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From: Anu Jain
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Technical Support Document
Asarco LLC - Ray Operations
Permit # V20675.R02

1. BACKGROUND

1.1 Applicant

This is a permit for a mining operation, operated by Asarco LLC, a Delaware limited liability company. The SIC Code is 1021 for Metal Mining, Copper Ores. The facility is located at State Highway 177, 8 miles north of Kearny, Arizona, upon a parcel also identified by Pinal County Assessor's Parcel # 106-38-0001.

This technical support document summarizes this facility's history and any changes made to the permit. Additional information may be found in the Technical Support Documents for previous permits for the facility.

1.2 Attainment Classification

This facility is located in an area designated as nonattainment for PM_{10}. At 59 FR 36116 (7/15/94), the EPA approved a plan for the "Hayden Township" TSP/PM_{10} non-attainment area. However, the plan lacks any recognition of this facility, or any limitation or obligation that applies to this source.

1.3 Permitting History

The following is a list of permits applied for and/or issued since 1990 with respect to the ASARCO Ray Mine.

Permit #	Permit Type	Issue Date	Equipment
6925, 6926	Installation (operating?)	1/10/90 (Operating permit issued)	In-pit sulfide crusher, overland conveyor, two stackers, reclaim system, omni-cone crusher
7267	Installation (operating?)	7/16/90 (Operating permit issued)	Water sprays on limestone plant
	20148	4/14/93	Facility
10047	Installation	9/27/93	Gas tanks
20456	Installation (Operating?)	9/27/93 (Operating permit issued)	Lime handling/slaking; lab fume scrubbers
20148.R01	Revision	7/9/99	Secondary sulfide ore crusher
20148.R02	Revision	11/19/99	Performance test for secondary sulfide ore crusher
20456	Operating	9/27/93	Lime & Lab
A20510.000	Major Source	Withdrawn	Facility
V20600.000	Title V	6/5/03	Facility
V20600.R01	Minor Mod.	12/13/04	Heavy duty equipment painting
V20600.R02	Minor Mod.	7/13/05	Burning of pallets for training of the fire brigade.
V20600.R03	Minor Mod.	11/17/06	Landfill cell for asbestos materials.

Permit #	Permit Type	Issue Date	Equipment
V20600.R04	Significant Rev.	9/28/07	Replacement of In-Pit Crusher/Secondary Crusher.
V20633.000	Renewal	7/01/08	No changes.
V20633.R01	Significant Revision	5/4/09	Revise requirement of 2 scrubbers for CR4 and require a baghouse instead.
V20633.R02	Minor Mod.	6/2/10	Installation of a 2.9 mm btu/hr natural gas fired boiler.
V20633.R03	Minor Mod.	9/27/10	Installation of 250,000 gallon diesel tank.
V20633.R04	Minor Mod.	4/12/13	Installation of conveyor from the CR4 crushed ore stockpile to the Omni crusher.
V20654.000	Renewal	3/13/14	Addition of primary crushing circuit and a new SAG Mill.
V20654.R01	Significant Revision	7/21/15	Pebble bypass crusher project and installation of four diesel engines.
V20654.R02	Significant Revision	6/28/17	1. Installation of new engines 2. Correction to CRI crushing circuit throughput. 3. Deletion of CR4 Operating Scenarios 1, 2, and 3. 4. Change the current permitted engines classification from emergency to non-emergency. 5. Replacement of existing engines (Engine ID 1058 and 1059). 6. Revisions to CR4 baghouse CAM plan. 7. Revisions to CR4 baghouse QIP 8. Alternate operating scenarios for CR1, CR4 and SAG Mill Circuits that allows the circuits to operate using low moisture ore (i.e., ore with < 4% moisture) 9. Update the list of insignificant activities.
V20654.R03	Minor Revision	1/29/18	Addition of abrasive blasting operations.
V20675.000	Renewal	6/26/18	/Deletion of various operating scenarios for C/R1 Primary Crushing Circuit, CR4 Primary Crushing Circuit, SAG Mill Grinding Circuit, and updating the engines subject to Subpart IIII and Subpart ZZZZ.

Permit #	Permit Type	Issue Date	Equipment
V20675.R01	Minor Revision	11/9/21	1. Installation and operation of a cone crusher as a part of the existing CR4 crushing circuit, to support crushing harder core. 2. Replace existing emergency generator ID 2020 with a new emergency generator. 3. Update the regulatory applicability for two existing generators ID 2012 and ID 2013 from NSPS Subpart IIII to NESHAP Subpart ZZZZ. 4. Remove emergency pump ID1025 and emergency generator ID 2007.
V20675.R02	Minor Revision	2/16/22	Addition of spray evaporation system to support the forced evaporation of water retained within the mine pit.

1.4 Compliance History

Inspections are being regularly conducted at the Asarco Ray mine to ensure compliance with its applicable permit conditions.

Asarco is currently in compliance with the permit conditions cited in permit V20633.R03. The following table summarizes the recent inspections that have been conducted on the source:

Inspection Date	Type of Inspection	Results
2/22/06	Compliance	In compliance
4/24/07	Compliance	In compliance
4/2/08	Compliance	In compliance
3/19/09	Compliance	In compliance
5/19/10	Compliance	In compliance
3/25/11	Compliance	In compliance
6/15/12	Compliance	In compliance
2/20/14	Compliance	In compliance
4/29/16	Compliance	In compliance
5/3/18	Compliance	In compliance
6/10/20	Compliance	In compliance

1.4.1. RACT Compliance

The Title V permit V20600.000 for the Asarco Ray Complex facility was issued on 6/5/2003. The technical support document (TSD) for such permit indicated that the existing controls at the facility constituted RACT.

As part of the RACT determination, PCAQCD agreed to install a PM_{10} monitor in Riverside to confirm whether RACT had been characterized properly. The TSD also indicated that "should the monitoring data disclose a pattern of exceedances that could be attributed to the Ray Mine that would provide justification for either re-opening this permit, or invoking other relevant process, to revisit the foregoing characterization of RACT."

The data obtained from the Riverside monitor from 2003 to 2007 shows no exceedances of the 150 $\mu g/m^3$ PM10 24-hour standard.

2. PROCESS DESCRIPTION

The Ray Mine is an open pit mine, primary operations at the mine consist of mining the copper ore and beneficiation of the ore. Operations at the facility can be categorized into the following:

1. Ray Mine Operations (Operation ID 100);
2. Mine Maintenance Operations (Operation ID 200);
3. Ray Concentrator Operations (Operation ID 300);
4. Train Load-out Operations (Operation ID 400);
5. Ray Leaching Operations (Operation ID 500);
6. Ray Solvent Extraction-Electrowinning Operations (Operation ID 600); and
7. Ray Administration / Miscellaneous Operations (Operation ID 700)

2.1 Ray Mine Operations (Operation ID 100)

The mine currently has three designated pit areas, namely the Sonora, Poorman, and Calumet. Diesel or electric-powered drills drill approximately 60-foot deep holes into the mineralized pit benches. The holes are used to collect samples to allow the assay of the copper ore and determine the ore's metallurgical characteristics. Blasting agents is introduced into the hole for blasting. The blasts fractures and loosens the ore. Electric shovels load the blasted material onto haul trucks which transports the ore to a primary crusher, leachable ore to leach dump areas, and waste material to the waste rock dumps. The ore handling activities are primarily a source of fugitive particulate matter emissions, with small quantities of NO_X and CO being emitted during the blasting operation.

2.2 Mine Maintenance Operations (Operation ID 200)

The facility uses several pieces of equipment primarily associated with mine operations and maintenance activities. To provide onsite fueling for the mine vehicles, the facility uses a 20,000 gallons split, above ground gasoline (15,000 gallons) and diesel (5,000 gallons) fuel. The site also uses two bulk fuel tanks with capacities 250,000 gallons and 207,000 gallons for the storage of diesel fuel.

Steam cleaning of vehicle parts, is conducted using nine (9) portable hot water washers. The washers are powered by either diesel or propane fuel.

The facility also operates a spray painting operation for painting heavy equipment, primarily haul trucks and water trucks. The operation is performed by an external contractor. Painting is performed using water and solvent based enamel paints.

2.3 Ray Concentrator Operations (Operation ID 300)

Ore from the mine pit is transported to the near pit primary crusher CR4. The ore is unloaded into the primary crusher dump pocket. The unloaded ore is transferred into the CR4 crusher feed hopper and then to the CR4 primary crusher.

The crushed ore from the CR4 primary crusher discharges through a discharge chute onto a belt conveyor fro where it is transferred to an overland conveyor. The overland conveyor transfers the crushed ore onto the Ray concentrator coarse ore stockpile.

A coarse ore reclaim system is located beneath the Ray concentrator coarse stockpile and consists of three reclaim apron feeders which fed the coarse onto the SAG mill conveyor. The apron feeders withdraw coarse ore from the bottom of the Ray concentrator coarse ore stockpile.

The SAG mill feed conveyor transfers the crushed ore into the SAG mill for grinding. The SAG mill reduces the ore size to the consistency of coarse gravel, using a wet-grinding process. Discharge from the SAG mill is significantly wet and has the consistency of slurry. The slurry is discharged through a screen to remove any oversized material. A series of conveyors carry the oversized material either directly back onto the SAG mill feed conveyor or to the Omni Cone crusher.

The oversize ore being returned to the Omni Cone crusher is significantly wet and saturated with water. The ore contains practically no fines. Crushed ore from the Omni Cone crusher is transferred directly onto the SAG mill feed conveyor, where it co-mingles with the coarse ore from the CR4 coarse ore stockpile.

Fine material passing through the SAG mill discharge screen enters one of two (2) parallel wet ball mills which further reduce the ore to the consistency of fine sand. Reagents, fed into the ball mills, adhere to the copper-bearing metallic particles. The reagents include slaked lime, drawn from a dry lime storage silo, and flotation chemicals. Delivery trucks supply lime to the storage silos from off-site.

The ball mills feed a series of flotation cells where the reagent/metallic mineral mixture floats to the surface. Skimmer systems recover the floated materials. An intermediate wet regrinding process enhances the efficiency of the flotation process. A concentrate thickener and filters de-water the skimmed material to produce a damp, copper-rich concentrated. A conveyor transfers the concentrate to a loading pad where diesel-powered mobile equipment loads the material into rail cars or trucks for shipment off-site. Drains remove waste material or “tailings” from the bottom of the flotation cells. The tailings slurry is pumped approximately two miles to a tailings thickener where a portion of the water is separated from the slurry. The thickened slurry is then pumped to the Elder Gulch tailings impoundment.

2.4 Train Loadout Operations (Operation ID 400)

Ore from the mine pit is also transferred to a primary crusher (CR1). The ore is unloaded into the primary crusher unloading hopper. The unloaded ore is transferred into the CR1 dump pocket and then to the CR1 primary crusher. Ore from the CR1 crusher is dropped onto the crusher picking conveyor from where it is transferred to the CR1 coarse ore stockpile stacker conveyor.

The stacker conveyor drops the ore onto the coarse ore stockpile, which is also referred to as the Hayden Stockpile. A rail road tunnel runs underneath the stockpile. Drop chutes allow the ore to be gravity fed into the rail cars which are positioned in the tunnel. Coarse ore from the rail cars is taken to the Asarco Hayden Plant, located approximately 18 miles away.

2.5 Ray Leaching Operations (Operation ID 500)

Ore from the mine pit is carried by ore haul trucks to designated heap-leaching areas. Once deposited on the dumps, dilute sulfuric acid is sprayed on top of the ore. Sustained contact with sulfuric acid slowly leaches the copper from the mass of material and the liquid drains down. The underlying bedrock and drainages funnel this copper lechate, referred to as Pregnant Leach Solution (PLS), to collection areas (referred to as dams), which drain or are pumped to the solvent extraction-electrowinning (SX/EW) plant system (Operation ID 600).

2.6 Ray Solvent Extraction-electrowinning Operations (Operation ID 600)

The PLS formed after leaching out the copper ore from the leach dump, is conveyed to the SX plant, where a liquid organic-based solvent/kerosene solution strips the copper from the water-based leach solution. The PLS is then contracted with concentrated sulfuric acid which strips the copper from the solvent/kerosene phase. Pumps transfer the copper-rich acid solution to electrowinning plant, where an electric current plates elemental copper onto copper cathode sheets.

2.7 Dumps and Tailings Operations (Operation ID 700)

De-watered mill tailing from the mining operation are pumped to the existing tailing management facility known as Elder Gulch. In addition, a 14-acre landfill cell is operated to accept regulated asbestos materials (RACM). The cell accepts only asbestos containing debris resulting from the incidental demolition of building or structures generated at the Asarco Ray Mine.

2.8 Administration/Miscellaneous

Other miscellaneous operations at this site generate fugitive particulate matter emissions, including windblown dust from leach heaps, dumps, stockpiles and tailings, a 50 acre solid waste landfill and a 14-acre regulated asbestos materials (RACM) landfill.

3.0 PROCESS CHANGES

3.1 Equipment Addition

Minor permit Revision V20633.R02 authorized the installation of a 2.9m MMBtu/hr natural gas fired boiler for heating operations associated with the Solvent Extraction-Electrowinning (SX-EW) operations. This will increase the number of SX-EW boilers (hot water heaters) to 5. The addition of this boiler represents a potential emissions increase of 1.2 tons of NOx and 1.04 tons of CO.

Minor permit Revision V20633.R04 authorized the installation of a conveyor from the CR4 crushed ore stockpile to the Omni cone crusher. The throughput capacity of the new conveyor is 375 tons per hour. The expected PM_{10} increase is 10.5 tons per year.

Permit Renewal V20654.000 authorizes the mill expansion including a primary crushing circuit and a new mill. The new mill will have two SAG Mill circuits with a common secondary (SAG oversize return) crushing circuit.

Significant Revision V20654.R01 authorized the facility to make the following changes:

1. Installation of mine equipment (belt conveyors, storage bin etc.) to allow Asarco to use a portion of the existing oversize ore from the existing Pebble Crusher oversize

ore circuit as referred to as the road base for haul roads located within the Ray Mine. This project is Pebble Crusher Bypass project.

2. Installation of four stationary diesel engines to support the existing mine operations.

3. Reducing the Pebble Crusher permitted throughput from 3,066,000 tons/year to 2,750,000 tons per year.

Significant Revision V20654.R02 authorized the facility to make the following changes:

1. Installation of new engines.
2. Correction to CR1 crushing circuit throughput.
3. Deletion of CR4 Operating Scenarios 1, 2, and 3.
4. Change the current permitted engines classification from emergency to non- emergency.
5. Replacement of existing engines (Engine ID 1058 and 1059).
6. Revisions to CR4 baghouse CAM plan.
7. Revisions to CR4 baghouse QIP
8. Alternate operating scenarios for CR1, CR4 and SAG Mill Circuits that allows the circuits to operate using low moisture ore (i.e., ore with < 4% moisture).
9. Update the list of insignificant activities.

Minor Permit Revision V20654.R03 authorized the facility to perform abrasive blasting.

Minor Permit Revision V20675.R01 authorizes the facility to make the following changes:

1. Installation and operation of a cone crusher, as a part of the existing CR4 crushing circuit, to support crushing harder core.
2. Replace existing emergency generator, ID 2020, with a new emergency generator.
3. Update the regulatory applicability for two existing generators ID 2012, and ID 2013 from NSPS Subpart IIII to NESHAP Subpart ZZZZ
4. Remove emergency pump, ID 1025, and emergency generator ID 2007.

3.2 Administrative Changes

Some incorrect section or rule references have been addressed during revision V20633.R02. Also, as indicated in the latest testing data for the crusher CR4, the CAM plan has been revised (per Asarco's 12/18/09 submittal) to indicate the specific water flows and pressure drops that the controls should be operated at.

4. EMISSIONS

The existing facility already constitutes a "major emitting facility" within the meaning of CAA §165(a), and constitutes a "major source" within the meaning of CAA §302(j) or CAA §112.

The addition of the boiler represents a potential emissions increase of 1.2 tons/year of NOx and 1.04 tons/year of CO.

The addition of cone crusher in the CR4 crushing circuit represents potential emission increase of 5.63 tons/year of PM10.

5. REGULATORY REQUIREMENTS AND MONITORING

5.1 New Source Performance Standard - Subpart LL (Standards of Performance for Metallic Mineral Processing Plants)

The provisions of this subpart are applicable to all the affected facilities in metallic mineral

processing plants including: each crusher and screen in open-pit mines; each crusher, screen, bucket elevator, conveyor belt transfer point, thermal dryer, product packaging station, storage bins, enclosed storage area, truck loading station, truck unloading station, railcar loading station, and railcar unloading station at the mill or the concentrator. The affected facilities are:

Process	Equipment ID	Description
CR4 Primary Crushing Circuit	396-2a	Transfer to picking conveyor controlled by CR4 baghouse
	396-2c	Transfer from Primary Crusher Discharge Conveyor to the Splitter Cart Transfer from Splitter Cart to Cone Crusher Transfer from Cone Crusher to Stockpile Feed Conveyor Transfer from Splitter Cart to Stockpile Feed Conveyor
SAG Mill Grinding Circuit	331	CR4 stockpile apron feeders
	341	SAG mill feed
	344	SAG mill oversize return to Pebble Crusher
	345	Pebble Crusher
Pebble Crusher Bypass	346-1	Conveyor transfer point
	346-2	Conveyor transfer point
	346-3	Conveyor transfer point
	346-4	Transfer to bin
	346-5	Transfer to haul truck
	346-6A	Transfer to stockpile
	346-6B	Transfer to haul truck
CR1 Primary Crushing Circuit	412	CR1 dump pocket and primary crusher
	414	Transfer of ore from CR picking conveyor to CR1 stacker conveyor
	421	Transfer of ore from CR1 stacker conveyor to Hayden stockpile
	441	Transfer of ore in Hayden loadout tunnel

5.2 Compliance Assurance Monitoring (CAM)

Following units are subject to the CAM requirements of 40 CFR Part 64:**Unit ID**	**Control Equipment ID**	**Control Equipment Type**
396-2a	TBD	CR4 Baghouse/Dust Collector
396-2b	TBD	CR4 Baghouse/Dust Collector
414	TBD	CR1 Scrubber
331	TBD	SAG Baghouse/Dust Collector

5.3 Monitoring/Compliance Verification

The same requirements that apply to the existing boilers (water heaters) apply to the proposed one. Therefore only natural gas must be used as primary fuel, and propane as secondary fuel. Records of the annual amount of fuel used in the boilers/heaters must be kept.

6. AMBIENT IMPACT ASSESSMENT

Any changes proposed by this permit renewal do not include significant increases in emissions of PM_{10}, therefore, no additional impact assessments have been conducted.

7. LIST OF ABBREVIATIONS

ADS ..... Agglomerative Dust Suppression
AP-42 .....
"Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources", 5th Edition
ASTM ..... American Society for Testing and Materials
CAA .....Clean Air Act
CAM ..... Compliance Assurance Monitoring
CFR ..... Code of Federal Regulations
CO .....Carbon Monoxide
$H2S0_4$ ..... Sulfuric Acid
hr .....Hour
lb .....Pound
MACT ..... Maximum Achievable Control Technology
MMBTU ..... Million British Thermal Units
Mod. ..... Modification
MSDS..... Material Safety Data Sheet
NO_X .....Nitrogen Oxides
NSPS .....New Source Performance Standard
NSR..... New Source Review
PCAQCD .....Pinal County Air Quality Control District
PGCAQCD ..... Pinal-Gila Counties Air Quality Control District
PM_{10} ..... Particulate Matter nominally less than 10 Micrometers
PSD .....Prevention of Significant Deterioration
SIC ..... Standard Industrial Code
SO_X ..... Sulfur Dioxide
tpy ..... tons per year
TSD..... Technical Support Document
VOC .....Volatile Organic Compound
yr……..year