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Technical Support Document
ASARCO LLC - Ray Mine
Permit # V20633.000

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1. BACKGROUND

1.1 Applicant

This is a permit renewal for an existing 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 through this renewal. Additional information may be found in the Technical Support Documents for previous permits for the facility.

This analysis reflects consideration of (at least) the following:

1. Application for renewal V20633.000, signed on 12/08/07.

1.2 Attainment Classification

This facility is located in an area designated as nonattainment for PM10. At 59 FR 36116 (7/15/94), the EPA approved a plan for the "Hayden Township" TSP/PM10 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 (Oper. permit issued)	In-pit sulfide crusher, overland conveyor, two stackers, reclaim system, omni-cone crusher
7267	Installation (operating?)	7/16/90 (Oper. permit issued)	Water sprays on limestone plant
20148	Operating	4/14/93	Facility
10047	Installation	9/27/93	Gas tanks
20456	Installation (Operating?)	9/27/93 (Oper. permit issued)	Lime handling/slaking; lab fume scrubbers
20148.R01	Revision	7/9/99	Secondary Sulfide Ore Crusher
20148.R02	Revision	11/19/99	Perf. 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A20510.000	Major Source	Withdrawn	Facility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.

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 V20600.R04. The following table summarizes the recent inspections that ave been conducted on the source:

Inspection Date	FAR Number	Type of Inspection	Results
2/22/06		Compliance	In compliance
4/24/07	F-2007-129	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 PM10 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 2006 shows no exceedances of the 150 $\mu g/m^3$ PM10 24-hour standard.

2. PROCESS DESCRIPTION

2.1 General Process[1]

This facility includes an open pit mine, crushing, grinding and flotation operations, leaching, solvent extraction and electrowinning operations. The bulk of the particulate matter emissions

[1]This section includes a summary of the current and projected operations at the facility, including activities just recently permitted through revisions.

from this site originate from ore-mining operations. The site includes hot water heaters, solvent and diluent storage tanks, solvent extraction tanks, mixers/settlers, occasional open burns and landfill operations. These equipment and operations/activities are also sources of emissions of particulate matter and other pollutants.

2.1.1 Pit Operations

The mine extracts sulfide, oxide and silicate ores. Initially, diesel or electric-driven drills perforate the mineralized rock benches with 60-foot deep drill holes. Compressed air blows rock cuttings from the blast holes. Operators collect samples from cuttings to allow assay of the copper content and ore character. Blasting agents fracture and loosen the ore. Electric shovels load the material into diesel- or diesel-electric powered haul trucks. The haul trucks transfer sulfide ore to one of the several crushers, transfer leachable ores to separate sulfide or silicate leach dump areas, and transfer overburden material to waste dumps.

2.1.2 Maintenance Operations

The permitted operations at this facility include several diesel and gasoline tanks, 9 hot water washers powered by diesel and heavy equipment spray painting. All these operations are sources of Volatile Organic Compounds.

2.1.3 Ray Concentrator

There are currently 3 ore crushers at the Ray site: the in-pit crusher (CR-3a), the secondary in-pit crusher (CR-3b) and the near-pit Omni-cone crusher (CR-1). One (1) additional near-pit crusher (CR-4) has been permitted to replace the current in-pit and secondary crushers.

The current in-pit (CR-3a) crusher system is located approximately 500 feet below the pit lip. Trucks dump the sulfide ore into the in-pit's dump pocket, which in turn empties the ore onto an apron feeder that supplies the crusher. The in-pit crusher reduces the ore to an 8-inch-minus dimension. The secondary crusher only operates when harder ore materials are being mined from the pit. When both crushers are operating, they operate in series; the primary crusher feeds to the secondary crusher and the secondary crusher output is delivered to the concentrator via the overland conveyor. When the secondary crusher is not working, the output from the primary crusher is routed directly to the "overland" conveyor. Water sprays at each transfer point control emissions. The overland conveyor carries the ore about 0.8 mile to a transfer tower where a diverter gate alternatively directs a gravity drop of the ore onto a transfer belt conveyor leading to the railroad loading stockpile, or onto a transfer conveyor leading to the Ray concentrator coarse ore stockpile. Water sprays control drop point emissions.

The new near-pit crushing plant (CR-4), which is proposed to be operational by the third quarter 2008, will be located approximately 800 feet from the existing transfer tower. Once its construction is finished it will completely replace the current in-pit and secondary crushers. The crushed ore from the new near-pit crusher will discharge directly into the discharge chute underneath the crusher, on to the discharge belt conveyor from where it will be transferred to a new overland conveyor. This conveyor

will be approximately 800 feet long, in comparison with the existing one which is 4,200 feet long.

A coarse ore reclaim system is located beneath the Ray concentrator coarse stockpile and consists of three reclaim apron feeders and a mill conveyor. Water sprays control emissions at each apron feeder transfer point. The mill feed empties into a semiautogenous (SAG) mill. The SAG mill reduces the ore size to the consistency of coarse gravel using a wet-grind process. The SAG mill discharges the slurry through a screen used to remove the oversized material.

Fine materials passing through the SAG mill output screen enter 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 lime which is stored in dry storage silos. A baghouse controls the emissions generated by trucks delivering lime into the silos.

The ball mills feed a series of flotation cells where the reagent/metallic mineral mixture floats to the surface and is recovered by skimmer systems. The skimmed material is de-watered to produce a damp, copper-rich concentrate. This concentrate is transferred by conveyor to a loading pad where equipment load the material into rail cars or trucks for shipment off site. Drains remove the waste material or “tailings” from the bottom of the flotation cells. The tailings are pumped to a thickener and then to the Elder Gulch tailings impoundment.

A metallurgical laboratory used to analyze blast rock cuttings and other samples generates particulate matter and sulfuric acid emissions.

2.1.4 Train Load-Out

A railroad tunnel runs under the coarse ore stockpile. Drop chutes allow material to gravity feed into rail cars positioned in the tunnel. Water sprays control emissions during rail car loading.

The near-pit Omni-cone crusher (CR-1) receives previously crushed ore from the overland conveyor and it is used to crush the ore to an 8"-minimum dimension. This crusher is located in the train load out area. A wet scrubber system is used to control fugitive particulate matter emissions.

2.1.5 Ray Leaching Operations

Silicate ore that is mined out of the pit is carried to the heap-leaching areas and sprayed with dilute sulfuric acid to keep it wet. Contact with the acid slowly leaches the copper from the material and the liquid drains out. The underlying bedrock and drainages funnel the leachate into dams, which drain or are pumped to the solvent extraction-electrowinning plant.

2.1.6 Solvent Extraction-Electrowinning (SX-EW) Operations

The copper-laden leachate or “pregnant leach solution” (PLS) is conveyed to the SX plant where an organic solvent/kerosene solution strips the copper from the leach

solution. Sulfuric acid is used to strip the copper from the solvent/kerosene phase. The copper-rich solution is pumped to the electrowinning plant, where an electric current plates elemental copper onto copper cathode sheets. VOC emissions are generated from the use and storage of the solvent/kerosene solution. Also emissions of sulfuric acid are generated from the electrowinning tanks.

Natural gas heaters are used to provide process heat for both the solvent extraction and the electrowinning process. Combustion emissions are generated.

2.1.7 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.

2.2 Process Changes

2.2.1 Haul Truck Fleet Replacement

Currently 240-ton haul trucks carry ore out to an "in-pit" ore crusher, transfer leachable ore to several leach dump areas and transfer overburden material to waste dumps. Over the next five years, the 240-ton truck fleet will be phased out and replaced by a 400-ton Liebherr truck fleet. The phase -in and out process will be carried out through the year 2013 at which time (21) 400-ton trucks will completely replace (37) 240-ton trucks, and therefore the capacity will stay the same or slightly decrease. The old trucks will be decommissioned and removed from site. There will be a reduction in truck miles driven by implementing the 400-ton haul truck fleet as follows:

Year	Reduction of Truck Miles Driven (miles)
2007[2]	118,580
2008	251,910
2009	451,450
2010	502,770
2011	481,280
Total	**1,805,990**

Due to the decrease of miles driven by the trucks, fugitive emissions on haul roads will also be reduced. Permittee has calculated potential (uncontrolled) emissions[3] from the

[2]The changes made to the fleet during 2007 were approved by revision V20600.R04.

[3]Calculated at 24 hours per day, 365 days per year operations. ASARCO's actual operations only run 19 hours per day, 365 days per year with lighter operations during holidays.

(37) 240 ton trucks to be 2441.1 tpy, and for the (21) 400-ton trucks to be 1869.4 tpy, a decrease in emissions of 571.7 tons per year.

Additionally, a new loader with a capacity of 53 cubic yards will be replacing one of the existing shovels in the pit. This loader will generate approximately 3.76 tpy of particulate matter (PM10) emissions. Other equipment will be phased in and out as part of the addition of a new near-pit crusher, including the addition of 2 excavators, 2 backhoes, 2 cable reelers and 1 compactor.

2.2.2 Prill (ammonium nitrate) Storage Tank

Dry prill is used as an explosive for the blasting operation. As part of this renewal, ASARCO will be installing an additional prill storage tank with a capacity of 1694 cubic feet. This will be the 3rd prill tank on site. No regulated emissions are generated by this tank.

2.3 Administrative Changes

Several administrative changes have been processed with this renewal. The equipment list has been revised to reflect existing equipment on the facility, disclosed with the original Title V permit application, but which never made it into the equipment list. Some of these administrative changes are:

- Equipment list lists one dust hood in the metallurgical laboratory. There are currently 7 dust hoods which vent to the Ducon scrubber outside the building;
- Equipment phased out from the leaching operations: 9 rubber tire rigs, (2) 1000-water trucks, (1) 50-ton haul truck;
- Equipment list missing 1 rubber tired dozer from the leaching operations;
- Four wash tanks from the SX-EW operations have been dismantled and removed from the permit;
- the total number of vat storage tanks in the SX-EW operation has been corrected to 12;
- the total number of raffinate sumps in the SX-EW operation has been corrected to 5.

3. 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.

3.1 General

Potential Emissions per §1-3-140

ID	SOURCE	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	H_2SO_4 (tpy)	VOC (tpy)
110	Drilling (drilling holes for assay and blasting)	7.00	0.40					

ID	SOURCE	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	H_2SO_4 (tpy)	VOC (tpy)
120	Blasting (blasting ore and waste so it can be loaded into haulage equipment, including loading of prill silos)	20.29	1.49	285.6	1125.6	33.6		
130	Loading (haul equipment with ore and waste, includes shovels, hydraulic/electric equipment and loaders)	51.86	7.85					
130a	Loading - New Le Tormeau Loader	3.76	0.57					
140	Hauling (waste and ore from loading site to dumps, stockpiles and dump pockets w/240 ton trucks)							
141	170-ton trucks	11.26	11.26					
142	240-ton trucks	2441.1	292.9					
142a	New 400-ton trucks (replacing the 240-ton fleet)	1869.4	224.3					
144-5	Other hauling vehicles (transportation and cleanup)	142.5	17.77					
160	Dozing (mine areas, dumps and stockpiles)	48.2	6.7					
170	Blading (grading roads)	6.4	0.33					
180	Screening Plant (screening, conveying, handling)	3.41						
190	Dumping (waste rock material on the dumps, stockpiles)	33.8	5.12					
230	Maintenance (Fueling and heavy equipment painting)							7.22
310	Crushing (and handling in the in-pit crusher and secondary crusher)	92.3	92.3					
320	Conveying (crushed ore for further processing, including to railroad loadout)	49.6	49.6					
330	Stockpiles (crushed ore for further processing)	7.0	0.25					
340	Grinding(apron feeder to mill feed conveyor to SAG mill and grinding)	18.0	18.0					
360	Reagent Storage (minerals are stored, mixed and added)	0.1	0.1					
390	Laboratory (assay using sulfur digestion)	1.4	1.4					

ID	SOURCE	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	H_2SO_4 (tpy)	VOC (tpy)
396-8	Crushing (and handling in the new near-pit crusher)	15.24						
410	Crushing (existing near-pit crushing and handling)	22.00	20.64					
420	Conveying (existing near-pit)	18.0	18.0					
430	Stockpile (near-pit)	10.2	1.6					
440	Loading(ore for further processing at Hayden)	1.6	0.24					
500	Leaching(adding ore to dumps and processing, accounted for also under #160)	2.9	0.43					
610	Solvent Extraction							95.35
620	Reagent Storage							0.22
640	Electrowinning						12.5	
650	Hot Water Heaters	0.03	0.03	0.4	0.33	0.002		0.02
710	Roads - Employees reporting to work	3.6	0.45					
720	Roads - vendor visits	2.41	0.31					
730	Dumps and Tailings Windblown Dust	180.8						
740	Heaps Windblown Dust	22.7						
750	Stockpiles - windblown dust	0.69						
760	Water Treatment Plant	5.38	5.38					
	TOTAL	5092.9	777.4	286	1125.9	33.6	12.5	102.8

3.2. Actual in Emissions

Typical annual emissions are listed in the table below (based on the 2006 Emissions Inventory)

ID	SOURCE	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	H_2SO_4 (tpy)	VOC (tpy)
100s	Ray Mine Operations	3102.21	509.55	60.19	237.23	7.08		
200s	Ray Mine Maintenance							3.1
300s	Ray Concentrator Operations	51.23	1.32					
400s	Hayden Ore Crushing	41.96	0.95					
500s	Leaching	3.68	0.59					

ID	SOURCE	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	H_2SO_4 (tpy)	VOC (tpy)
600s	Solvent Extraction			7.57	6.36	0.05	1.69	35.44
700s	Admin/Misc. Operations	43.1	1.05					
	TOTAL	**3199.08**	**512.41**	**67.76**	**243.59**	**7.13**	**1.69**	**38.54**

4. REGULATORY REQUIREMENTS AND MONITORING

4.1 NSR/NSPS Applicability

The existing near-pit crusher (ID#410), conveyors and rail car loading station all antedate New Source Review (NSR) and New Source Performance Standard (NSPS) requirements and have a "grandfathered" status.

4.1.1 NSPS Applicability

Subpart LL

The in-pit secondary crusher and the screening line for sulfide approved in 1999, and the new near-pit crushing system (including dump pocket, apron feeder, crusher, conveyor belt transfer points), authorized by Revision 'R04 triggered the NSPS, subpart LL, applicability. This subpart of the NSPS includes 2 standards, one particulate matter grain loading standard of 0.02 g/dscm for any scrubbers used to control emissions from the systems, and for any other points sources (dump pocket, top of crusher and conveyor transfers), and opacity standard of 10%. To demonstrate compliance with the grain loading standard, Permittee operates/will operate scrubbers to control particulate matter emissions.

Subpart OOO

The installation of the screening plant approved in Revision 'R02 did not trigger the applicability of NSPS, subpart OOO, because it is a "stand-alone" screening operation with no crushers or grinding mills. The material used in the screening plant comes directly from the pit, and does not go through a crusher.

4.1.2 NSR Applicability

Any facility modifications conducted after the initial Title V permit produced emissions increases below the significance thresholds, therefore continuing the grandfathered NSR status of the entire facility. The TSD for the initial Title V contains more information on this area's designation as nonattainment in 1990.

The following is a summary of the emissions changes (increases and decreases) approved through permit revisions since the Title V permit was issued in 2003. During the last revision to the permit, ASARCO had to conduct an analysis to demonstrate that all their contemporary increases of PM10 did not exceed the significance threshold of 15 tpy.

Revision/Modification	Year	PM10 Increases/Decreases (tpy)
‘R02 - allows open burning	2005	0.9
‘R03 - allows asbestos landfill cell	2006	+0.9
‘R04 - allows installation of new crusher (CR4), screening plant and removal of existing in-pit crusher/secondary crusher.	2007	+21.34 +2.03 -18.19
TOTAL		**6.98**

4.2 Monitoring/Compliance Verification

4.2.1 Opacity

This permit includes requirements for opacity monitoring of both NSPS and non-NSPS emission sources. The NSPS sources are limited to 10% opacity, including the new near-pit crushing system (CR4). As of April 2006, the 40% standard of §2-8-300 was lowered to 20% for existing point sources which don’t already have an applicable NSPS or another opacity standard in Pinal County’s rules. The 20% rule has not yet been approved into the SIP and is therefore only locally enforceable.

The 20% standard applies to point sources at the facility which are not currently regulated by NSPS Subpart LL, including the existing Near-Pit crusher and associated transfer drops, which are pre-NSPS, the new screening plant, the dry lime silo storage vent, conveyor transfer points in the portable screening plant, and any other conveyor transfer points not listed as “affected sources” anywhere in §§5.D, 5.F and 5.H of the permit.

4.2.2 Weight Rate Equation §5-5-190 [Federally Enforceable Pursuant to PGAQCD Reg. 7-3-1.8]

The permit does not include a compliance verification requirement with respect to the “mass emission equation” pertaining to process industries. Prior analysis has amply demonstrated that the allowable emissions under the “process industry” limitation far exceeds the levels predicted using AP-42 emission factors.

4.2.3 Compliance Assurance Monitoring (CAM) - 40 CFR Part 64

The CAM rule requires that a control-equipped, pollutant specific emission unit with a potential to emit above a “major” threshold, must be covered by a CAM plan. The permit for this facility already includes 2 CAM plans, one for the existing in-pit secondary crusher and one for the new CR4 crusher.

PCAQCD has looked into the applicability of CAM to other emission units at the facility, and has come to the conclusion that it does not apply to any other sources. The uncontrolled potential to emit for the current in-pit crusher (the one about to be removed)

and for the existing near-pit crusher (CR1) do not exceed 100 tpy, being 99 and 80 tons per year, respectively.

4.2.4 Testing Requirement

4.2.4.1 NSPS Testing, Scrubber Efficiency

The source is required to perform a test on the CR4 crusher system to ensure compliance with the 95% control efficiency of the scrubbers, as well as the NSPS grain loading standard and opacity.

Tests for efficiency and grain loading standard will be conducted within 180 days of startup and every 5 years.

Opacity testing requirements for NSPS affected units are located in §6.A.1.d of the permit. Permittee has to conduct monthly surveys of visible emissions from the crusher inlets and outlets, and conveyor drops. If the surveys identify emissions that could exceed the opacity standard, a Method 9 reading is required.

4.2.4.2 Non-NSPS Testing

This permit requires monthly surveys of all non-NSPS affected material handling facilities for visible emissions. Fuel burning equipment surveys are only required semi-annually. Any emissions that may trigger the opacity standard of 40% (or 20% for the fuel burning equipment), triggers a Method 9 reading. These requirements are located in §6.A.1.e of this permit.

4.2.4.3 Ore Moisture Content

Permittee has used emission factors for high-moisture ore (>4%) for purposes of calculating emissions from the crushing system. The pit at the mine is for the most part well below the water table, and the ore is typically saturated with water. According to a memo provided by ASARCO from Sterling Cook, the Senior Geologist, by the time the rock is loaded into a haul truck it contains seven to ten percent moisture by weight, which accounts for the 2-4% moisture that existed in situ, plus the additional water that saturates the rock after blasting. According to Mr. Cook, the current appropriate value for the Ray mine is 5-6% moisture (by weight).

On July 18, 2007, ASARCO conducted a moisture content sampling in accordance with ASTM D2216, and the result showed a moisture content of 6.63% by weight.

The permit requires a determination of the ore moisture content on an annual basis, 12 months from the previous test, which was conducted in the summer of 2007. If the testing results show that the moisture content is lower than 4%, Permittee will have to submit a corrective action plan.

5. AMBIENT IMPACT ASSESSMENT

Any changes proposed by this permit renewal are minimal and do not include significant increases in emissions of PM10, therefore, no additional impact assessments have been conducted.

6. 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
H2S04 . . . . . Sulfuric Acid
hr . . . . . Hour
lb . . . . . Pound
MACT . . . . . Maximum Achievable Control Technology
MMBTU . . . . . Million British Thermal Units
Mod. . . . . Modification
MSDS . . . . . Material Safety Data Sheet
NOX . . . . . 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
PM10 . . . . . Particulate Matter nominally less than 10 Micrometers
PSD . . . . . Prevention of Significant Deterioration
SIC . . . . . Standard Industrial Code
SOX . . . . . Sulfur Dioxide
tpy . . . . . tons per year
TSD . . . . . Technical Support Document
VOC . . . . . Volatile Organic Compound
yr . . . . . year