll-free at (888) 271-9302.

Information Repository:

The local repository is located at the [Hayden Public Library](#), 520 Velasco Avenue, Hayden, AZ 85235, (520) 356-7031.

Site files are also located at the ADEQ Main Office located at 1110 W. Washington Street, Phoenix. Once all documents requested have been collected, someone will contact you for a review Monday through Friday from 8:30 a.m. to 4:30 p.m. at the ADEQ Records Management Center, 1110 W. Washington Street in Phoenix, Arizona. Please contact (602) 771-4380 or (800) 234-5677 to schedule an appointment with 24-hour notice to review these documents.

The complete official Site file can be reviewed at the EPA Region IX, [Records Center](#), Mail Stop SFD-7C, 95 Hawthorne Street, Room 403, San Francisco, CA 94105, (415) 536-2000.