PROPOSED SIP Revision: Hayden 2008 Lead NAAQS Nonattainment Area

Air Quality Division
May 16, 2024

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Appendix D: EJ Screen Analysis

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Completeness Criteria

(40 CFR Part 51, Appendix V, Section 2.0)

Appendix V Section 2.1 - Administrative Materials

(a) A formal signed, stamped, and dated letter of submittal from the Governor or his designee, requesting EPA approval of the plan or revision thereof (hereafter "the plan"). If electing to submit a paper submission with a copy in electronic version, the submittal letter must verify that the electronic copy provided is an exact duplicate of the paper submission.

See the cover letter for this State Implementation Plan (SIP) submission signed by ADEQ Air Quality Director Daniel Czecholinski. Also included with the cover letter is a delegation of authority from Karen Peters, Cabinet Executive Officer of the Arizona Department of Environmental Quality (ADEQ), to Daniel Czecholinski. This delegation gives Mr. Czecholinski the authority to perform any act the ADEQ Cabinet Executive Officer is authorized to perform under the state air quality statutes, including the submission of SIPs to EPA.

(b) Evidence that the State has adopted the plan in the State code or body of regulations; or issued the permit, order, consent agreement (hereafter "document") in final form. That evidence shall include the date of adoption or final issuance as well as the effective date of the plan, if different from the adoption/issuance date.

Appendix C contains a copy of the final permit revision for the Hayden smelter.

(c) Evidence that the State has the necessary legal authority under State law to adopt and implement the plan.

Arizona is authorized to adopt and implement SIP revisions under Arizona Revised Statutes (A.R.S.) §§ 49-104, 49-106, 49-402, 49-404, 49-406, 49-425, and 49-426. Copies of these statutes are included for reference in this SIP revision submittal in Appendix C.

(d) A copy of the actual regulation, or document submitted for approval and incorporation by reference into the plan, including indication of the changes made (such as redline/strikethrough) to the existing approved plan, where applicable. The submission shall include a copy of the official State regulation/document, signed, stamped, and dated by the appropriate State official indicating that it is fully enforceable by the State. The effective date of any regulation/document contained in the submission shall, whenever possible, be indicated in the regulation/document itself; otherwise the State should include a letter signed, stamped, and dated by the appropriate State official indicating the effective date. If the regulation/document provided by the State for approval and incorporation by reference into the plan is a copy of an existing publication, the State submission should, whenever possible, include a copy of the publication cover page and table of contents.

Table 1-1 shows the final permit revisions being adopted and rule provisions being replaced by this SIP Revision. As mentioned above in (b), this SIP revision contains the final permit revision.

(e) Evidence that the State followed all of the procedural requirements of the State's laws and constitution in conducting and completing the adoption/issuance of the plan.

Appendix E contains the public process documentation showing that the State followed all requirements regarding adoption and issuance of the plan.

(f) Evidence that public notice was given of the proposed change consistent with procedures approved by EPA, including the date of publication of such notice.

Proof that ADEQ gave notice of the SIP Revision in accordance with A.R.S. § 49-444 is attached as Appendix E.

(g) Certification that public hearing(s) were held in accordance with the information provided in the public notice and the State's laws and constitution, if applicable and consistent with the public hearing requirements in 40 CFR 51.102.

The certification and other documents related to the public hearing are attached as Appendix E.

(h) Compilation of public comments and the State's response thereto.

Public comments and ADEQ's responsiveness summary are attached as Appendix E.

Appendix V Section 2.2 - Technical Support

(a) Identification of all regulated pollutants affected by the plan.

This SIP revision applies to the 2008 Lead (Pb) National Ambient Air Quality Standard (NAAQS).

(b) Identification of the locations of affected sources including the EPA attainment/ nonattainment designation of the locations and the status of the attainment plan for the affected areas(s).

Identification of the locations and sources affected by this plan are included in Chapters 1, 2, and 3. Information is also contained in the Hayden Pb Emissions Inventory (EI) Technical Support Document (TSD) (Appendix A) and Hayden Pb Modeling TSD (Appendix B). This SIP revision is applicable to the Hayden Pb nonattainment area (NAA) for the 2008 Pb NAAQS.

(c) Quantification of the changes in plan allowable emissions from the affected sources; estimates of changes in current actual emissions from affected sources or, where appropriate, quantification of changes in actual emissions from affected sources through calculations of the differences between certain baseline levels and allowable emissions anticipated as a result of the revision.

The Hayden Pb Emissions Inventory TSD (Appendix A) contains the technical documentation and a detailed emissions inventory.

(d) The State's demonstration that the national ambient air quality standards, prevention of significant deterioration increments, reasonable further progress demonstration, and visibility, as applicable, are protected if the plan is approved and implemented. For all requests to redesignate an area to attainment for a national primary ambient air quality standard, under section 107 of the Act, a revision must be submitted to provide for the maintenance of the national primary ambient air quality standards for at least 10 years as required by section 175A of the Act.

The Hayden Pb Modeling TSD (Appendix B) contains the attainment demonstration for the 2008 Pb NAAQS.

(e) Modeling information required to support the proposed revision, including input data, output data, models used, justification of model selections, ambient monitoring data used, meteorological data used, justification for use of offsite data (where used), modes of models used, assumptions, and other information relevant to the determination of adequacy of the modeling analysis.

Modeling information and the technical demonstration is contained in Appendix B.

(f) Evidence, where necessary, that emission limitations are based on continuous emission reduction technology.

The control strategy is discussed in Chapter 4 of the SIP revision. A copy of the final permit revision is located in Appendix C, and includes numerical fugitive emissions limits for the copper smelter in the nonattainment area. The permit contains particular work practice standards and recordkeeping/reporting requirements to ensure compliance with the emission limit and to ensure attainment of the 2008 Pb NAAQS.

(g) Evidence that the plan contains emission limitations, work practice standards and recordkeeping/reporting requirements, where necessary, to ensure emission levels.

The control strategy is discussed in Chapter 4 of the SIP revision. A copy of the final permit revision is located in Appendix C, and includes numerical fugitive emissions limits for the copper smelter in the nonattainment area. The permit contains particular work practice standards and recordkeeping/reporting requirements to ensure compliance with the emission limit and to ensure attainment of the 2008 Pb NAAQS.

(h) Compliance/enforcement strategies, including how compliance will be determined in practice.

Chapter 4 contains a summary and description of the permit revision regarding the requirements for compliance/enforcement strategies as well as a discussion of compliance is determined.

(i) Special economic and technological justifications required by any applicable EPA policies, or an explanation of why such justifications are not necessary.

Chapter 4 discusses the need to vary from the use of CEMS to monitor fugitive emissions.

1 INTRODUCTION

Chapter 1 describes the purpose of this State Implementation Plan (SIP) Revision, summarizes the National Ambient Air Quality Standards (NAAQS or "standards") for lead (Pb), and presents regulatory requirements for Pb nonattainment areas. This chapter also provides a regulatory history of the Hayden nonattainment area (NAA), as well as a description of the physical geography and the economy of the area.

1.1 Statement of Introduction and Purpose

Pursuant to Clean Air Act (CAA) Section 107(d), the U.S. Environmental Protection Agency (EPA) redesignated the Hayden area, located in portions of southern Gila and eastern Pinal counties, Arizona, from ''unclassifiable'' to ''nonattainment'' for the 2008 National Ambient Air Quality Standards (NAAQS) for lead (Pb). EPA based its redesignation of the area on recorded violations of the Pb standards at the Globe Highway monitoring site, located near the towns of Hayden and Winkleman, Arizona.[1]

Under the authority granted by the Governor and the State of Arizona, the Arizona Department of Environmental Quality (ADEQ) is responsible for the preparation and submittal of State Implementation Plan revisions for the Hayden area.[2]

On March 3, 2017, ADEQ submitted *SIP Revision: Hayden Lead Nonattainment Area, March 2, 2017 Final* to demonstrate attainment of the 2008 Lead NAAQS by the statutory attainment date of October 3, 2019. EPA approved the plan and associated control measures in 2018.[3] On January 31, 2022, EPA published a finding of failure to attain the 2008 Pb NAAQS by the October 3, 2019 attainment date.[4] This action established a new attainment date and requires the submittal of a new SIP revision meeting the requirements of CAA sections 110 and 172, including the nonattainment plan provisions of section 172(c). The new plan must include any new measures necessary to demonstrate attainment of the Pb NAAQS by January 31, 2027.

This document summarizes the progress of the Hayden area in reducing Pb emissions and demonstrates that all CAA requirements for Pb nonattainment areas have been satisfied. The enclosed analyses show that the area will attain the Pb NAAQS by the applicable January 31, 2027 attainment date. With this submittal, ADEQ requests that EPA approve the attainment plan for the Hayden 2008 Pb nonattainment area.

1.2 Control Measures to be Added to the SIP

Table 1-1 lists the new control measures submitted for approval as a component of the Arizona SIP. ADEQ and the American Smelting and Refining Company LLC (ASARCO) developed new measures for the control of Pb emissions from the Hayden primary copper smelter to demonstrate attainment of the Pb NAAQS by

[1] *See* 79 FR 52205 (September 3, 2014).
[2] *See* Arizona Revised Statues (A.R.S.) §§ 49-401, 402, 404, and 406.
[3] *See* 83 FR 7614 (February 22, 2018), 83 FR 56734 (November 14, 2018), and 83 FR 56736 (November 14, 2018).
[4] *See* 87 FR 4805 (January 31, 2022).

January 31, 2027. ADEQ incorporated these measures into ASARCO's Hayden Operations Class I Air Quality Permit (Permit No. 39948 as amended by Significant Permit Revision (SPR) No. 97168).

The proposed permit revision was posted on May 24, 2024, opening a public comment period. A public hearing was held on June 24, 2024. The elements of the final permit, as listed in Table 1-1, submitted to EPA for inclusion in the SIP are contained in Appendix C and discussed in Chapter 4 of this document.

Table 1-1 Measures to Be Added to SIP

Control Measures Added	SIP Measures Replaced
SPR No. 97168, *Attachment I: Hayden Smelter Site-Specific Sip Requirements*	None
Appendix 1 Of Attachment I	None

1.3 National Ambient Air Quality Standards

Title I of the CAA requires EPA to set NAAQS for those pollutants that are considered harmful to both public health and the environment. Standards are set for six air pollutants: ground-level ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. EPA sets two types of NAAQS, a primary standard and a secondary standard. Primary standards are set to protect human health and secondary standards are established to protect public welfare, including protection of visibility and prevention of damage to animals, crops, vegetation, and buildings.[5]

The standard for each pollutant is set at a maximum concentration measured in either parts per million (ppm) by volume, parts per billion (ppb) by volume, or micrograms per cubic meter of air ($\mu g/m^3$). Each standard also has a distinct averaging time in order to provide the necessary level of protection. These standards are periodically reevaluated and are either retained or revised based on review of scientific literature and analyses.[6]

1.4 National Ambient Air Quality Standards for Lead

The EPA set primary and secondary NAAQS for Pb because of adverse effects on human health as well as the environment, including animal and plant life. Lead is a heavy metal that occurs naturally in the environment. Lead emissions can also be a byproduct of various manufacturing processes.

Major sources of Pb emissions in air include ore and metals processing, leaded aviation gasoline, lead-acid battery manufacturing and other industrial processes. Lead may persist in the environment for long periods of time because it does not decompose in soil after deposition. Lead adversely impacts ecosystems by contributing to biodiversity loss through reduced reproduction and growth rates in plants and animals.[7]

In humans, exposure to Pb can have adverse effects on multiple organ systems, including neurological, reproductive, kidney, cardiovascular and immune systems. Lead may be inhaled or ingested through

[5] *See* U.S. Environmental Protection Agency. (n.d.). *NAAQS Table*. Retrieved September 6, 2022, from https://www.epa.gov/criteria-air-pollutants/naaqs-table

[6] *See* CAA section 109 (42 U.S.C. 7409 [2015]).

[7] U.S. EPA. (n.d.). *Lead in Outdoor Air*. Retrieved September 26, 2022, from https://www.epa.gov/lead/lead-outdoor-air

contact with contaminated air, soil, or water. Once the pollutant enters the body via the respiratory or gastrointestinal system, it is absorbed into the bloodstream and distributed throughout multiple organs. Lead may bioaccumulate in bones and soft tissues, causing persistent, long-term health problems. Lead bioaccumulation is more common in children due to rapid bone growth and replacement. Exposure to relatively low levels of Pb in children can have permanent adverse effects on neurological development, including reduced motor function, learning deficits, and lowered IQ.[8]

In 1978, the level of the Pb NAAQS were set at 1.5 $\mu g/m^3$, not to be exceeded by the maximum arithmetic mean concentration averaged over a calendar quarter.[9] In 2008, in order to better protect public health and welfare, EPA strengthened the primary (and secondary) NAAQS to 0.15 $\mu g/m^3$. The period of measurement was also changed from the calendar quarter basis in the 1978 standard to a three-month rolling average (not to be exceeded) form, evaluated over a three-year period.

Planning and control requirements for the 1978 Pb NAAQS were revoked one year after area designations for the 2008 Pb NAAQS (from the effective date of the new designation). In areas designated nonattainment for the 1978 NAAQS, that standard applied until the State submitted, and EPA approved, a SIP revision providing for attainment of the 2008 standard.[10] Because of revocation procedures for the 1978 primary Pb NAAQS and the absence of any nonattainment areas designated for that standard in Arizona, no planning requirements remain in the State for the 1978 Pb NAAQs.

On September 16, 2016, based review of the air quality criteria for Pb, EPA issued a decision to retain the existing 2008 standards without revision.[11] Table 1-2 shows historical and current Pb standards.

Table 1-2 Lead National Ambient Air Quality Standards

Lead National Ambient Air Quality Standards					
Final Rule	**Primary/Secondary**	**Indicator[a]**	**Averaging Time**	**Level[b]**	**Form**
1978[c]	Primary & Secondary	Pb-TSP	Calendar Quarter	1.5 $\mu g/m^3$	Not to be exceeded
1991	Agency released multimedia "Strategy for Reducing Lead Exposures"				
2008[d]	Primary & Secondary	Pb-TSP	3-month period	0.15 $\mu g/m^3$	Not to be exceeded
2016[e]	Primary & secondary standards retained, without revision.				

Source: U.S. Environmental Protection Agency. (n.d.). *Timeline of Lead (Pb) National Ambient Air Quality Standards (NAAQS).* Retrieved September 26, 2022, from https://www.epa.gov/lead-air-pollution/timeline-lead-pb-national-ambient-air-quality-standards-naaqs
[a] Pb-TSP = Lead in total suspended particles.
[b] Units of measure are micrograms per cubic meter of air (µg/m3).
[c] 43 FR 46246 (October 5, 1978).
[d] 73 FR 66964 (November 12, 2008).
[e] 80 FR 278 (October 18, 2016).

[8] U.S. EPA. (n.d.). *Lead Air Pollution.* Retrieved September 26, 2022, from https://www.epa.gov/lead-air-pollution
[9] 1977 Air Quality Criteria for Lead (U.S. EPA, 1977).
[10] *See* 73 FR 66964 (November 12, 2008).
[11] U.S. EPA. (n.d.). *NAAQS for Lead (Pb)*. Retrieved September 26, 2022, from https://www.epa.gov/lead-air-pollution/national-ambient-air-quality-standards-naaqs-lead-pb

1.5 Hayden Area Regulatory Background

2008 Pb NAAQS Nonattainment Designation

In 2008 EPA revised the Lead NAAQS, strengthening the level of the primary and secondary standards from 1.5 micrograms per cubic meter ($\mu g/m^3$) to 0.15 $\mu g/m^3$.[12] EPA based this decision on new data that concluded a lower threshold was necessary to protect human health and welfare.

Pursuant to CAA section 107(d)(1)(A), Arizona was required to submit boundary recommendations for areas of the state that meet (attainment), do not meet (nonattainment), or cannot be classified for the 2008 primary NAAQS. On December 15, 2009, Arizona submitted boundary recommendations for the state including a request that EPA delay a decision on the designation of nine townships centered on the Hayden primary copper smelter to provide additional time to collect ambient air quality data. EPA's initial response was to designate the Hayden Planning Area as unclassifiable and designated the rest of the State as unclassifiable/attainment until further data could be gathered to make a final determination for the Hayden area.[13]

CAA section 107(d)(3) authorizes EPA to revise designations on the basis of any new air quality related considerations that it deems appropriate. On April 21, 2014, EPA notified the State that a Pb NAAQS violation had been measured in the Hayden planning area, and consequently, the area would be redesignated from unclassifiable to nonattainment.[14] EPA redesignated the Hayden planning area as nonattainment for the 2008 Lead NAAQS, effective October 3, 2014. The boundaries of the planning area were defined in accordance with the State's original recommendations, matching those of the 2010 Sulfur Dioxide NAA.[15]

SIP Submittals

Infrastructure SIP (I-SIP)

CAA section 110(a)(1) requires states to submit SIPs within three years following the promulgation of new or revised NAAQS to provide for implementation, maintenance, and enforcement of such standards. Each of these SIPs must address certain basic elements or the "infrastructure" of its air quality management programs under CAA section 110(a)(2)(A) through (M). These elements include, but are not limited to, provisions for establishment and operation of ambient monitoring, public and local agency participation in air quality planning, and operation of permitting programs. The provisions of section 110(a)(2) are primarily general program requirements applicable to all areas of the state.

On October 14, 2011 ADEQ submitted *Arizona State Implementation Plan Revision under Clean Air Act Section 110(a)(1) and (2): Implementation of the 2008 Lead National Ambient Air Quality Standard*. Certain required permitting-related elements and demonstrations of authority to conduct air quality modeling

[12] *See* 73 FR 66964 (November 12, 2008).
[13] *See* 76 FR 72105 (November 22, 2011).
[14] *See* Letter from Jared Blumenfeld, Administrator, EPA Region 9, to Janice K. Brewer, Governor of Arizona regarding EPA's intent to redesignate the Hayden Pb planning area to nonattainment (April 21, 2014).
[15] *See* 79 FR 52205 (September 3, 2014).

were addressed in subsequent submittals. EPA approved most elements of Arizona's infrastructure plan in several separate actions.[16]

Nonattainment Area Plan

Designation of the Hayden area as nonattainment for the 2008 Pb NAAQS in 2014 triggered CAA requirements under Section 110 and Title I, Part D for the State to submit a SIP revision to demonstrate how the area will attain the 2008 Pb NAAQS. On March 3, 2017, ADEQ submitted *SIP Revision: Hayden Lead Nonattainment Area, March 2, 2017 Final* to demonstrate attainment of the 2008 Lead NAAQS in the Hayden planning area by the statutory attainment date of October 3, 2019. EPA approved the plan and associated control measures in 2018.[17]

Finding of Failure to Attain

On January 31, 2022 EPA published a finding of failure to attain the 2008 Pb standards by the October 3, 2019 attainment date.[18] This action established a new attainment date and requires the submittal of a new SIP revision, by January 31, 2023, meeting the requirements of CAA sections 110 and 172, including the nonattainment plan provisions of section 172(c). The new plan must include any new measures determined necessary to demonstrate attainment of the Pb NAAQS by January 31, 2027. The required SIP revision is the subject of this document.

Sources of Pb in the Hayden Planning Area

Source categories of lead emissions within the Hayden nonattainment area include mobile nonroad, area, and point sources. Mobile nonroad sources comprise modes of transportation that continue to use leaded fuels, such as piston-engine aircraft. Area sources of lead are related to the storage and transport of gasoline, miscellaneous industrial sources, and miscellaneous non-industrial sources. Finally, the point source category is limited to one source, the ASARCO primary copper smelter found in the Town of Hayden. The SIP revision focuses primarily on the ASARCO smelter, the largest source of Pb emissions in the area.

Lead emissions are a potential byproduct of metal ore smelting and processing. Smelting and mining activities have taken place in the Hayden NAA for over 100 years, with the Hayden primary copper smelter processing ores from the nearby Ray Mine as early as 1912. Beginning in 1958, the Hayden smelter began processing ores from various mine sites across the State. In 1999/2000 Grupo Mexico, a mining company with headquarters in Mexico, acquired ASARCO, and the company now operates as a U.S. subsidiary of Grupo Mexico.[19]

In 2008 following a finding of soil contamination from historical mining and smelting activities in the area, ASARCO, under EPA Superfund and ADEQ direction, began remediation efforts at several sites in Hayden and the nearby Town of Winkelman. A 2010 Administrative Order on Consent between ASARCO, ADEQ,

[16] EPA's actions on Arizona's Infrastructure SIP for the 2008 Pb NAAQS are contained in the following final rules: 80 FR 40905 (July 14, 2015), 80 FR 47859 (August 10, 2015), 87 FR 19631 (May 4, 2018), and 83 FR 42214 (August 21, 2018).
[17] *See* 83 FR 7614 (February 22, 2018), 83 FR 56736 (November 14, 2018), and 83 FR 56734 (November 14, 2018).
[18] *See* 87 FR 4805 (January 31, 2022).
[19] *See* ASARCO. (n.d.). *About Us*. Retrieved December 2, 2022 from https://www.asarco.com/history/

and EPA required ASARCO to continue soil, water, and air remediation and monitoring efforts at the site; those activities are ongoing as of 2022.[20]

Smelter operations were originally permitted as a major source of criteria pollutants and minor source for hazardous air pollutants. During ADEQ's permit review and renewal process in November 2011, EPA concluded that the smelter should instead be classified as a major source of hazardous air pollutants and issued a Finding of Violation against ASARCO. This finding of violation resulted in a settlement with EPA (Consent Decree), finalized December 30, 2015, intended to address any additional required provisions in the facility's Class I permit.[21]

The Hayden smelter is currently operating under a permit issued by ADEQ in April 2018.[22] This permit is a Class I major source operating permit in accordance with Title V of the CAA. The 2018 permit renewal for the facility incorporates control technologies used to comply with the Consent Decree.

1.6 Hayden NAA Description

Sections 1.6.1 through 1.6.4 describe the boundary, geography and climate, demographics, and economy of the Hayden planning area to provide additional context for this SIP revision.

1.6.1 Hayden NAA Boundary

Pursuant to section 107(d) of the CAA, EPA, with input from the States, designates areas as either nonattainment, attainment, or unclassifiable for each NAAQS. The CAA defines a nonattainment area as any area that exceeds the NAAQS for a given pollutant or contributes to ambient air quality in a nearby area that does not meet the NAAQS. EPA designated portions of Gila County and Pinal County as nonattainment for the 2008 Pb standard in 2014.[23] The current boundary of the Hayden Pb nonattainment area is codified in 40 CFR 81.303 and summarized in Table 1-3 below.

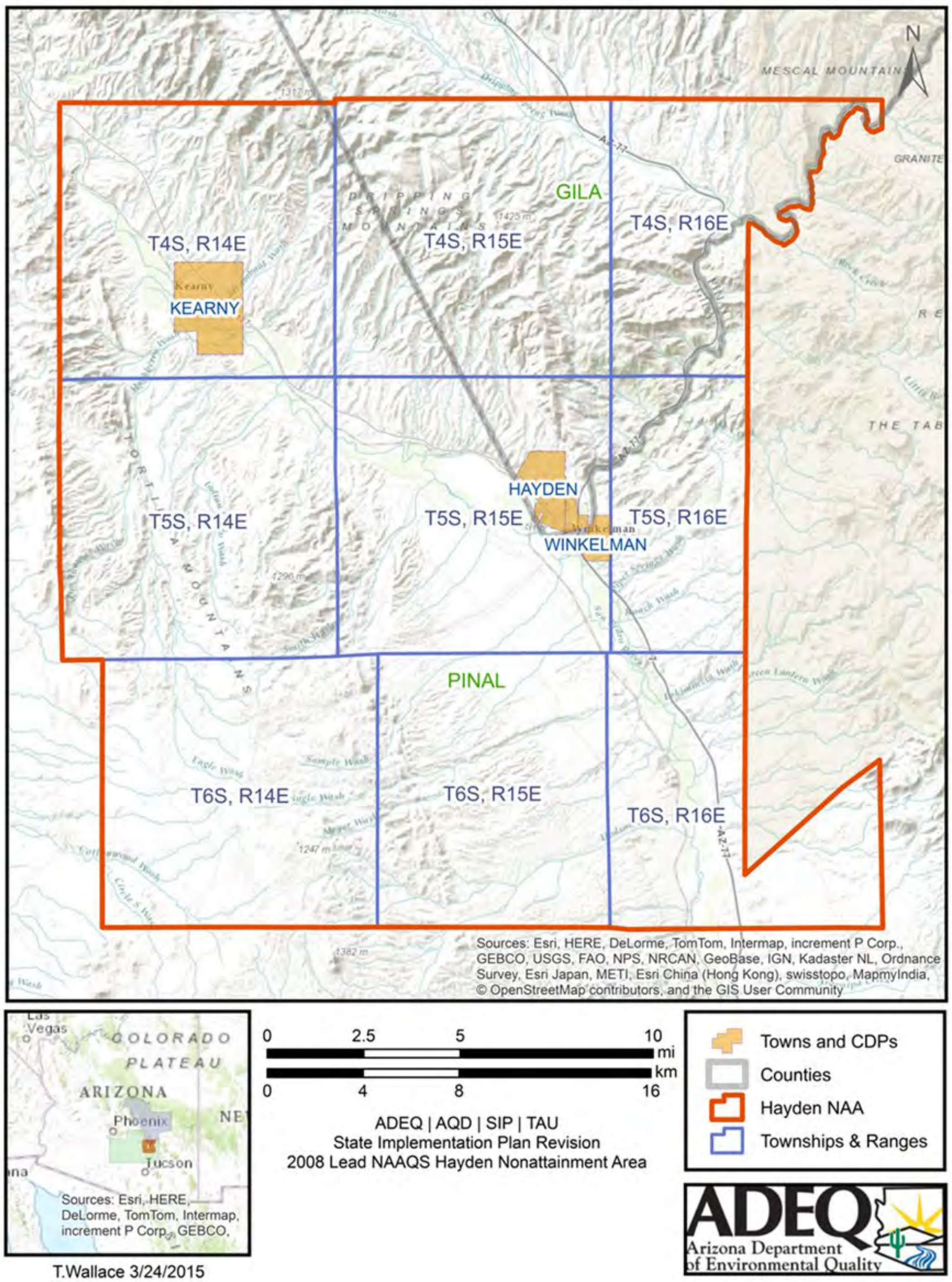
Table 1-3 Hayden, AZ 2008 Lead NAAQS Nonattainment Area Boundary

Hayden, AZ 2008 Lead NAAQS Nonattainment Area Description (township and range)	
County	**Designated Area**
Gila (part)	The portions of Gila County that are bounded by: T4S, R14E; T4S, R15E; T4S, R16E; T5S, R15E; T5S, R16E
Pinal (part)	The portions of Pinal County that are bounded by: T4S, R14E; T4S, R15E; T4S, R16E (except those portions in the San Carlos Indian Reservation); T5S, R14E; T5S, R15E; T5S, R16E (except those portions in the San Carlos Indian Reservation); T6S, R14E; T6S, R15E; T6S, R16E (except those portions in the San Carlos Indian Reservation)
Source: 40 CFR 81.303 Arizona.	

[20] *See* "Case Summary: EPA Funded Sites and Communities in the ASARCO Bankruptcy Settlement" at https://www.epa.gov/enforcement/case-summary-epa-funded-sites-and-communities-asarco-bankruptcy-settlement#hayden and "Superfund Alternative Site | ASARCO Hayden Plant" at http://azdeq.gov/node/1871.
[21] *See* Consent Decree, United States of America v. ASARCO LLC, CV-15-02206-PHX-DLR (D. Ariz. 2015). A copy of the Consent Decree is available at: https://www.epa.gov/enforcement/asarco-llc-settlement.
[22] *See* permit renewal No. 39948.
[23] *See* 79 FR 52205 (September 3, 2014) and 79 FR 56962 (September 24, 2014).

The Hayden Lead NAA is comprised of nine whole or partial townships as illustrated in Figure 1-1.

Figure 1-1 Map of Hayden Pb Nonattainment Area



1.6.2 Geography and Climate

The Hayden Lead NAA is found within Gila and Pinal Counties in southern and central Arizona. Gila County, located in the southern portion of the state, encompasses approximately 4,752 square miles. Located in central Arizona, Pinal County, encompasses approximately 5,374 square miles. Hayden is approximately 50 miles northeast of Tucson and 35 miles south of Globe. Other towns in the NAA include Winkelman, which borders Hayden to the southeast and Kearny, located in the northwest section of the NAA.

The area is characterized by complex terrain with both desert terrain and mountain ranges across the southern Gila County and central Pinal County landscape. The mountain ranges in the area form natural boundaries that isolate the NAA from the rest of Gila and Pinal Counties. Elevations range from roughly 1,800 feet to more than 4,400 feet above sea level in the Hayden nonattainment area, with the Town of Hayden situated at an elevation near 2,050 feet above sea level.

The climate of the area is classified as hot summer, Mediterranean climate, includes both warm desert and cool alpine climates, and is characterized by dry summers and cooler, wetter winters.[24] Average annual temperatures in the Hayden NAA range from 84.3 degrees Fahrenheit in the summer to 46.2 degrees Fahrenheit in the winter. Annual precipitation in the NAA averages 16.22 inches. The driest time of the year is typically April through June. There are generally two distinct rain seasons in the winter and late summer. Low pressure systems and cold fronts in December produce an average monthly total of 1.64 inches of rain or snow. Monsoon wind shift with increased moisture from Mexico in August produces an average monthly total of 2.46 inches of rain.[25] The nonattainment area does not currently have a station available for monthly norms; however, the ADEQ Globe Highway monitor sits a half mile northeast of the smelter complex and is adjacent to the Gila River. The monitor is located in a river valley with the valley crest roughly 350 feet above the monitor elevation (see Figure 2-1). This river valley runs northeast to southwest. The Town of Winkelman is located within the nonattainment area and has the only available minimum and maximum temperature averages (for years 1961-1990), taken from the Winkelman 6S Station (see Figure 1-2).

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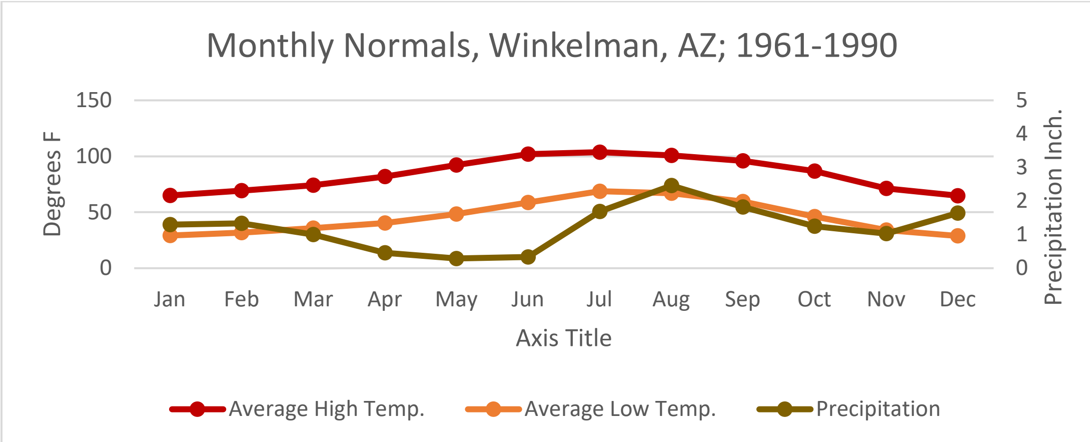
[24] *See* Weatherbase. (n.d.). *Winkleman, Arizona*. Retrieved October 11, 2022, from http://www.weatherbase.com/weather/weather-summary.php3?s=524920&cityname=Winkleman%2C+Arizona%2C+United+States+of+America&units=

[25] Western Regional Climate Center. (n.d.) *Winkleman 6S, Arizona (029420), Period of Record Monthly Climate Summary, Period of Record 1961 to 1990*. Retrieved July 26, 2023, from https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az9420

Figure 1-2 Monthly Average Temperatures and Precipitation - Globe, AZ



1.6.3 Population

The Hayden Pb NAA has been codified in 40 CFR 81.303 and is comprised of the portions of Gila County and Pinal County bound by the townships and ranges listed in Table 2-2 and represented geographically in Figure 1-1. Population estimates for the entire Hayden Pb NAA as well as the respective proportions of Gila and Pinal Counties are also presented in Table 2-2. The Hayden NAA encompasses the towns of Hayden, Winkelman and Kearny, for which population data have been included in Table 2-1.

Table 1-4 Towns in Hayden Pb NAA

Hayden Pb NAA Towns[26]	
Location	**2017 Population**
Kearny	1,787
Hayden	548
Winkelman	308

Table 1-5 Geographic Location and Population

Hayden Pb Nonattainment Area[27]			
Land Area	275 square miles		
2017 Population	4,409		
2026 Projected Population	3,679		
Gila County Portion		**Pinal County Portion**	
Land Area	58 square miles	Land Area	217 square miles
2017 Population	1,176	2017 Population	3,233
2026 Projected Population	982	2026 Projected Population	2,697

[26] ADOA 2017 population estimate. *Population Estimates for Arizona Counties, Incorporated Places & Balance of County.* Retrieved from: https://www.azcommerce.com/oeo/population/population-estimates/.
[27] ADOA provided land area estimates and population estimates and projections for ADEQ in an internal report.

1.6.4 Economy

As noted previously, the Hayden Pb NAA is located in portions of Gila County and Pinal County. Top industries in both Counties include education, healthcare and social services, retail, agriculture and mining. The copper mining industry, in particular, supports the economies of many towns located within the NAA. In 2021, around 28 percent of the civilian labor force in the Town of Hayden and 11.9 percent of the civilian labor force in the Town of Winkelman worked in occupations classified as mining, agriculture, forestry, and fishing/hunting, compared to around 8.6 percent in greater Gila County and 2.7 in greater Pinal County. (see Table 1-7).

The Hayden smelter operations, currently owned and operated by ASARCO, have a significant impact on the economies of Hayden, nearby communities in the NAA, and on Arizona's economy as a whole. Hayden operations for processing copper ores include: 27,400 ton/day concentrator, a 720,000 ton/year copper smelter, and a sulfuric acid plant. Hayden operations produce over 300 million pounds of copper annually.[28]

In 2012, ASARCO operations in Hayden contributed $140.8 million in wages, salaries and benefits to local workers. Additionally, ASARCO pays royalties on minerals mined from state leases across Arizona and leases on Indian land. In 2023, ASARCO's Hayden operations employed approximately 1,700.[29]

Table 1-6 shows employment rates in the towns of Hayden and Winkelman, as well as Gila and Pinal Counties for 2010, 2013, and 2020. The labor force declined in Hayden, Winkelman, and Gila County in 2013 and 2020 but grew in Pinal County. Unemployment rates have recently declined in Hayden, Gila County, and Pinal County. Unemployment increased from 8 percent to 23.8 percent in Winkelman.

Table 1-6 Labor Force

Civilian Labor Force for Hayden Planning Area, Arizona (# of employees)			
Employment Status	**2010***	**2013****	**2020****
Hayden			
Civilian Labor Force	359*	204	158
Unemployed	28*	44	30
Percent Unemployed	7.8%*	21.6%	19.0%
Winkelman			
Civilian Labor Force	184*	138	105
Unemployed	15*	11	25
Percent Unemployed	8.2%*	8.0%	23.8%
Gila County			
Civilian Labor Force	21,664	21,148	20,355
Unemployed	2,695	2,050	1,525
Percent Unemployed	12.4%	9.7%	7.5%

[28] *See* "ASARCO, About Us" (2015, Sept.) Retrieved: http://www.asarco.com/about-us/our-locations/hayden-operations/.
[29] *See* "ASARCO, Purpose" (2023, Feb.) Retrieved: https://www.ASARCO.com/purpose/.

Civilian Labor Force for Hayden Planning Area, Arizona (# of employees)			
Employment Status	**2010***	**2013****	**2020****
Pinal County			
Civilian Labor Force	154,038	150,007	187,999
Unemployed	16,402	12,187	13,680
Percent Unemployed	10.6%	8.1%	7.3%
*Source: U.S. Census Bureau, American Fact Finder. 2006-2010 American Community Survey, 5-Year Estimates (2010) (2015, April 29). Retrieved from http://factfinder.census.gov. ** Arizona Office of Economic Opportunity (AOEO); medium series current population.[30]			

Table 1-7 shows employment by sector for Hayden, Winkelman, Gila County, and Pinal County in 2021. Educational services, health care, and social assistance were the largest employment sectors in Gila County, Pinal County, and the town of Winkelman, while agriculture, forestry, fishing, hunting, and mining accounted for almost half of the workforce in Hayden.

[30] *See* Arizona Office of Economic Opportunity (AOEO), medium series population (https://oeo.az.gov/). Retrieved June 2023.

Table 1-7 Labor Force by Sector

Labor Force by Employment Sector 2009-2013								
Employment Sector (# of employees)	Hayden (100)		Winkelman (59)		Gila County (18,822)		Pinal County (179,360)	
Employment Sector	Estimate	% Employed	Estimate	% Employed	Estimate	% Employed	Estimate	% Employed
Agriculture, Forestry, Fishing, Hunting, & Mining	28	28	7	11.9	1,614	8.6	4,773	2.7
Construction	0	0	0	0	1,563	8.3	16,460	9.2
Manufacturing	20	20	6	10.2	694	3.7	14,833	8.3
Wholesale trade	0	0	0	0	288	1.5	1,980	1.1
Retail trade	12	12	0	0	2,075	11	24,143	8.6
Transportation, Warehousing, & Utilities	0	0	0	0	908	4.8	11,332	6.3
Information	0	0	0	0	207	1.0	3,219	1.8
Finance, Insurance, Real Estate, Rental, & Leasing	0	0	0	0	818	4.3	10,333	5.8
Professional, Scientific, Management, Administrative, & Waste Management	0	0	11	18.6	1,183	6.3	19,583	10.9
Educational Svcs, Health Care, & Social Assistance	10	10	35	59.3	4,875	25.9	36,464	20.3
Arts, Entertainment, Recreation, Accommodation, & Food Svcs	18	18	0	0	2,552	13.6	15,462	8.6
Other Svcs (except public administration)	0	0	0	0	600	3.2	7,832	4.4
Public Administration	12	12	0	0	1,463	7.8	12,946	7.2
Source: U.S. Census Bureau, American Fact Finder. (2023, February 1). Retrieved from https://data.census.gov/table?t=Employment+and+Labor+Force+Status:Industry&g=0500000US04007. 2021 American Community Survey								

1.7 General SIP Approach- Regulatory Requirements and Guidance

In November 1990, the U.S. Congress enacted a series of amendments to the CAA. One of the primary effects of the revision was to expand and clarify the planning provisions for those areas not meeting the NAAQS. The CAA, as amended, authorizes comprehensive federal and state programs to provide for attainment and maintenance of the NAAQS. Section 1.7.1 outlines CAA requirements for Pb nonattainment areas. In addition, EPA has published guidance documents to clarify environmental regulations relating to attainment of the NAAQS and to assist in developing approaches for implementing those regulations. Section 1.7.2 summarizes applicable EPA guidance.

1.7.1 Clean Air Act and Code of Federal Regulations

Plan provisions for Pb nonattainment areas are contained in CAA Title I, Part A and Title I Part D, Subparts 1 and 5. A summary of requirements applicable to this SIP revision is provided in Table 1-8 below.

Table 1-8 Clean Air Act Regulatory Requirements for Pb NAA SIPs

CAA Citation	Action to Meet Requirement	Location in SIP
CAA Title I – Air Pollution Prevention and Control; Part A – Air Quality and Emissions Limitations; Section 110 – Implementation Plans		
110(a)(1) and (2)	Clean Air Act (CAA) Section 110(a)(1) requires states to submit State Implementation Plans (SIPs) within three years following the promulgation of new or revised National Ambient Air Quality Standard (NAAQS) to provide for implementation, maintenance, and enforcement of such standards. Each of these SIPs must address certain basic elements, or the "infrastructure", of its air quality management programs under CAA Section 110(a)(2). These elements, detailed in CAA Sections 110(a)(2)(A) through (M), include provisions for monitoring, emissions inventories, and modeling designed to assure attainment and maintenance of the NAAQS. The *Arizona State Implementation Plan Revision under Clean Air Act Section 110(a)(1) and (2): Implementation of the 2008 Lead National Ambient Air Quality Standard* was submitted to EPA on October 14, 2011.	**Section 1.5**
110(l)	"Each revision to an implementation plan submitted by a State under this Act shall be adopted by such State after reasonable notice and public hearing. The Administrator shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (as defined in section 171), or any other applicable requirement of this Act." This SIP includes a discussion of anti-backsliding provisions to ensure noninterference with applicable requirements of the CAA.	**Chapter 6**

CAA Citation	Action to Meet Requirement	Location in SIP
CAA Title I – Air Pollution Prevention and Control; Part D – Plan Requirements for Nonattainment Areas; Subpart 1 – Nonattainment Areas in General; Section 172. Nonattainment Plan Provisions in General; Subsection 172(c) Nonattainment Plan Provisions		
172(c)(1) – In General	"Such plan provisions shall provide for the implementation of all reasonably available control measures [RACM] as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology [RACT]) and shall provide for attainment of the national primary ambient air quality standards." RACT is defined for Pb as that technology which is necessary to achieve the NAAQS (40 CFR 51.100(o)). Chapter 4 contains an explanation of applicable RACM/RACT for point and area sources in the nonattainment area.	**Chapter 4**
172(c)(2) – RFP (Reasonable Further Progress)	"Such plan provisions shall require reasonable further progress" defined in CAA Sec. 171(1) as "… annual incremental reductions in emissions … for the purpose of ensuring attainment of the applicable national ambient air quality standards by the applicable date." This submittal demonstrates, in accordance with 73 FR 66964 (November 12, 2008), that the Hayden NAA will attain and maintain the Pb NAAQS with implemented control measures that adhere to an ambitious compliance schedule, which is expected to periodically yield significant emissions reductions. As such, the RFP requirement is met.	**Chapter 4**
172(c)(3) – Inventory [Emissions]	"Such plan provisions shall include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants in such area, including such periodic revisions as the Administrator may determine necessary to assure that the requirements of this part are met." ADEQ developed a 2017 base year inventory from the 2017 National Emissions Inventory (NEI) and ADEQ Internal Point Source Database. A 2026 attainment year inventory, projected from the base year, includes emissions reductions from implementation of existing and new control measures. Base year and projected emissions are summarized in Chapter 3.	**Chapter 3**

CAA Citation	Action to Meet Requirement	Location in SIP
172(c)(4) – Identification and Quantification	"Such plan provisions shall expressly identify and quantify the emissions, if any, of any such pollutant or pollutants which will be allowed, in accordance with Section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in each such area. The plan shall demonstrate to the satisfaction of the Administrator that the emissions quantified for this purpose will be consistent with the achievement of reasonable further progress and will not interfere with attainment of the applicable national ambient air quality standard by the applicable attainment date." The permit program requirements of CAA section 173(a)(1)(B) are applicable to sources located in a "targeted economic development zone" as determined by the Administrator under consultation with the Secretary of Housing and Urban Development. No such zones are currently known to exist within the Hayden Pb NAA.	**No additional location in SIP.**
172(c)(5) – Permits for New and Modified Major Stationary Sources	"Such plan provisions shall require permits for the construction and operation of new or modified major stationary sources anywhere in the nonattainment area, in accordance with section 173." Nonattainment new source review (NNSR) programs should ensure that construction and modification of major stationary sources will not interfere with RFP or attainment of the 2008 Pb NAAQS. The NNSR requirements apply to sources that have the potential to emit in amounts greater than the applicable major source threshold for a particular pollutant (40 CFR 51.165(a)(1)(iv)). For new sources located in areas that are designated nonattainment for the 2008 Pb NAAQS, 100 tons per year (tpy) or more of Pb represents a major source. Similarly, Pb NNSR requirements also apply to any existing major stationary source of Pb that proposes a major modification, i.e., a physical change or change in the method of operation that results in a significant net emissions increase (0.6 tpy or more) of Pb (40 CFR 51.165 (a)(1)(x)(A)). All new sources and modifications to existing sources in Arizona are subject to state requirements for preconstruction review and permitting pursuant to Arizona Administrative Code (A.A.C.) Title 18, Chapter 2, Articles 2, 3, and 4 or relevant county rules. All new major sources and major modifications to existing major sources in Arizona are also subject to the nonattainment new source review (NNSR) provisions of these rules or prevention of significant deterioration for attainment areas. On November 2, 2015 the EPA Region 9 Administrator published a notice of final rulemaking issuing limited approval/limited disapproval (LA/LD) of an October 29, 2012 Arizona SIP revision designed to	**No additional location in SIP.**

CAA Citation	Action to Meet Requirement	Location in SIP
	update the new source review (NSR) rules included in the SIP and to bring the state's NSR program into compliance with federal requirements. On April 28, 2017 ADEQ submitted a SIP revision with rule amendments intended to address deficiencies related to major NSR with the exception of requirements pertaining to greenhouse gases (GHGs). ADEQ is currently administering the NSR requirements for GHGs under a delegation agreement with EPA. On May 4, 2018 EPA took final action to approve Arizona's major NSR regulatory revisions. The action included a conditional approval of ADEQ's NSR program with respect to CAA requirements related to ammonia as a precursor to fine particulate matter ($PM_{2.5}$) under the NNSR program requirements in CAA section 189(e).[31] On January 14, 2020 ADEQ submitted a SIP revision addressing the regulation of ammonia as a precursor of $PM_{2.5}$ in the major NSR program, as well as additional issues related to NSR. On July 22, 2020 ADEQ submitted a SIP revision to address the outstanding deficiencies in ADEQ's program relating to minor NSR. EPA approved these revisions in a June 2021 rulemaking.[32] At this time, ADEQ's NNSR program is fully approved with respect to Pb.	
172(c)(6) – Other Measures	"Such plan provisions shall include enforceable emissions limitations, and such other control measures, means or techniques …, as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date specified in this part." Emissions limitations, control measures, and applicable compliance schedules for Pb sources in the nonattainment area may be found in Chapter 4.	**Chapter 4**
172(c)(7) – Compliance with Section 110(a)(2)	"Such plan provisions shall also meet the applicable provisions of Section 110(a)(2)." As noted above, the *Arizona State Implementation Plan Revision under Clean Air Act Section 110(a)(1) and (2): Implementation of the 2008 Lead National Ambient Air Quality Standard* was submitted to EPA on October 14, 2011.	**Section 1.5**

[31] *See* 83 FR 19631 (May 4, 2018) and 40 CFR 52.144(C).

[32] *See* 86 FR 31927 (June 16, 2021).

CAA Citation	Action to Meet Requirement	Location in SIP
172(c)(8) – Equivalent Techniques	"Upon application by any State, the Administrator may allow the use of equivalent modeling, emission inventory, and planning procedures, unless the Administrator determines that the proposed techniques are, in the aggregate, less effective than the methods specified by the Administrator." ADEQ's intended modeling (Modeling Protocol) and emissions inventory (Inventory Preparation Plan) methodologies were submitted to and reviewed by EPA. Dispersion modeling to establish emissions limits for the ASARCO copper smelter was conducted using AERMOD and LEADPOST with EPA's concurrence and in accordance with the "Guideline on Air Quality Models."	**Chapters 3 & 5; Appendices A & B**
172(c)(9) – Contingency Measures	"Such plan shall provide for the implementation of specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date applicable under this part. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator." Consistent with 73 FR 67040 (Nov. 12, 2008), this submittal includes emissions limits, compliance schedules, and permit program and enforcement information that demonstrate the area will attain and maintain the Pb NAAQS with control measures fully implemented. It also contains a contingency measure to be implemented if the area fails to achieve RFP or fails to attain the NAAQS by the attainment year of 2027. As such, the contingency measure requirement is met.	**Chapter 4**
CAA Title I – Air Pollution Prevention and Control; Part D – Plan Requirements for Nonattainment Areas; Subpart 1 – Nonattainment Areas in General; Section 176. Limitations on Certain Federal Assistance		
176(c) – Transportation Conformity	Transportation conformity is required to ensure that federal funding and approval are given to highway and transit projects that are consistent with ("conform to") the air quality goals established by a state air quality implementation plan (SIP). Conformity, to the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards. 40 CFR 93.102(b) waives transportation conformity for Pb nonattainment and maintenance areas.	**No additional location in SIP.**

CAA Citation	Action to Meet Requirement	Location in SIP
176(c) – General Conformity	Similar to Transportation Conformity, which applies to highways and mass transit projects, the General Conformity Rule, which applies to all other federal actions, ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality. General conformity for the Hayden Pb nonattainment area, located within both Gila and Pinal Counties, must be addressed to assure Pb emissions from any federal actions or plans do not exceed the rates outlined in 40 CFR 93.153(b) (see 58 FR 63253, November 30, 1993). Criteria for making determinations and provisions for general conformity are located in A.A.C. R18-2-1438. ADEQ commits to review and comment, as appropriate, on any federal agency draft general conformity determination it receives pursuant to 40 CFR 93.155 for activities scheduled in this air quality planning area. There are currently no known federal plans or actions affecting air quality currently in the Hayden area.	**No additional location in SIP.**
CAA Title I – Air Pollution Prevention and Control; Part D – Plan Requirements for Nonattainment Areas; Subpart 5 – Additional Provisions for Areas Designated Nonattainment for Sulfur Oxides, Nitrogen Dioxide, or Lead; Section 191. Plan Submission Deadlines and Section 192. Attainment Dates		
191(a) – Submission	"Any State containing an area designated or re-designated under section 107(d) as nonattainment with respect to the national primary ambient air quality standards for sulfur oxides, nitrogen dioxide, or Pb subsequent to the date of the enactment of the Clean Air Act Amendments of 1990 shall submit to the Administrator, within 18 months of the designation, an applicable implementation plan meeting the requirements of this part." Designation of the Hayden area as nonattainment was effective October 3, 2014 (79 FR 52205, September 3, 2014). The nonattainment area plan was due to EPA by April 2016. ADEQ submitted SIP Revision: Hayden Lead Nonattainment Area, March 2, 2017 Final on March 3, 2017. EPA published a finding of failure to attain the 2008 Pb standards on January 31, 2022 (87 FR 4805). As a result of the determination, the State of Arizona is required to submit a revision to the Arizona SIP by January 31, 2023, to provide for expeditious attainment of the Pb NAAQS in the Hayden Pb NAA by January 31, 2027. See this submittal.	**Section 1.5**

CAA Citation	Action to Meet Requirement	Location in SIP
192(a) – Plans Under Section 191(a)	"Implementation plans required under section 191(a) shall provide for attainment of the relevant primary standard as expeditiously as practicable, but no later than 5 years from the date of the nonattainment designation." Designation of the Hayden area was effective October 3, 2014 (79 FR 52205; September 3, 2014). On March 3, 2017, ADEQ submitted SIP Revision: Hayden Lead Nonattainment Area, March 2, 2017 Final to demonstrate attainment of the 2008 Lead NAAQS in the Hayden planning area by the statutory attainment date of October 3, 2019. EPA published a finding of failure to attain the 2008 Pb standards on January 31, 2022 (87 FR 4805). As a result of the determination, the State of Arizona is required to submit a revision to the Arizona SIP by January 31, 2023, to provide for expeditious attainment of the Pb NAAQS in the Hayden NAA by January 31, 2027. See this submittal.	**Section 1.5**

1.7.2 EPA Guidance

Applicable guidance for demonstrating attainment of the 2008 Pb NAAQS includes the following EPA memoranda:

- The July 8, 2011, Memorandum*, 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers*,[33] and the July 11, 2011, *Addendum to the 2008 Lead NAAQS Implementation*, Scott L. Mathias, Interim Director, U.S. Environmental Protection Agency, Air Quality Policy Division, offers guidance on attainment demonstrations, modeling, reasonable further progress (RFP) and contingency measures for developing SIP revisions for the 2008 Lead NAAQS. The addendum provides guidance on producing emissions inventories for the 2008 NAAQs specifically.[34]
- The March 2012 Memorandum, *Implementation of the 2008 Lead National Ambient Air Quality Standards, Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, provides guidance on developing RACM for sources in Pb nonattainment areas, including reasonably available control technologies (RACT) for major point sources. It also provides some guidance on RACM for re-entrained Pb found in fugitive dust.[35]
- The September 1992 Memorandum, *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures*, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, provides guidance for developing RACM and best available control measures for fugitive dust from point sources.[36]
- The November 2011 Memorandum, *Guidelines for Preparing Letters Submitting State Implementation Plans (SIPs) to EPA and for Preparing Public Notices for SIPs*, from Janet McCabe and Becky Weber to Air Division Directors, Regions 1-10, U.S. EPA, provides guidelines for SIP revision submittal[37].

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[33] *See* U.S. EPA. (2011, July 8). *2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Guidance Documents*. Retrieved from US EPA, Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Guidance Documents, https://www.epa.gov/lead-air-pollution/lead-pb-national-ambient-air-quality-standards-naaqs-implementation-guidance, July 10, 2023.

[34] *See* U.S. EPA. (2012, August 10). *Addendum to the 2008 Lead NAAQS Implementation Questions and Answers Signed on July 11, 2011*. Retrieved from US EPA, Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Guidance Documents, https://www.epa.gov/lead-air-pollution/lead-pb-national-ambient-air-quality-standards-naaqs-implementation-guidance, July 11, 2023.

[35] *See* U.S. EPA. (2012, March). *Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions.* Retrieved from Retrieved from US EPA, Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Guidance Documents, https://www.epa.gov/lead-air-pollution/lead-pb-national-ambient-air-quality-standards-naaqs-implementation-guidance, July 11, 2023.

[36] *See* U.S. EPA. (1992, September). *Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures.* Retrieved from National Service Center for Environmental Publications (NSCEP), https://tinyurl.com/27kchzk4. July 11, 2023.

[37] *See* U.S. EPA. (2011, November 22). *Guidelines for Preparing Letters Submitting State Implementation Plans (SIPs) to EPA and for Preparing Public Notices for SIPs.* Retrieved from US EPA Guidance on Streamlining the SIP Process, https://www.epa.gov/air-quality-implementation-plans/guidance-streamlining-sip-process, July 11, 2023.

2 AIR QUALITY MONITORING

This chapter provides historical ambient air monitoring network information in order to provide context for the nonattainment area network, NAAQS exceedances, and air monitor placement in the Hayden planning area.

Ambient monitoring networks for air quality are established to sample pollutants in a variety of representative settings, to assess health and welfare impacts, and to assist in determining air pollution sources. These networks contain individual monitoring sites that are operated by a number of government agencies and regulated facilities.

The EPA protocols for Pb monitoring are located in the following sections of the Code of Federal Regulations (CFR):

- 40 CFR Part 50, Appendix G, Reference Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air
- 40 CFR Part 50, Appendix Q, Reference Method for the Determination of Lead in Particulate Matter as PM_{10} Collected from Ambient Air
- 40 CFR Part 53 Subpart C, Ambient Air Monitoring Reference and Equivalent Methods
- 40 CFR Part 58 and Appendices A, C, D, and E, Ambient Air Quality Surveillance

In order for data to be used for determining NAAQS compliance (i.e. for boundary designations), it must meet the above requirements. Specifically, data must be measured using instruments designated by EPA as Federal Reference Methods (FRM) or Federal Equivalent Methods (FEM); it must be reported to the Air Quality System (AQS)[38] and must follow an EPA approved quality assurance plan.

2.1 Hayden Pb and Meteorological Monitoring Network

Air monitoring is generally performed by state, local, and tribal agencies at federally required locations or other locations with suspected high pollutant concentrations. EPA and state, local, and tribal agencies may also monitor in areas where the public has complaints or concerns. Agencies planning to use air pollutant measurements for regulatory purposes operate with EPA reference or equivalent methods and develop and follow approved quality assurance procedures.[39] In October 2010, ADEQ established an air quality monitor at the Globe Highway monitoring site within the Hayden NAA. ADEQ installed an additional air quality monitor at the Hillcrest monitoring site in January 2016. These two monitors are currently the only State and Local Air Monitor System (SLAMS) monitors in the NAA with AQS-certified data that can be used to determine NAAQS compliance.

ADEQ operates meteorological equipment at selected sites throughout its network. Some sites were originally established because other meteorology networks (NWS, AZMet, etc.) were not located near ADEQ's ambient air quality monitoring sites. As recommended in ADEQ's Five-Year Network Assessment, ADEQ has begun to expand the meteorology monitoring network and standardize the meteorological

[38] EPA's repository of air quality data.

[39] *See* U.S. EPA, Managing Air Quality, Ambient Air Monitoring. Retrieved November 7, 2023 from https://www.epa.gov/air-quality-management-process/managing-air-quality-ambient-air-monitoring

measurements so that all sites collect measurements of wind speed, wind direction, temperature, and relative humidity. ADEQ only reports meteorology data to AQS as required by 40 CFR 58.16.

Three meteorological monitors are found within the area of study; two are maintained by ADEQ and the other by ASARCO. The two MET monitors maintained by ADEQ are located at the Hayden Old Jail and Globe Highway monitoring sites. The Hayden Old Jail monitor is located approximately 0.66 miles west of the ASARCO concentrator and smelter complexes, and the Globe Highway monitor is located approximately 0.59 miles to the east of the ASARCO Smelter. The ASARCO monitor is located at the Camera Hill site, about 0.22 miles south of the smelter.

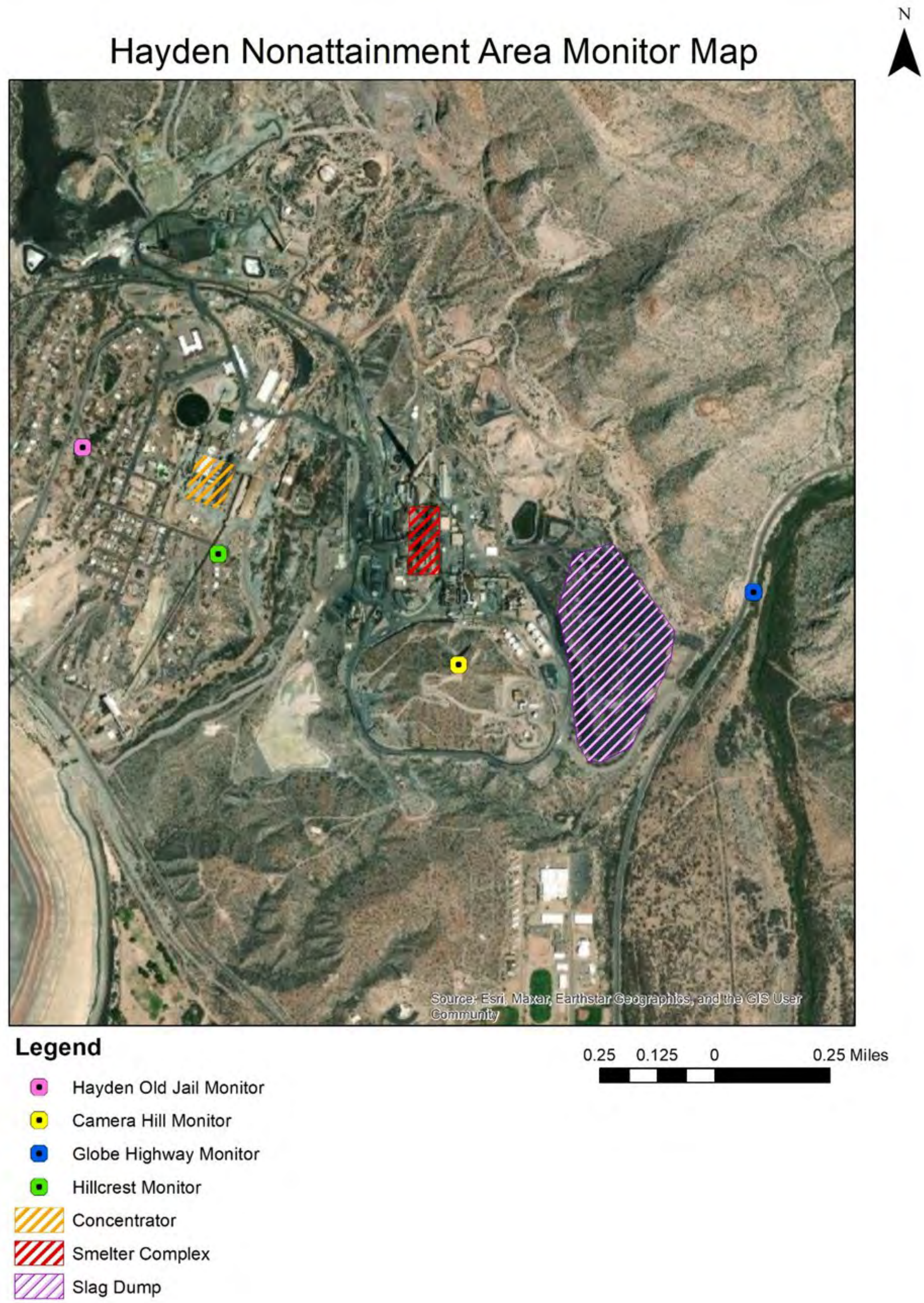
Table 2-1 summarizes the locations of the MET and Pb monitoring stations used in ADEQ's meteorology and ambient air analysis.

Table 2-1 Hayden MET and Ambient Pb Monitoring Stations

Hayden Monitoring Stations				
Site Name	**Distance to Smelter (miles)**	**Latitude**	**Longitude**	**Elevation (feet)**
ADEQ MET Monitors				
Globe Highway	0.59	33.00251	-110.76545	1,962
Hayden Old Jail	0.66	33.00621	-110.78645	2,043
ASARCO MET Monitors				
Camera Hill	0.22	33.00046	-110.775	2,292
ADEQ Pb Monitors				
Globe Highway	0.59	33.00251	-110.76545	1,962
Hillcrest	0.39	33.00363	-110.78232	2,111

Figure 2-1 below shows a map of the ambient Pb and meteorological monitoring networks.

Figure 2-1 Hayden Nonattainment Area Monitor Map



2.1.1 Monitoring Equipment and Quality Assurance Procedures

ADEQ's two TSP-Pb monitors (one operating as the primary monitor, the other as a quality assurance, collocated monitor) at Globe Highway are required per 40 CFR part 58 Appendices A and D. Based on a recommendation by EPA, ADEQ installed an additional air quality monitor at the Hillcrest monitoring site in January 2016. ADEQ's current data quality assurance program plan (QAPP) was approved by EPA Region 9 in January 2018. ADEQ sustains a quality assurance system as required by EPA to ensure high quality data is collected. The EPA primarily specifies the quality assurance (QA) requirements for operating air monitors in 40 CFR Part 58 Appendix A, *The Quality Assurance Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality*, and other supporting guidance documents.

ADEQ develops quality assurance plans for air monitoring networks, which provide detailed information regarding the specifics of each air monitoring network and how data will be managed. Components of ADEQ's quality system include, but are not limited to: ADEQ being established as the primary quality assurance organization (PQAO) for the criteria and non-criteria pollutant air monitoring data collected and reported to EPA's Air Quality System (AQS); an agency-level Quality Management Plan (QMP), which is an "umbrella" document that defines, in broad terms, the strategies used to carry out quality assurance and quality control (QA/QC) in environmental data collection activities; and Division-level QAPPs for each major, ongoing air monitoring network.[40]

2.2 Ambient Lead Data Trends

A violation of the 2008 Pb primary NAAQS occurs when the three-month rolling average ambient Pb concentration exceeds 0.15 $\mu g/m^3$, evaluated over a three-year period. Recent trends show ADEQ's Globe Highway monitor recorded three exceedances of the 2008 Pb NAAQS in 2017, one in 2018, three in 2019, and no exceedances in 2020, 2021, and 2022. Table 2-2 shows the rolling 3-month average Pb concentrations at the Globe Highway monitor from 2011 through 2022.[41]

[40] ADEQ, State of Arizona Air Monitoring Network Plan for the Year 2022, June 2022.

[41] Existing air quality data is summarized pursuant to 40 CFR 51.115.

Table 2-2 Ambient Pb Concentrations - Globe Highway Monitor

ADEQ Globe Highway Monitor Rolling 3-month Average Pb concentration (µg/m^3)[42]												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2011	--	--	0.11	0.18	0.21	0.27	0.23	0.14	0.07	0.08	0.08	0.09
2012	0.07	0.14	0.15	0.20	0.16	0.20	0.15	0.14	0.12	0.11	0.09	0.06
2013	0.04	0.05	0.10	0.11	0.11	0.12	0.11	0.11	0.06	0.06	0.04	0.03
2014	0.02	0.04	0.07	0.11	0.15	0.17	0.16	0.12	0.09	0.07	0.05	0.07
2015	0.06	0.08	0.07	0.08	0.07	0.11	0.11	0.12	0.07	0.07	0.06	0.06
2016	0.06	0.04	0.07	0.08	0.14	0.12	0.12	0.08	0.08	0.06	0.04	0.03
2017	0.04	0.06	0.09	0.12	0.17	0.21	0.17	0.11	0.09	0.10	0.11	0.09
2018	0.09	0.09	0.13	0.14	0.153	0.14	0.14	0.13	0.10	0.08	0.04	0.02
2019	0.03	0.03	0.05	0.06	0.10	0.12	0.16	0.16	0.16	0.10	0.06	0.01
2020	0.00*	0.00*	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00*
2022	0.00*	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00

*Indicates invalid 3-month Rolling Average due to data completeness issues.

Table 2-3 below shows the rolling three-month average Pb concentration from the Hillcrest monitor, which began operating January 2016. The addition of this monitor substantially increases the representativeness of Pb monitoring data available to ADEQ for regulatory purposes. ADEQ's Hillcrest monitor recorded two exceedances of the 2008 Pb primary NAAQS in 2016, six in 2017, three in 2018, and no exceedances in 2019, 2020, 2021, 2022.

Table 2-3 Ambient Pb Concentrations - Hillcrest Monitor

ADEQ Hillcrest Monitor Rolling 3-month Average Pb concentration (µg/m^3)[43]												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2016	N/A	N/A	0.22	0.16	0.07	0.09	0.10	0.08	0.09	0.12	0.14	0.14
2017	0.11	0.19	0.20	0.19	0.09	0.07	0.07	0.11	0.13	0.28	0.26	0.28
2018	0.20	0.23	0.21	0.12	0.07	0.06	0.09	0.10	0.10	0.12	0.12	0.13
2019	0.09*	0.09*	0.09*	0.09	0.09	0.07	0.07	0.07	0.09	0.10	0.08	0.04
2020	0.010	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
2021	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2022	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01

*Indicates invalid 3-month Rolling Average due to data completeness issues.

Please note, 2017 was the last year of normal operations at the ASARCO Hayden Smelter (largest Pb source in the NA). During the years of 2018-2021 there were several shutdowns at the Smelter, resulting in decreased or complete shutdown of production.

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[42] Highlighted values indicate a violation of the Pb NAAQS (over 0.15 µg/m^3).

[43] Highlighted values indicate a violation of the Pb NAAQS (over 0.15 µg/m^3). Months January and February for the Hillcrest monitor are "N/A" due to the fact that a complete rolling three-month average for 2016 is not available until March, as the monitor was not installed and operating until January 2016.

Figure 2-3 is a chart of three-month rolling averages monitored at the ADEQ Globe Highway monitor from 2011, when data collection began, through the end of 2022. Figure 2-4 illustrates values for the Hillcrest monitoring site.

Figure 2-2 Globe Highway Monitor Rolling 3-Month Average Concentrations

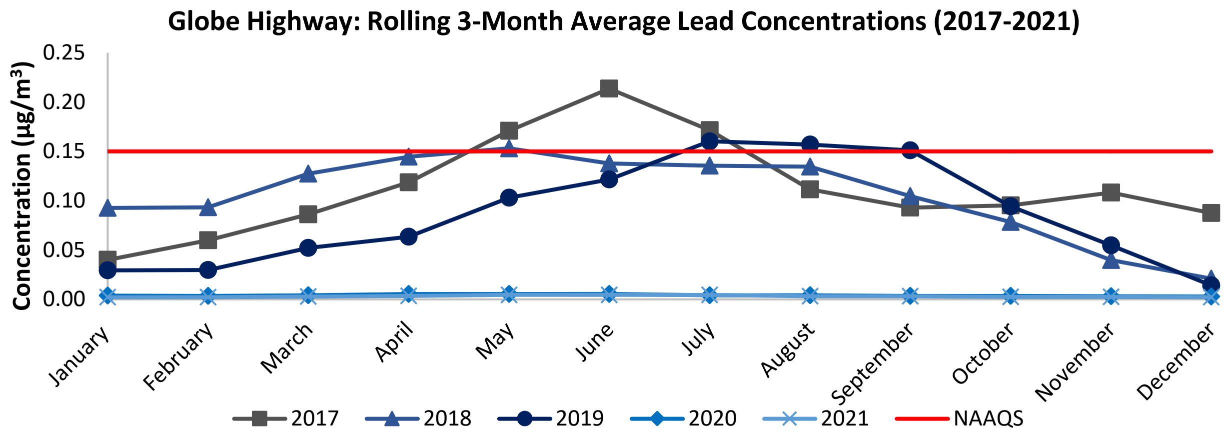
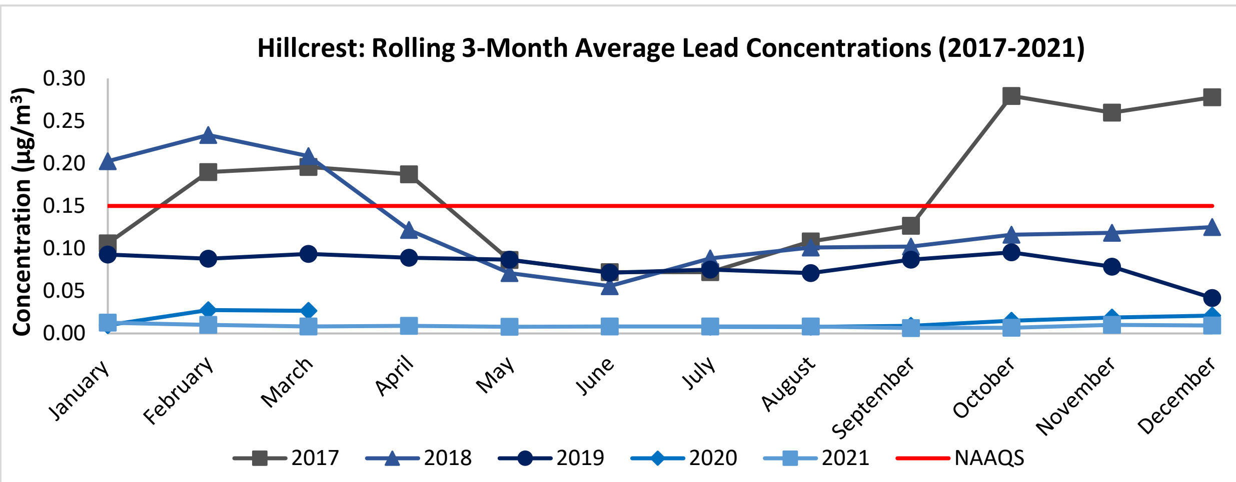


Figure 2-3 Hillcrest Monitor Rolling 3-Month Average Concentrations



NAAQS exceedances at all monitors were analyzed in conjunction with meteorological data in order to evaluate potential emissions sources and weather conditions that resulted in high ambient air concentrations of Pb. An in-depth meteorological analysis can be found in the Emissions Inventory TSD in Appendix A. Emissions sources are discussed in greater detail in Chapter 3.

2.3 Current Lead NAAQS Compliance

Tables 2-4 and 2-5 summarize the maximum three-month rolling average Pb concentrations (and design values) for the periods 2019-2021 and 2020-2022.[44]

Table 2-4 2019-2021 Pb NAAQS Compliance Summary

2019 through 2021 Pb-TSP Compliance **Bold** denotes value above the standard. *(NAAQS 3-Month Rolling Average 0.15 µg/m³)*				
Site Name	**3-month Maximum Value (µg/m3)**			**Valid 2019-2021 Design Value (µg/m3)**
	2019	**2020**	**2021**	
Gila County				
Globe Highway	**0.16**	0.01	0.00	**0.16**
Hillcrest	0.10	0.03	0.01	–
Number of Sites in Violation of the NAAQS				**1**

Source: *Lead Design Values, 2021 (xlsx)*, EPA, May 25, 2022 (https://www.epa.gov/air-trends/air-quality-design-values).

Table 2-5 2020-2022 Pb NAAQS Compliance Summary

2020 through 2022 Pb-TSP Compliance **Bold** denotes value above the standard. *(NAAQS 3-Month Rolling Average 0.15 µg/m³)*				
Site Name	**3-month Maximum Value (µg/m3)**			**Valid 2020-2022 Design Value (µg/m3)**
	2020	**2021**	**2022**	
Gila County				
Globe Highway	0.01	0.00	0.01	–
Hillcrest	0.03	0.01	0.01	0.03
Number of Sites in Violation of the NAAQS				**0**

[44] *See* 40 CFR Appendix R to Part 50 available at https://www.govinfo.gov/app/details/CFR-2016-title40-vol2/CFR-2016-title40-vol2-part50-appR.

3 EMISSIONS INVENTORIES

Section 172(c)(3) of the CAA requires that nonattainment area plans include an emissions inventory from all significant sources within a planning area:

> "Such plan provisions shall include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants in such area, including such periodic revisions as the Administrator may determine necessary to assure that the requirements of this part are met."

An emissions inventory helps identify the significant sources and source categories across the NAA. These inventories are intended to identify significant sources of emissions to help inform the development of pollution control measures that will bring the area into attainment.

As noted in Section 1.5, designation of the Hayden area as nonattainment for the Pb NAAQS in 2014 triggered CAA requirements under Title I, Section 110 and Part D for the State to submit a SIP revision to demonstrate how the area will attain the 2008 Pb NAAQS. The CAA provides that nonattainment areas must attain the Pb NAAQS as expeditiously as practicable, but no later than five years after the effective date of designation. On March 3, 2017, ADEQ submitted *SIP Revision:* Hayden *Lead Nonattainment Area, March 2, 2017 Final* to demonstrate attainment of the 2008 Lead NAAQS in the Hayden planning area by the statutory attainment date of October 3, 2019. The 2017 nonattainment area plan included a 2012 base year inventory and projected emissions to 2019 that incorporated emissions reduction measures (adopted in the 2017 plan) intended to provide for attainment by the required attainment date.

On January 31, 2022, EPA published a finding of failure to attain the 2008 Pb standards by the October 3, 2019 deadline.[45] This action established a new attainment date and requires the submittal of a new SIP revision meeting the requirements of CAA Title I, Part D, Subparts 1 and 5. The new plan must include any new measures determined necessary to demonstrate attainment of the Pb NAAQS by January 31, 2027.

For this new 2023 SIP revision, ADEQ inventoried Pb emissions for the base year of 2017. ADEQ chose 2017 as the base year from which to inventory emissions in accordance with EPA guidance.[46] The following reasons further support the selection of 2017 to develop a base year inventory:

- 2017 had the highest monitored ambient concentrations in recent years.
- 2017 was the last year of normal operations at the ASARCO Hayden Smelter.
- 2017 also had the highest reported emissions from ASARCO in recent years.

A projected 2026 attainment inventory includes additional emissions reduction measures (see Chapter 4 for a description of proposed new measures) necessary to provide for attainment by the new January 2027 attainment date.

The following Sections provide a broad overview of inventory methodologies and Pb emissions in the Hayden NAA for the years 2017 and 2026. For more information, see the Emissions Inventory Technical Support Document (EI TSD) in Appendix A.

[45] *See* 87 FR 4805 (January 31, 2022).

[46] *See* U.S. EPA, Air Quality Policy Division, Memorandum, "2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers," July 8, 2011.

3.1 Point Sources

In accordance with the 2008 Pb NAAQS implementation rule,[47] ADEQ developed an emissions inventory for all point sources in the NAA with a potential to emit 0.5 tons per year (tpy) or more of Pb. ADEQ found that the only point source in the NAA is the primary copper smelter owned and operated by ASARCO. The Hayden smelter emissions are the most significant in the nonattainment area, making up roughly 96.3% of total emissions in the inventory. ADEQ's inventory partitions emissions from this facility into three categories: smelter stack and smelting process-related fugitives,[48] non-smelting process related fugitives, and roads.

3.1.1 Stack & Smelting Process-Related Fugitives

Base year emissions for stack and smelting process-related fugitive emissions were provided to ADEQ by ASARCO in a 2017 emissions report retrieved from the State and Local Emissions Inventory System (SLEIS).

ADEQ projected stack and smelter process-related fugitive emissions for 2026 based on ASARCO's maximum allowable Pb emissions, that is, their proposed permitted (and federally enforceable) Potential to Emit (PTE). It is important to note that the PTE limits used in the 2026 emissions inventory and modeling reflects the controls implemented as part of the Converter Retrofit Project (CRP) and Consent Decree, as well as new emissions reduction measures adopted in this SIP revision.

In 2017 the highest contributors of Pb emissions are the main stack emissions coming from the flash furnace and converter, followed by fugitive emissions escaping from the converters. In 2026, the highest contributors will be the main stack and flash furnace fugitives. The anode furnaces in comparison remain a minor contributor in both years. Table 3-1 below displays emissions for these sources for 2017 and 2026.

[47] *See* 73 FR 66964 (November 12, 2008).

[48] Fugitive Pb emissions that originate from the flash furnace, converters, and anode furnaces are considered "smelting process-related" fugitive emissions, whereas emissions from dust-related sources outside the smelter (like roads or materials handling) are referred to as "non-smelting process related" fugitive emissions. Calculations and further methods are discussed in detail in the EI TSD in Appendix A.

Table 3-1 Projected Smelter Stack & Fugitive Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory (in tons)			
Smelter Stack & Fugitive Emissions			
Source	Description	2017 Emissions	2026 Facility Potential to Emit
Main Stack Emissions			
Dryer with Flash Furnace & Converter	Emission Point: Annulus Main Stack-R&R	1.1509	2.99
Acid Plant	Emission Point: Acid Plant Inner Main Stack	0.0223	
Anode Furnace Baghouse	Emission Point: Anode Baghouse Stack	0.0923	
Fugitive and Other Process Emissions			
Flash Smelting	Emission Point: Flash Furnace Fugitives	0.8135	0.2095
Converter	Emission Point: Converter Fugitives	1.8471	0.0856
Anode Refining Furnace: Fugitive Emissions	Emission Point: Furnace Fugitives	0.0554	0
Brick Crusher Baghouse	Emission Point: Brick Crusher Baghouse	0	0.0923
Small Boilers & Heaters	Emission Point: Miscellaneous Small Boilers & Heaters	0	0.0005
	Smelter Stack & Fugitive Emissions Total	3.9815	3.3779

3.1.2 Roads

Due to the interaction between high temperature atmospheric lead emissions and coarse mode particles, ADEQ quantified leaded road dust emissions from the ASARCO concentrator and smelter complexes. This portion of the inventory was divided into unpaved and paved roads for both the concentrator and smelter. To quantify emissions from these scenarios, ADEQ used a percent Pb factor applied to particulate matter (PM) totals of 0.3150 percent for road dust. This factor was submitted by the source and was applied to PM totals in ASARCO's 2017 SLEIS submission. Tables 3-2 through 3-5 present 2017 base year and projected 2026 emissions for these sources.

Table 3-2 Smelter Road Dust Emissions

Point Source Inventory		
Smelter Paved Road Dust Emissions (in tons)		
Source	Description	2017 Pb Emissions
Concentrate, anode, blister receipts & shipments	Emissions from hauling of concentrate, oxygen, anodes, & blister copper	0.0002
General Plant Traffic	Emissions from the flow of general plant traffic	0.0052
Water truck	Emissions from maintenance of roads by water truck	0.0084
Street Sweeper	Emissions from maintenance of roads by street sweeper	0.0026

Point Source Inventory		
Smelter Paved Road Dust Emissions (in tons)		
Plant Service Haul Truck	Emissions from hauling material by plant service haul trucks	0.0050
Scrap handling forklifts	Emissions from traffic of forklifts	0.0108
Miscellaneous use forklifts	Emissions from traffic of forklifts	0.0015
Misc. Delivery Trucks	Emissions delivering various items to tanks or heavy items to point of use.	0.0003
Sulfuric acid trucks	Emissions from hauling of sulfuric acid	0.0024
Storage pile front-end loaders	Emissions from traveling of front-end loaders	0.0100
Misc. use front-end loaders	Emissions from traveling of front-end loaders	0.0083
	Smelter Paved Roads Emissions Total	0.0546
Smelter Unpaved Road Dust Emissions (in tons)		
Source	**Description**	**2017 Pb Emissions**
Flux Trucks	Emissions from hauling flux from the crusher to the stockpiles	0.0037
Slag Trucks	Emissions from hauling slag from the slag dump to mill for recycling	0.0053
Slag Trucks	Emissions from hauling slag from the furnace to the slag dump	0.0047
	Smelter Unpaved Roads Emissions Total	0.0136

Table 3-3 Concentrator Road Dust Emissions

Point Source Inventory Cont.		
Concentrator Paved Road Dust Emissions (in tons)		
Source	**Description**	**2017 Pb Emissions**
General Plant Traffic (Includes 18 Wheelers)	Emissions from travel to concentrator storage area	0.0002
	Concentrator Paved Roads Emissions Total	0.0002
Concentrator Unpaved Road Dust Emissions (in tons)		
Source	**Description**	**2017 Pb Emissions**
General Plant Traffic (Includes 18 Wheelers)	Emissions from travel to concentrator storage area	0.0146
	Concentrator Unpaved Roads Emissions Total	0.0146

Table 3-4 Road Dust Summary

Point Source Inventory	
Road Dust Emissions Summary (in tons)	
Source	**2017 Pb Emissions**
Paved Roads	0.0548
Unpaved Roads	0.0282
Road Emissions Total	0.0830

Table 3-5 Projected Facility Road Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Facility Road Emissions (in tons)		
Source	2017 Emissions	2026 Facility Potential to Emit
Paved Roads	0.0548	0.1147
Unpaved Roads	0.0282	0.0956
Facility Road Emissions Total	0.0830	0.2103

3.1.3 Non-smelting Process-Related Fugitives

Non-smelting process related fugitive emissions at ASARCO's Hayden smelter result from processes that are separate from the building where copper is smelted. These sources include slag pouring, reverts crushing and handling, concentrate handling, and dewatering of the Venturi scrubber slurry. ADEQ used the following methods to derive emissions for years 2017 and 2021:

Slag pouring - Base year Pb emissions due to slag pouring were provided by the facility in their annual emissions submission. The calculation method used can be found in EPA AP-42, *Compilation of Air Pollutant Emission Factors,* Chapter 12.3 using tables 12.3-19. For attainment year emissions, ADEQ used ASARCO's permitted PTE emissions, which was also calculated using EPA AP-42, Chapter 12.3, tables 12.3-19.

Reverts crushing and reverts storage and handling – ASARCO

ADEQ has chosen to quantify reverts crushing and handling emissions because previous soil sampling around these operations have shown elevated soil lead concentrations. Therefore, reverts crushing and handling is a quantifiable source of fugitive emissions and windblown leaded dust. Both the coarse revert crushing circuit and the fine crushing circuit are handled on-site by a contractor, Smithco. To quantify emissions from these scenarios, ADEQ used a percent Pb factor applied to PM totals of 1.04 percent for reverts crushing. This factor was submitted by the contractor and was applied to PM totals in ASARCO's 2017 SLEIS submission.

At the smelter complex, reverts storage and handling operations take place in two areas: reverts crushing north and reverts crushing south. Three emissions scenarios were considered for each reverts handling area: wind erosion, batch drop emissions, and load out emissions. To quantify emissions from these scenarios, ADEQ used a percent Pb factor applied to PM totals of 0.7981 percent for reverts handling. This factor was submitted by the source and was applied to PM totals in ASARCO's 2017 SLEIS submission.

An additional revert storage pile was added in 2018, referred to as the "cold dope" pile. This pile has similar emissions characteristics to the north reverts pile and thus similar emission scenarios. Since emissions for the cold dope pile did not exist in 2017, 2018 emissions will be used since this was the highest emissions for this pile since it was created. Additionally, ADEQ used the percent Pb factor discussed above for reverts storage and handling operations.

Concentrate storage and handling - ASARCO

Like reverts crushing, the three emissions scenarios ADEQ quantified were: wind erosion, batch drop emissions, and load out emissions. These scenarios were applied to the concentrate bedding and overflow storage areas. ADEQ quantified these scenarios by applying a percent Pb factor, which was provided by the source, to PM totals reported in the sources 2017 SLEIS submission. The percent lead factor applied to the PM totals for the overflow storage areas was 0.1683 percent. The percent lead factor applied to the PM totals for the bedding area was 0.315 percent.

Dewatering of Venturi scrubber slurry – In the base year, slurry from the venturi scrubber was dewatered in open air wet/dry bins. However, as part of the fugitive dust plan, the acid plant scrubber blowdown material (venturi scrubber slurry) is to be handled by first diverting the slurry to a new thickener. From the thickener, the material will be sent to two electric dryers, and the dried cake will then be discharged directly into bags. Because the CERCLA investigation found high lead concentrations in the open air wet/dry bins (see Section 3.4), ADEQ feels this operational change will greatly reduce the ambient air Pb concentrations.

For the sake of consistency, emissions from the wet/dry bins were quantified using the same methods the source used in their 2017 SLEIS report (for materials handling). This particular method can be found in AP-42, section 11.2.3 (May, 1983) Aggregate Handling and Storage Piles.

Table 3-6 Projected Process Fugitive Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory			
Process Fugitive Emissions (in tons)			
Source	**Description**	**2017 Emissions**	**2026 Facility Potential to Emit**
Pouring of Slag at the Slag Dump	fugitive emissions released when molten slag is poured at the dump	0.04043	0.05120
Pile-Unloading bedding area	Emissions resulting from wind erosion	0.00014	0.00107
Unloading from truck/rail to bedding area	Unloading copper concentrate and by-products from truck or rail to unloading dump hopper	0.00002	0.00009
Load out from storage piles onto belt	Emissions from load out of concentrate in outdoor storage	0.00037	0.00150
Overflow concentrate storage	Emissions resulting from wind erosion	0.00441	0.03911
Transfer - truck to overflow concentrate storage	Emissions from transfer of copper concentrate to outdoor storage	0.00005	0.00054
Load out from overflow storage	Emissions from the load out of copper concentrate in outdoor storage	0.00011	0.00108
South Reverts	Wind erosion at south reverts crushing area	0.00081	0.00544
South Reverts	Reverts transfer from truck to storage piles-south	0.00029	0.00120
South Reverts	Reverts load out from storage piles-south	0.00232	0.00962
North Reverts	Wind erosion at the North reverts area	0.00001	0.00004
North Reverts	Reverts transfer from truck to storage piles-north	0.00014	0.00060
North Reverts	Reverts load out from storage piles north by converter area	0.00232	0.00962
Cold Dope Reverts	Wind erosion at the Cold Dope reverts area	0.00001	0.03849
Cold Dope Reverts	Reverts transfer from truck to storage piles-cold dope	0.00014	
Cold Dope Reverts	Reverts load out from storage piles- cold dope by converter area	0.00029	
SmithCo Reverts	Reverts operations carried out by contractor	0.06505	
Wet/Dry Bins #1	Emissions resulting from wind erosion	0.00805	0.00225
Wet/Dry Bins #1	Emissions from load out of scrubber slurry	0.00003	
Wet/Dry Bins #2	Emissions resulting from wind erosion	0.00732	

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory			
Process Fugitive Emissions (in tons)			
Source	Description	2017 Emissions	2026 Facility Potential to Emit
Wet/Dry Bins #2	Emissions from load out of scrubber slurry	0.00001	
Filter Plant	Emissions resulting from wind erosion	0.00262	
Filter Plant	Emissions from load out	0.00001	
	Process Fugitive Emissions Total	0.13494	0.16187

Table 3-7 Projected Point Source Emissions Summary

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Point Source Emissions (in tons)		
Source	2017 Emissions	2026 Facility Potential to Emit
Smelter Stack & Fugitive Emissions	3.9815	3.3779
Process Fugitive Emissions	0.1349	0.1619
Facility Road Emissions	0.083	0.2103
Point Source Emissions Total	4.1994	3.7501

3.2 Nonpoint Source Emissions

Nonpoint sources in the NAA are relatively insignificant when compared to the remaining source categories, making up 3.7 percent of the NAA emissions. ADEQ quantified the nonpoint source category using 2017 NEI data. Table 3-7 summarizes the base year emissions from this source category.

ADEQ employed a population allocation method to all of the area sources within the NAA to determine their estimated future contribution to Pb emissions in the NAA. The projection method used gave approximately a 17 percent decrease in emissions to the attainment year. Table 3-8 represents ADEQ's estimates of projected emissions for area sources within the Hayden NAA in 2026.

Table 3-8 Projected Area Source Emissions

2017 Projected Hayden Pb Nonattainment Area Source Emission Inventory			
Area Source Emissions (in tons)			
Source	Description	2017 Emissions	2026 Projected Emissions
Gas Stations	Storage and Transport-Petroleum and Petroleum Product Storage	0.000006	0.000005
Industrial Processes - NEC	Miscellaneous Industrial Sources	0.001570	0.001310

2017 Projected Hayden Pb Nonattainment Area Source Emission Inventory			
Area Source Emissions (in tons)			
Industrial Processes - Non-ferrous Metals	Miscellaneous Industrial Sources	0.167164	0.139481
Miscellaneous Non-Industrial NEC	Miscellaneous Area Sources	0.000011	0.000010
	Area Source Emissions Total	0.168751	0.140806

3.3 Mobile Sources

Historically, on-road and off-road mobile sources were a potential source of Pb emissions due to leaded fuel. ADEQ did not inventory or model Pb emissions from on-road vehicles because leaded gasoline was completely phased out by 1996 and, thus, is not calculated as a pollutant in the EPA MOVES model used to quantify mobile source emissions. Currently, the only fuels allowed to contain lead are those used in non-road applications. The nonroad source category consists of emissions from piston aircraft and makes up 0.1 percent of the NAA emissions.

Like nonpoint sources, mobile sources in the Hayden NAA were also a minor source of Pb emissions in 2017, with total emissions of 0.0152 tons, accounting for less than 1 percent of total annual Pb emissions in the NAA. Mobile source emissions slightly increase but remain very minor in 2019, with a combined contribution of around 0.02 tons (see Table 3-9 below).

Table 3-9 Projected Mobile Nonroad Emissions

Mobile Nonroad Source Emission Inventory			
Source	**Description**	**2017 Emissions (tons)**	**2026 Projected Emissions (tons)**
Aircraft	Pinal County Portion of NAA	0.003311	0.002763
	Mobile Nonroad Emissions Total	0.003311	0.002763

3.4 Summary of All Sources

Emissions in the 2021 attainment year are expected to differ from the 2017 base year across all sources. Emissions from mobile and area source categories are both projected to increase due to expected population growth in Gila and Pinal counties. However, even with a significant increase in population, and an increase in emissions from these two source categories, the total contribution from mobile and area sources will remain very low in the 2019 attainment year, with a combined contribution of less than 0.5 percent of total Pb emissions in the NAA.

Emissions from the ASARCO Hayden Operations, the only point source in the NAA, changed significantly based on reconfiguration of the smelting process under the CRP and the application of controls across all emission points under the Consent Decree. ADEQ only used these permit maxima in order to produce conservative projections; there is no specific reason to believe that the facility will approach its permitted limit. Therefore, the comparison of actual and potential emissions should be done with reservation.

ADEQ asserts that the changes implemented as part of the converter retrofit project, fugitive dust plan, and subsequent controls improve the ambient air quality in the town of Hayden.

Table 3-9 contains a summary of base and projected emissions from all source categories in the Hayden NAA.

Table 3-9: Projected Hayden Pb NAA Emissions Summary

Projected Hayden Pb Nonattainment Emission Inventory Summary		
Source	**2017 Emissions (tons)**	**2026 Projected Emissions (tons)**
Point	4.1994	3.7501
Nonpoint	0.1688	0.1408
Mobile Nonroad	0.0033	0.0028
Hayden Pb NAA Emissions Total	4.3715	3.8937

ADEQ used the 2026 Pb emissions inventory to inform the control measure analysis (see Chapter 4). The 2026 emissions inventory was also used as inputs from the model used for the attainment demonstration (see Chapter 5).

4 CONTROL MEASURES

As discussed in Chapter 3, ASARCO's Hayden Operations is the primary source of Pb emissions in the Hayden NAA. Control measures specific to smelter operations provide the emissions reductions necessary to meet the 2008 Pb NAAQS.

The following sections summarize the current and future control measures that are applicable to ASARCO's Hayden Operations, and present ADEQ's analysis that demonstrates how the measures fulfill reasonably available control measure (RACM) requirements.

4.1 Requirements

Section 172(c)(1) of the CAA requires that nonattainment area plans include a control strategy that provides for attainment of the NAAQS:

> *Such plan provisions shall provide for the implementation of all reasonably available control measures [RACM] as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology [RACT]) and shall provide for attainment of the national primary ambient air quality standards.*

EPA has interpreted Section 172(c)(1) to mean that a state must "consider all potentially available measures to determine whether they [a]re reasonably available for implementation in the area, and whether they would advance the [area's] attainment date."[49] RACT is defined as "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[50] EPA has interpreted the terms RACM and RACT as being the level of emissions control that is necessary to provide for expeditious attainment of the NAAQS within a nonattainment area. Courts have upheld this interpretation of the statute with respect to nonattainment SIPs.[51] The "General Preamble" to the 1990 CAA Amendments and other policy and guidance documents describe the general methodology for determining RACM/RACT.

In addition to RACM/RACT provisions, CAA section 172(c)(6) requires that nonattainment plans "include enforceable emissions limitations, and such other control measures, means or techniques … as well as schedules and timetables for compliance, as necessary or appropriate to provide for attainment of [the NAAQS] by the applicable attainment date ..."[52] This chapter describes the compliance and enforcement schedules for the new emissions reduction measures adopted in this plan as well as those included in the 2017 nonattainment area plan.

EPA recommends that, at minimum, all stationary sources emitting 0.5 tpy or more of Pb emissions should undergo a RACT review.[53] ADEQ focused its RACM/RACT analysis on ASARCO's Hayden Operations because it is the single largest contributor to Pb emissions in the Hayden NAA. ADEQ's full RACM/RACT analysis is described in section 4.7.

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[49] *See* 66 FR 586, page 607 (January 3, 2001); Sierra Club v EPA, 294 F.3d 155, 162-63 (D.C. Cir. 2002).
[50] *See* 44 FR 53762 (September 17, 1979); 57 FR 13498 (April 16, 1992).
[51] *See* NRDC v. EPA, 571 F.3d 1245, 1252-53 (D.C. Cir. 2009).
[52] *See* C.A.A. § 172(c)(6)
[53] *See* 73 FR 66964, at 67037 (November 12, 2008).

4.2 Identification of Significant Sources

The most significant point source, and most significant source overall, is the primary copper smelter currently owned and operated by ASARCO, which accounts for more than 96 percent of Pb emissions in the nonattainment area. Emissions generally originate from the hot-metal smelting process and lead-bearing fugitive dust.[54]

Nonpoint sources account for less than 4 percent of the nonattainment area's Pb emissions and mobile sources account for less than 1 percent. For this reason, these sources are not considered significant sources and were not included in the control analysis.

The attainment control strategy focuses on ASARCO's Hayden Operations, in particular, the hot metal smelting process and fugitive Pb dust sources. Significant sources or emitting activities within ASARCO's Hayden Operations are identified in the Emissions Inventory (see Appendix A) and summarized in Table 4-1 below along with the corresponding required controls.

Table 4-1 Summary of Emission Sources/Activities and Required Controls

Emissions Source/Activity	Controls Applied (2017 SIP)	Controls Applied (2023 SIP)
Main Stack	Secondary Hood Baghouse, Improved Primary & Secondary Hooding, Tertiary Hooding	-
Flash Furnace Fugitives	Matte Tapping Ventilation System	Secondary Ventilation (Uptake Improvement Project)
Converter Aisle Fugitives	Secondary Hood Baghouse, Improved Primary & Secondary Hooding, Tertiary Hooding	Fuming-Ladle Hood
Anode Furnace Fugitives	Improved ventilation system	Secondary Hoods & Baghouse
Anode Baghouse Stack	Sent to the main stack	-
Slag Dump	Restrictions on slag dumping location	-
Acid Plant Scrubber Blowdown Solids Drying	Thickener Project	-
Concentrate storage area	Wind fence, water sprays	-
Bedding area	Wind fence, water sprays	-
Reverts operations	Wind fence, water sprays	-
Paved Roads	Sweepers	-
Unpaved Roads	Chemical Dust Suppressant (on a schedule achieving 90% control efficiency)	-

To assist in a broad understanding of the smelting process and Pb emissions, the following sections present an overview of ASARCO's Hayden Operations and Pb emission points, followed by a description of the current and future controls.

[54] Refer to Chapter 3 and Appendix A of this submittal for more information on the emissions inventory.

4.2.1 Overview of Operations and Significant Sources

ASARCO LLC owns and operates a primary copper smelter within the Hayden Pb nonattainment area.[55] The smelter is one of three in the United States and has been operating since the early 1900s, around the same time the Town of Hayden was established. The original facility employed eight multiple hearth roasters and two reverberatory furnaces to process copper sulfide ore. Today the Hayden primary copper smelter utilizes an oxygen flash smelting process as well as converters and anode furnaces to produce anode copper. An oxygen plant produces oxygen for the furnace and a sulfuric acid plant recovers the sulfur dioxide produced during smelting. A water treatment plant recovers process water from both the acid plant and flash furnace gas cleaning systems for reuse. The following subsections (4.2.1.1 and 4.2.1.2) generally describe smelter operations and provide a brief overview of smelting process-related and lead bearing dust emissions sources. Any descriptions of emissions capture and control systems include only those adopted in the 2017 SIP (see Section 4.4). New emissions reduction measures included in this 2023 SIP revision are introduced and described in Section 4.5.

4.2.1.1 Smelting Process-Related Emissions

Mining and Milling

Copper is used in many facets of everyday life, from plumbing to cell phones and architecture to medicine. To obtain pure copper for these uses, copper-bearing mineral (ore) is mined and processed via sequential beneficiation steps. These steps include size reduction by means of crushing and milling, and a flotation process that separates the metallic mineral from the non-metallic constituent, resulting in a higher-grade product (concentrate) and a waste stream (tailings). ASARCO owns and operates several facilities that mine copper ore and supply copper concentrate to ASARCO's Hayden Smelter.

Concentrate Feed and Preparation

Once the concentrate is received at the Hayden Smelter, it is sampled for metal and sulfur content for commercial and metallurgical control purposes. The concentrate is then transported to the bedding plant where a relatively homogenous "mix" of copper concentrate, silica flux, and recycled process by-products is prepared. This mix is the feed material to the INCO Flash Furnace.

INCO Flash Furnace

Prior to introduction into the INCO Flash Furnace, the feed material is dried in one of two fluidized bed dryers and recovered in an associated product baghouse. The dried feed is then conveyed to furnace feed bins, one for each of the four burners. Flash smelting occurs when the dried feed is introduced into the INCO Flash Furnace, along with 95 percent pure oxygen, through the burners. Combustible constituents of the feed (predominately sulfur) ignite, providing the heat to melt the feed mixture.

The molten material produced in the flash process separates into two layers, with the lighter top layer being iron-rich slag and the heavier lower layer being copper matte. The slag is skimmed off the top of the molten bath into large pots which are transported to the slag deposition area. The molten copper matte is tapped from the bottom of the furnace into a ladle and transferred via overhead crane to the converter furnaces.

[55] ASARCO also owns a copper mine, called the Ray Mine, located near the town of Kearny. The mine is included in the Hayden PM_{10} nonattainment area and is not a significant source of Pb emissions.

The matte tapping/slag skimming and dryer emissions are routed to a particulate control device (electrostatic precipitator – pre-Converter Retrofit Project (CRP), ventilation gas baghouse – post-CRP)[56] before exiting the 1,000-foot stack annulus. Flash furnace process gases are conditioned through a series of unit operations en route to the acid plant for sulfur dioxide recovery before exiting the 1,000-foot stack center.

Peirce-Smith Converters

Molten matte, containing approximately 58 percent copper, is transferred to the converters from the flash furnace for further processing. In the converters, air is injected beneath the molten bath through tuyeres to further remove sulfur and other impurities (blowing). The first stage of the converting process (slag blow) yields an iron-silicate slag that is returned to the flash furnace for additional copper recovery. The final stage of the converting process (copper blow) combusts the remaining sulfur to produce blister copper. (The pre-CRP converter department configuration consisted of five Peirce-Smith type converters; the post-CRP configuration replaces the five converters with three larger Peirce-Smith converters.)[57]

Each converter is equipped with primary and secondary hooding systems to ventilate the process. The primary hooding system captures process gases produced during blowing for conditioning through a series of unit operations en route to the acid plant for sulfur dioxide recovery. As with the flash furnace process gas, the resultant acid plant tail gas exits the 1,000-foot stack center. The secondary hooding system captures gases that escape the primary hood during blowing or are emitted when the converter is performing secondary operations such as charging and skimming. Ventilation gases collected by the secondary hooding system report to a baghouse for particulate removal before exiting the 1,000-foot stack annulus. The post-CRP configuration directs secondary hood gases captured during blowing to the acid plant for sulfur dioxide recovery. Secondary hood gases captured during secondary operations (charging and skimming) will still report to the baghouse. A tertiary hooding system was installed (a feature of the CRP) to collect emissions from ladle transfers and/or emissions that may escape the primary and secondary hooding systems to be routed to the 1,000-foot stack.

Anode Furnaces

Blister copper from the converters is transferred via ladle to the anode refining furnaces (3). The anode refining process consists of an oxidizing stage and a reduction stage called “poling.” Sulfur remaining in the blister copper is further oxidized to a finer endpoint than is achievable in the converter furnaces. Natural gas is then injected into the molten copper to scavenge oxygen that reacted with the copper during converting and the anode oxidizing cycle rather than creating sulfur dioxide, i.e., reducing the copper oxide back to copper. This produces anode copper (more than 99 percent pure) which is cast into anodes on two casting wheels, each with 16 anode molds. The anodes are then transported to ASARCO’s facility in Amarillo, Texas where the copper is further refined before being sold as copper wire or copper cake.[58]

In 2012, ASARCO installed a ventilation system for the anode furnaces to collect process gases and control particulate matter with a baghouse. The baghouse exhausts through a dedicated stack, however the post-CRP configuration routes that exhaust to the 1,000-foot stack annulus.

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[56] *See* Section 4.4.1 for an overview of the Converter Retrofit Project and Consent Decree.
[57] *Id*.
[58] *See* Making Copper, American Smelter and Refining Company. (2015 Oct. 20) Retrieved: http://www.asarco.com/about-us/our-locations/asarco-mineral-discovery-center/making-copper/.

In addition to smelting process-related emissions, Pb is also emitted from sources not directly part of the smelting process. These sources are generally located outside of the smelter and originate from fugitive dust containing Pb. These fugitive dust sources are discussed further in the next section.

4.2.1.2 Fugitive Leaded Dust Emissions

In addition to the smelting process, Pb emissions also come from sources outside the smelting building. Pb emissions in the form of lead-bearing fugitive dust result from a variety of sources such as materials handling, roads, and reverts crushing. The major sources of lead-bearing fugitive dust at ASARCO's Hayden Operations include slag handling, reverts crushing and handling, concentrate handling, dewatering of scrubber slurry, and roads.:

Slag handling: Slag is a byproduct of the smelting process. Slag that is high in copper is segregated in a designated section of the slag deposition area for reprocessing through the Hayden Concentrator, whereas slag that contains little copper is deposited in an area less likely to be reprocessed. Pb emissions can occur when molten slag is poured and cooled at the deposition area. The Consent Decree requires slag to be dumped only in a designated area.[59] Emissions are controlled via ASARCO's Title V permit, which requires throughput restrictions.

Reverts crushing & handling: Reverts are copper-bearing process materials that are recovered and returned (reverted) to the smelting process. Reverts typically consist of matte, slag and copper ladle shells; copper oxide slag; launder accretions and cleanup of molten material splashes and spills. Some of the revert material is crushed and reintroduced into the smelting process as flash furnace feed; larger reverts are reintroduced into the converters directly. Revert materials are currently managed outside and stored in open piles susceptible to wind loss. Under A.A.C. R18-2-B1301.01, revert material shall be crushed and stored only within an area protected by a wind fence designed to reduce fugitive emissions. Crushed reverts are required to be wetted to maintained at a nominal 10 percent surface moisture content (which is consistent with other PM_{10} rules; see section 4.7.3.3). Uncrushed reverts, considering their large mass, are required to be wetted to minimize emissions to the greatest extent practicable. Reverts must also be crushed and crushed reverts must be stored on concrete pads. These requirements are also mandated by the Consent Decree.

Concentrate handling: Concentrate is the primary copper-containing material that comprises the flash furnace feed. The Hayden Smelter receives concentrate by trucks and/or rail from other ASARCO operations and outside sources. Concentrate is stored in open piles northwest of the smelter (the concentrate storage area). Concentrate typically has high moisture content, and the storage piles receive supplemental wetting as necessary to mitigate dust emissions, however, potential Pb emissions can result from wind loss and loading/unloading operations in this area. Under A.A.C. R18-2-B1301.01, concentrate shall be stored only within an area protected by a wind fence and wetted to maintain a nominal 10 percent surface moisture content. Concentrate must also be stored on concrete pads. These requirements are also mandated by the Consent Decree.

Dewatering of scrubber slurry: Process gases from the flash furnace and converters are cleaned of particulate before being treated at the sulfuric acid plant. Particulate-laden slurry resulting from the gas cleaning operations, termed "acid plant blowdown", is routed to a cone settling system at the filter plant. The underflow from the cone settlers is collected via a vacuum truck and transported to one of the concrete solar drying pads where the material is air-dried. Once the material is relatively dry, it is bagged

[59] *See* Appendix B of Consent Decree, Number 21.

and sold to other facilities for metals recovery. The potential Pb emissions from this system occur through the material transfers and track-out onto paved roadways where the material dries and becomes susceptible to wind erosion.

ASARCO installed a new acid plant scrubber blowdown system consisting of a venturi scrubber that reports to a new thickener. Underflow from the thickener goes to a filter press for further liquid removal, with the resulting filter cake being electrically dried and discharged directly into bags. Since the thickener project (or wet gas cleaning system/plant) became operational, acid plant scrubber blowdown solids are not allowed to dry in open outdoor storage, which greatly reduces fugitive Pb emissions. This control is required under A.A.C. R18-2-B1301.01 and the Consent Decree.

Roads*:* ASARCO's Hayden Operations' roadways are primarily paved, with a few unpaved roads that see heavy equipment traffic. The major source of Pb emissions from roadways is track-out and spillage onto paved roadways from material handling and storage operations. Such material can become airborne as a result of windy conditions and/or vehicle traffic. Under A.A.C. R18-2-B1301.01, spillage on paved roads must be cleaned up, at minimum, at the end of every workday. Track-out from the bedding area is mitigated through rumble grates. Paved roads must be cleaned daily. Unpaved roads are controlled via chemical dust suppressants, verified through a soil stabilization test. Should any area of unpaved road be broken down, chemical dust suppressants must be reapplied.

In all, ASARCO's Hayden Operations include: a 29,000 ton/day concentrator and a 693,500 ton/year copper smelter consisting of an oxygen flash furnace, converters, anode casting, oxygen plant, acid plant, and associated facilities. The operations produce over 300 million pounds of copper annually.[60]

4.3 Control Measures Implemented Prior to 2015

During development of the 2017 SIP, the Hayden smelter operated under a Title V permit[61] issued by ADEQ in 2001. The Hayden smelter was also regulated under A.A.C. R18-2-715 (*Standards of Performance for Existing Primary Copper Smelters; Site-Specific Requirements*) and R18-2-715.01 (*Standards of Performance for Existing Primary Copper Smelters-Compliance and Monitoring*),[62] these rules applied primarily to SO_2 emissions and were amended to update emission limits and control strategies for the 2010 SO_2 NAAQS.

Prior to 2015, process-related Pb emissions are controlled through the devices listed below. Figure 3-1 depicts ASARCO's operations prior to the Converter Retrofit Project.[63]

- An R&R Cottrell electrostatic precipitator (ESP) captures PM from the flash furnace, matte tapping/slag skimming operations, and concentrate dryers
- Primary hooding that collects process gases from the converters and routes them through the gas cleaning system and then the acid plant
- Secondary hooding that routes emissions to a baghouse for particulate control

[60] *See* Hayden Operations, American Smelter and Refining Company. (2015 Aug. 17) Retrieved: http://www.asarco.com/about-us/our-locations/hayden-operations/.
[61] *See* Operating Permit No. 1000042, issued by the Arizona Department of Environmental Quality to ASARCO on October 9, 2001.
[62] Sections (F), (G), and (H) of R18-2-715 were approved into the Arizona SIP on September 23, 2014 (79 FR 56655). Rule R18-2-715.01 was approved into the Arizona SIP on November 1, 2004 (69 FR 63321).
[63] Diagram courtesy of ASARCO, LLC.

- Anode furnaces baghouse that ventilates and captures PM emissions from the anode furnaces

Hayden Smelter
Simplified Flow Diagram

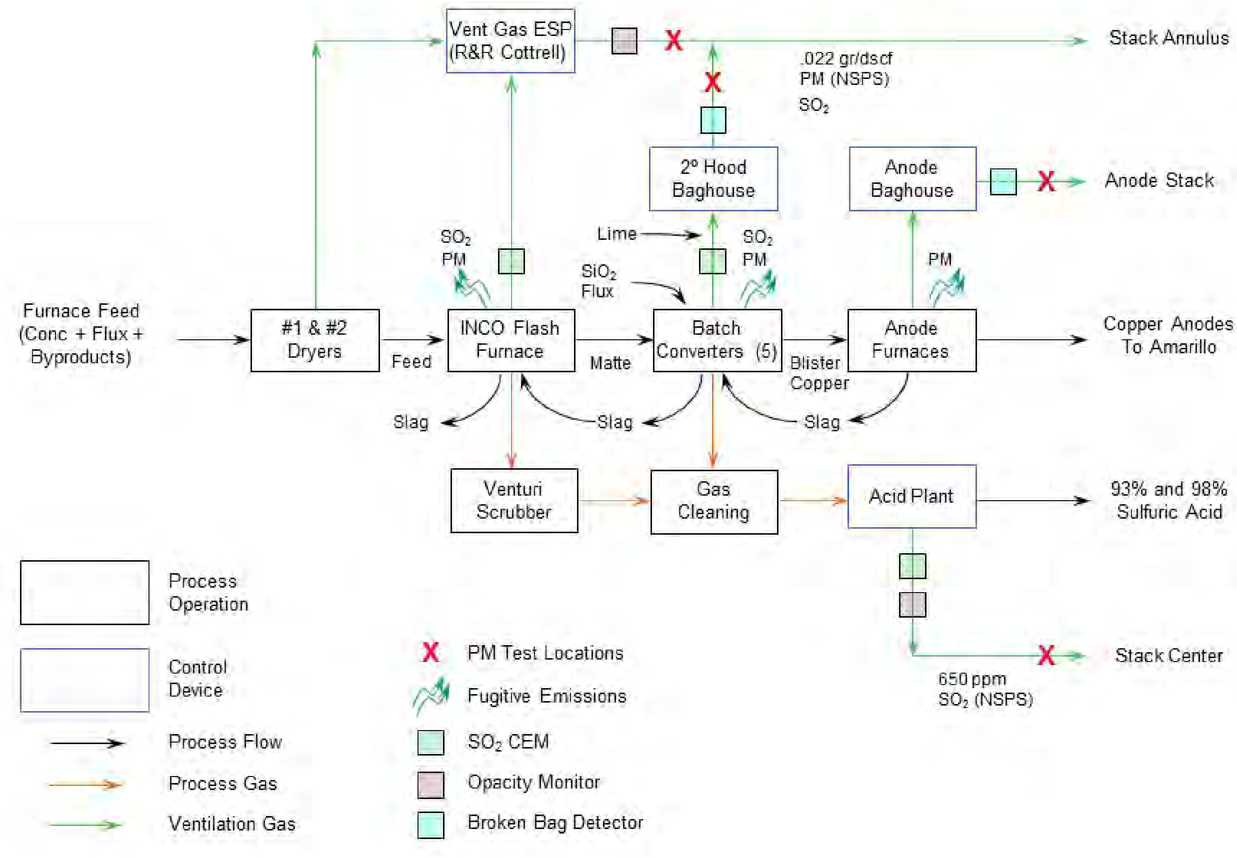

Figure 3-1 Diagram of ASARCO's Operations Pre-CRP

ASARCO's 2001 Title V permit required these controls, as well as additional requirements for fugitive dust sources as a means to control Pb and PM emissions. ASARCO was required to take reasonable precautions to ensure that PM did not become airborne. ADEQ's rules regulating PM emissions are in the Arizona Administrative Code, Article 6, "Emissions from Existing and New Nonpoint Sources."[64] Such reasonable precautions in ASARCO's Title V permit included:

- 20 percent opacity limit
- Chemical dust suppressants on unpaved roads
- Wetting of paved roads
- Using spray bars or wetting agents when crushing or handling materials
- Operating machinery with minimal fall of material
- EPA Method 9 observations for visible emissions

In order to demonstrate attainment by the original 2019 attainment date, ADEQ developed a main stack emission limit and incorporated controls from a Consent Decree into two new rules, A.A.C. R18-2-B1301 and A.A.C. R18-2-B1301.01, applicable to ASARCO's Hayden Operations. These control measures, submitted to support the 2017 nonattainment area plan, are discussed further in section 4.4.

4.4 Control Measures Included in the March 2017 SIP Revision

4.4.1 Consent Decree and Converter Retrofit Project

Shortly after the adoption of the 2010 SO_2 NAAQS, ASARCO enlisted Gas Cleaning Technologies, Inc. (GCT) to review pollution control technology around the world in an effort to devise the best strategy to minimize SO_2 emissions at the Hayden Smelter. As a solution, GCT developed the Converter Retrofit Project (CRP), which was designed to help the Hayden smelter attain the new SO_2 NAAQS.

Smelter operations were originally permitted as a major source of criteria pollutants and minor source for hazardous air pollutants. During ADEQ's permit review and renewal process in November 2011, EPA concluded that the smelter should instead be classified as a major source of hazardous air pollutants and issued a Finding of Violation against ASARCO. This finding resulted in a settlement with EPA (Consent Decree), filed in November 2015, intended to address any additional required provisions in the facility's Class I permit.[65]

The consent Decree, which was finalized before the CRP was fully permitted, primarily requires ASARCO to implement pollution controls for hazardous air pollutants (HAPs), which include lead (Pb), particulate matter (PM), and SO_2. As part of the Consent Decree process, ASARCO and GCT reworked the CRP to address three goals: (1) to help ASARCO comply with the 2010 SO_2 NAAQS; (2) the 2008 Pb NAAQS; and (3) the Consent Decree with EPA. Ultimately, the CRP and the associated improved control technology aimed to mitigate harmful air pollutants in the Hayden nonattainment area. Because Pb compounds are found in PM emissions from the smelting process and fugitive dust, ASARCO developed controls to reduce PM emissions as a surrogate for Pb.

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[64] *See*, in particular, A.A.C. R18-2-604, "Open Areas, Dry Washings, or Riverbeds"; R18-2-605, "Roadways and Streets"; R18-2-606, "Material Handling"; and R18-2-607, "Storage Piles."
[65] *See* Consent Decree, United States of America v. ASARCO LLC, CV-15-02206-PHX-DLR (D. Ariz. 2015). A copy of the Consent Decree is available at: https://www.epa.gov/enforcement/ASARCO-llc-settlement.

On June 24, 2014 ASARCO submitted a Class I Significant Permit Application to ADEQ, proposing upgrades to enhance the emission capture and control systems at the Hayden Smelter facility. ASARCO's permit was subsequently revised in December 2015 to incorporate the CRP.[66] The control measures from the consent decree and CRP are also considered in the emissions limits and requirements in rule A.A.C. R18-2-1301 that was developed for the 2017 SIP revision and discussed further in Section 4.4.2.[67]

In June 2016, ASARCO submitted a proposed Fugitive Dust Plan to EPA in compliance with the Consent Decree. The proposed Fugitive Dust Plan details the control strategy for sources of fugitive dust. The Fugitive Dust Plan-related controls are considered in the requirements in rule A.A.C. R18-2-B1301.01 that was also developed for the 2017 SIP revision and discussed in Section 4.4.2.[68]

In 2016, ASARCO began equipment procurement and construction on the CRP. Overall, the CRP and adjunct projects included:

- Replacing the five existing Peirce-Smith converters with three larger 15x35 foot Peirce-Smith converters. This change allows a single converter to blow at a time, better matching the process gas volume from the converters to the gas processing capacity of the acid plant Two new air blast blowers and a new delivery system were also installed.
- Modifying the converter aisle to fit the new larger converters and the updated primary and secondary hooding systems. Modifications include lowering the aisle grade by six feet, installing shorter crane rail girders, enhancing building column foundations, installing new sheeting to reduce the aisle opening, and modifying the roof above the new converters to create canopy hoods for the new tertiary hooding system.
- Installing a new tertiary hooding system to capture converter aisle emissions not collected by the primary or secondary hooding systems e.g., emissions from ladle movements of molten material along the aisle, for routing to the annulus of the main stack.
- Improving the matte tapping, slag skimming ventilation system to reduce fugitives and to direct emissions to a new vent gas baghouse, which replaced the previous electrostatic precipitator (ESP). The new vent gas baghouse has a higher control efficiency than the ESP and further reduces particulate emissions.
- Installing a new converter primary gas system to a new gas cleaning plant. New water-cooled primary hoods with a dedicated cooling tower will also be installed. These units would be close-coupled to evaporative cooling spray chambers followed by a common 4-field hot ESP with dust handling systems.

Figure 3-2 below depicts ASARCO's operations with CRP improvements.[69]

[66] *See* Significant Permit Revision No. 60647 to Operating Permit No. 1000042 issued by the Arizona Department of Environmental Quality to ASARCO on December 28, 2015, available upon request at ADEQ's Records Center.
[67] Final rules were published on April 7, 2017. ADEQ renewed work on a Title V permit renewal for the facility in December 2017. The permit (No. 39948) was finalized and issued in April 2018.
[68] *Id*.
[69] Diagram courtesy of ASARCO, LLC.

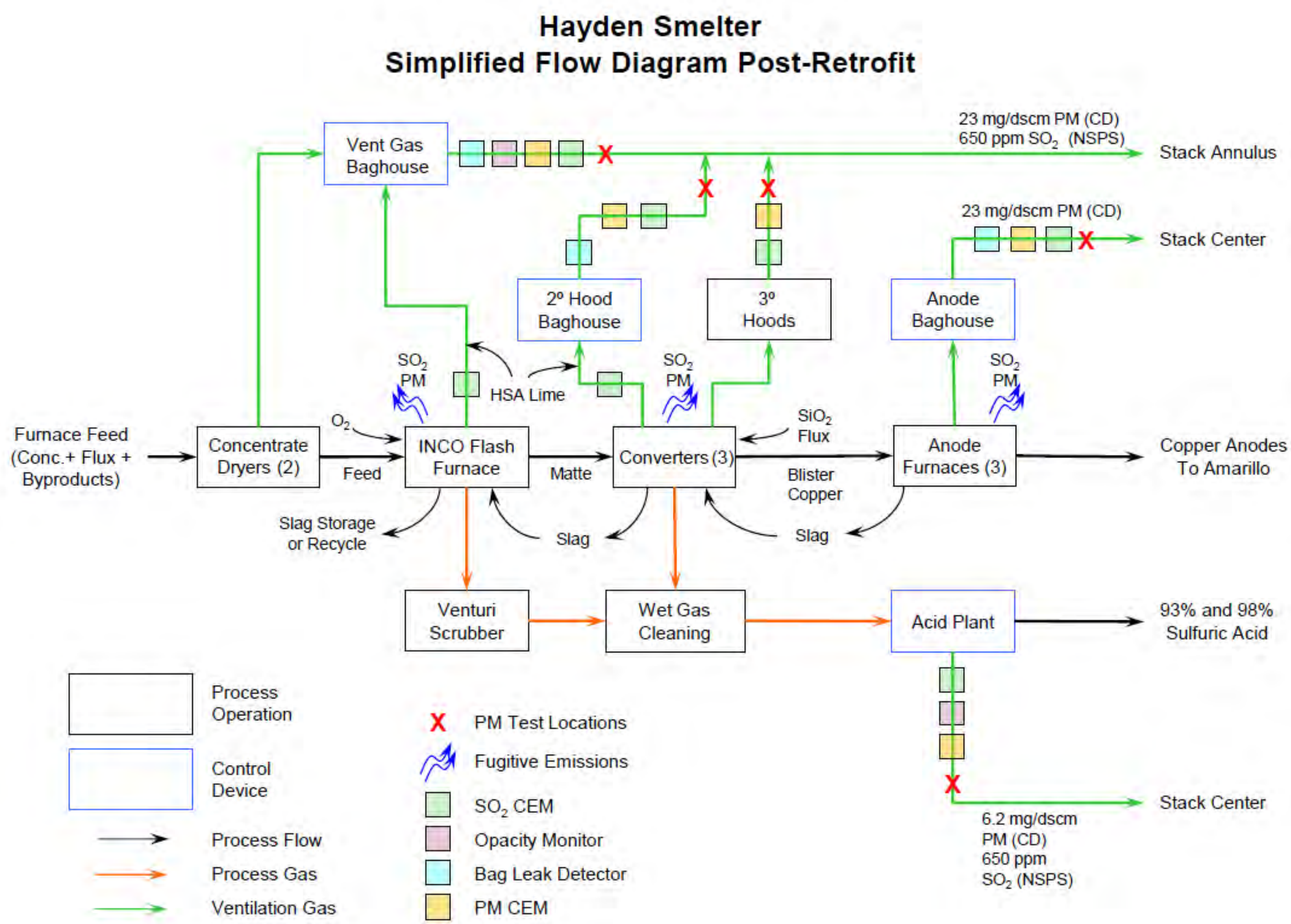


Figure 3-2 Diagram of ASARCO's Operations Post-CRP

Concurrent with the CRP, ASARCO modified its acid plant scrubber blowdown drying system to improve the processing of solids removed from the ventilation gases before going to the acid plant. ASARCO dries blowdown solids only in an enclosed system that is maintained under negative pressure to avoid emitting fugitives. Overall, the system[70] entails:

- A venturi scrubber in which slurry goes to a new thickener;
- The underflow from the thickener goes to a filter press for further liquid removal, and the resulting filter cake is sent to electric dryers to provide final drying;
- The exhaust from the dryers is sent to the converter ID fan inlet duct; and,
- The dried cake is discharged directly into supersack bags.

The Consent Decree also requires ASARCO to develop and comply with a Fugitive Dust Plan to control lead-bearing fugitive dust surrounding the smelter building. Such control measures from the Plan and incorporated in A.A.C. R18-2-B1301.01 include:

- Wind fences to encircle materials storage piles
- Water sprays to wet materials piles
- Chemical dust suppressants for unpaved roads
- Cleaning of paved roads
- Concrete pads for select materials storage areas
- 20 percent opacity limit
- Preventative maintenance procedures for control measures
- Specific inspections for each source
- Speed limit of 15 mph for vehicles
- Ambient air and meteorological monitoring

The Hayden smelter currently operates under a permit issued by ADEQ in April 2018.[71] This permit is a Class I major source operating permit in accordance with Title V of the CAA. The 2018 permit renewal for the facility incorporated control provisions used to comply with the Consent Decree and CRP as well as the emission limits and emissions mitigation requirements contained in rules A.A.C. R18-2-B1301 and R18-2-B1301.01 discussed further in section 4.4.2 below.

4.4.1.1.1 Lead Control Rules (2017 SIP Revision)

The control measures from the Consent Decree were included in the 2017 SIP and incorporated into A.A.C. R18-2-B1301, R18-2-B1301.01, and associated rules to ensure enforceability after the termination or expiration of the Consent Decree. The rules are summarized in Table 4-2 and described in further detail in Sections 4.4.2.1 and 4.4.2.2.

[70] By December 2016, this system was installed and operational.
[71] *See* permit renewal No. 39948.

Table 4-2 Lead (Pb) Emissions Control Rules Included in the 2017 SIP

Rule Added to the Arizona SIP	SIP Rule(s) Replaced	Amended by Notice of Final Rulemaking	EPA Approval (*Federal Register*)
A.A.C. R18-2-B1301. Limits on Lead Emissions from the Hayden Smelter	None	23 A.A.R. 767 (April 7, 2017)	83 FR 56736 November 14, 2018
A.A.C. R18-2-B1301.01. Limits on Lead-Bearing Fugitive Dust Emissions from the Hayden Smelter	None	23 A.A.R. 767 (April 7, 2017)	83 FR 7614 February 22, 2018
Appendix 14. Procedures for Sulfur Dioxide and Lead Fugitive Emissions Studies for the Hayden Smelter	None	23 A.A.R. 767 (April 7, 2017)	83 FR 56736 November 14, 2018
Appendix 15. Test Methods for Determining Opacity and Stabilization of Unpaved Roads	None	23 A.A.R. 767 (April 7, 2017)	83 FR 7614 February 22, 2018

4.4.1.2 Overview of R18-2-B1301 Requirements

Rule R18-2-B1301 is designed specifically for the ASARCO copper smelter and addresses Pb emissions from the hot smelting of copper process. The rule establishes an emission limit for the main stack and requires ASARCO to develop an operations and maintenance plan for each capture system and control device. The following provides a description of rule R18-2-B1301 requirements:

Emission limit: The rule specifies a numeric emissions limit for the main stack, which is 0.683 pound of lead per hour. This emission limit is based on facility calculations and Potential to Emit values, of which were modeled to demonstrate attainment in the 2017 SIP. The form of the limit is based on a per hour basis to conform with stack testing requirements.

Operational standards: At all times, including periods of startup, shutdown and malfunction, ASARCO must operate its smelter and control equipment in a manner consistent with good air pollution control practices to minimize Pb emissions. ASARCO shall develop and implement an operations and maintenance (O&M) plan that sets requirements for each capture system and control device, in addition to inspections, preventative maintenance, and monitoring devices. A similar operations and maintenance plan requirement is mandated by the Consent Decree.[72] The O&M plan, and any plan revisions, are required to be reviewed by ADEQ. The rule requires the owner or operator to submit to the Department for approval a plan revision with changes, if any, to the initial volumetric flow monitoring provisions and initial operational limits in subsection not later than six months after completing a fugitive emissions study conducted in accordance with Appendix 14.

ADEQ, ASARCO, and EPA Region 9 developed a list of operational parameters required to be included in the O&M plan, required by the rule, to provide assurance of fugitive emissions control. Appendix 14 serves as the mechanism to measure and confirm amount of fugitive emissions emitted. Appendix 14 and the rule both contain requirements that should any operational parameters need to change in order to stay consistent with modeled fugitive emissions after a fugitive emissions study, the owner or operator must

[72] *See* Section IV, Number 27 in Consent Decree, United States of America v. ASARCO LLC, CV-15-02206-PHX-DLR (D. Ariz. 2015).

submit such changes to ADEQ for approval, and then ADEQ must submit such changes to EPA Region 9 as a SIP revision.

Compliance methods: To demonstrate compliance with the main stack emission limit, ASARCO is required to conduct annual performance testing on the gas streams that are routed to the main stack (acid plant tail gas, vent gas baghouse, anode furnace baghouse, tertiary hooding, secondary hooding baghouse). ASARCO must calculate the combined results from the tests in pounds per hour to determine if emissions are at or below the limit. The results from the most recent stack test is used to determine compliance.

EPA, ASARCO, and ADEQ, determined that annual stack testing was the only viable option to verify compliance with the main stack limit. The required Continuous Emissions Monitoring Systems (CEMS) installed at the facility measures SO_2 (required by the Consent Decree), however there are no monitoring systems available or required to be installed for Pb emissions. While the modeled emission limit for the main stack was the highest out of all the sources (as of the 2017 SIP modeling), the modeled limit was based on ASARCO's requested Potential to Emit (PTE) and is the facility's maximum permitted amount to emit.

To ensure that fugitive emissions are controlled, ASARCO must maintain and operate the capture and control equipment in accordance with the O&M plan. Additionally, ASARCO must conduct fugitive emissions studies in accordance with Appendix 14 to demonstrate that fugitive emissions are consistent with modeled emissions in the SIP's attainment demonstration.

The fugitive emissions study required by Appendix 14 is consistent with requirements in the Consent Decree, but also requires ASARCO to analyze the operational parameters to ensure they are reliable indicators of control equipment operations and that the control equipment are operating accordingly to minimize fugitive Pb emissions. ASARCO is required to submit a fugitive emissions study protocol to ADEQ and EPA for review and approval at least six months before conducting a study, which is also consistent with Consent Decree requirements. The study must evaluate the smelting process that includes the flash furnace, converters, and anode furnaces. After completion of a fugitive emissions study, ASARCO must compile a report that includes the resultant emissions, descriptions of operational parameters, and an analysis of whether the results from the study demonstrate that the operational parameters confirm that fugitive emissions are consistent with modeled fugitive Pb emissions required to demonstrate attainment. If the analysis shows that operational parameters do not ensure consistency with modeled limits, ASARCO must conduct modeling to ensure that the resultant emissions still provide protection of the Pb NAAQS. ASARCO must submit such modeling to ADEQ and EPA for review and approval. If the revised emissions show that attainment is still met, then ADEQ will submit the revised emissions data, modeling demonstration, and operational parameters as a SIP revision to EPA.

Recordkeeping and reporting: Rule R18-2-B1301 requires recordkeeping for the O&M plan, emissions limit compliance calculations, control device maintenance activities, performance tests results, Appendix 14 fugitive emissions study protocols and results, and occurrence of startup and shutdown events.

ASARCO must provide semiannual reports pertaining to the construction of control equipment, notification of the start of such construction and initial startup, notification of any emission limit exceedance(s), quarterly reports of deviations of operations, and performance testing results.

4.4.1.3 Overview of R18-2-B1301.01 Requirements

Rule R18-2-B1301.01 was developed to control lead-bearing fugitive dust emissions occurring at the ASARCO copper smelter. ASARCO must comply with the rule no later than December 1, 2018. The following provides a description of rule R18-2-B1301.01 requirements, which are closely tied to the Consent Decree.

Operational standards: At all times, ASARCO must operate and maintain Pb fugitive dust sources and related control equipment in a manner consistent with good air pollution control practices to minimize Pb emissions and in accordance with a fugitive dust plan required by R18-2-B1301.01. The fugitive dust plan must address major sources of leaded fugitive dust, including paved and unpaved roads, concentrate piles, uncrushed and crushed reverts, the acid plant scrubber blowdown solids, and bedding area. The plan must detail the controls used to minimize emissions, include design plans of controls, any necessary modifications to certain controls, sample inspection sheets, preventative maintenance procedures, and physical inspections. The fugitive dust plan is also required by the Consent Decree.[73]

Both R18-2-B1301.01 and the Consent Decree require a fugitive dust plan. The difference between the two regulations is that the Consent Decree may be terminated or expire. The requirements for the fugitive plan contained in R18-2-B1301.01 will continue past the Consent Decree. Additionally, the housekeeping and performance requirements for sources covered under the R18-2-B1301.01 fugitive dust plan are independently required in the rule, regardless of a dust plan, to provide further protection of the NAAQS.

Physical inspection requirements: The rule sets specific inspection frequencies, for example: Daily inspections of water sprays, material storage piles, conveyor systems, rumble grates, paved roads, unpaved roads, and material handling areas; weekly inspections of wind fences; and bi-weekly inspections of the acid plant scrubber blowdown drying system building. As part of the fugitive dust plan, ASARCO must include sample inspection sheets for each required inspected source as well as keep such inspection sheets as records. The frequency of these inspections match those in the Consent Decree.[74]

Ambient air monitoring: Ambient Pb concentrations must be monitored in four locations already established (and required by the Consent Decree)[75]: ST-14, ST-23, ST-26, and ST-18. Samples of Pb must be collected continuously (every six days). The samples must be retained for at least three years and submitted to a certified laboratory for analysis. ASARCO is required to keep records of ambient air concentrations of Pb calculated for the applicable rolling average for each monitor.

In addition to ambient air monitors, ASARCO must operate a meteorological station at a location approved by ADEQ to continuously record wind speed and direction. This station is used to collect meteorological data for use in determining high wind events for Pb dust sources. The Consent Decree also requires ASARCO to operate a meteorological station at the Camera Hill location for use in determining high wind events.[76]

Corrective action requirements: There are essentially two corrective action provisions in R18-2-B1301.01. First, when ASARCO becomes aware that any provision under the fugitive dust plan is not being met, ASARCO must take prompt corrective action to return to compliance, such as returning water sprayers to their optimal performance, repairing damaged conveyor hooding, cleaning material trackout, or revising the fugitive dust plan itself. This corrective action provision is similar to one provided in the Consent

[73] *See* Appendix B of ASARCO Consent Decree, United States of America v. ASARCO LLC, CV-15-02206-PHX-DLR (D. Ariz. 2015).
[74] *Id.*, at number 28.
[75] *Id*, at Appendix B, Fugitive Dust Plan, number 31.
[76] *Id*, at Appendix B, Fugitive Dust Plan, number 32.

Decree.[77] ASARCO is required by the rule to maintain inspection checklists that detail any corrective actions taken, and also report any corrective actions to ADEQ.

The second corrective action provision in R18-2-B1301.01 is also in the Consent Decree.[78] This provision requires ASARCO to take corrective actions if opacity from any sources covered by the rule exceeds 15 percent, as determined by an EPA Reference Method 9 reading. The corrective action must be taken within 30 minutes of discovery of visible emissions. ASARCO must conduct an analysis to determine what caused the excess visible emissions and implement a control strategy that will avoid future exceedances of the opacity limit. ASARCO may submit a request to ADEQ to modify the fugitive dust plan accordingly.

Opacity limit: Opacity from sources covered by the rule cannot exceed 20 percent, as determined by an EPA Reference Method 9 reading (except for unpaved roads, which opacity shall be determined by an EPA-approved soil stabilization test method set forth in Appendix 15 of the rule). A Method 9-certified observer must conduct weekly visible emissions survey of all sources. A similar requirement is in the Consent Decree.[79]

Housekeeping requirements: While housekeeping requirements must be addressed in the fugitive dust plan, ASARCO must comply with such housekeeping requirements regardless of the plan. The rule details the modes of control, frequency, and efficiencies. The requirements in the rule mirror those in the Consent Decree.[80] Examples of controls for material piles include concrete pads, wind fences, and water sprays. Unpaved roads must be controlled with chemical dust suppressants and paved roads must be routinely cleaned either by sweeper, vacuum, or wet broom. See R18-2-B1301.01(D) for all housekeeping requirements for all sources of Pb dust.

Compliance method: Compliance with provisions in R18-2-B1301.01 is demonstrated through the implementation of all requirements in the fugitive dust plan and implementation of housekeeping requirements in R18-2-B1301.01(D).[81]

Contingency requirements: The contingency measure for the Hayden Pb NAA is increasing the frequency of paved road cleaning to twice per day rather than once per day. To ensure that the contingency is implemented without significant action by EPA and/or the State, ADEQ incorporated the requirements in R18-2-B1301.01. However, on January 31, 2022, EPA published a determination that the Hayden Pb nonattainment area failed to attain the 2008 Pb standards by the October 3, 2019 attainment date. The finding of failure to attain triggered the requirement for twice daily road cleaning as specified in subsection R18-2-B1301.01(D)(9). Because twice per day paved road cleaning is already implemented, the measure cannot be used to meet contingency measure goals for the 2023 SIP revision. See section 4.9 for more discussion on the selection of new contingency measures to meet CAA requirements for attaining the 2008 Pb NAAQS by the new attainment date of January 31, 2027.

Recordkeeping and reporting requirements: Rule R18-2-B1301.01 requires general recordkeeping and reporting. Such records include those required by the fugitive dust plan, inspection sheets, visible emissions survey results, housekeeping occurrences (i.e. chemical dust suppressant applications, intensity of water sprayers, location of washdowns, etc.), monitoring samples and ambient air concentration

[77] *Id.*, at number 24.
[78] *Id.*, at number 24.
[79] *Id.*, at number 29.
[80] *Id.,* at numbers 3-4, 6, 7, 10, 14, and 15.
[81] This compliance method is consistent with federal requirements for National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for primary copper smelters. *See* 40 C.F.R. Part 63, Subpart QQQ.

calculations, meteorological data, and any instances when operations deviated from the fugitive dust plan. These recordkeeping requirements are consistent with those in the Consent Decree.

On a quarterly basis, ASARCO is required to report to ADEQ instances where fugitive dust emissions exceeded 15 percent opacity, dates of high wind events, recounts of corrective actions taken and their successes, results of ambient air concentration calculations and meteorological data, a summary of when recordkeeping systems were not operating, and progress reports on new construction of control measures for fugitive dust sources.

4.4.1.4 Enforceability

The following sections address enforceability requirements[82] for R18-2-B1301 and R18-2-B1301.01, which are both applicable to ASARCO's Hayden Operations.

4.4.1.4.1 Authority

ADEQ has broad statutory authority to adopt and implement both rules under A.R.S. § 49-104 and § 49-106. Additionally, ADEQ possesses statutory authority under A.R.S. § 49-425 to adopt rules that are necessary to reduce air pollution. While the Hayden Pb NAA includes townships in both Gila and Pinal Counties, under A.R.S. § 49-402, ADEQ has jurisdiction over ASARCO's Hayden Operations.

Additionally, ADEQ has authority to carry out the necessary investigations, inspections, and enforcement of any rules and permit provisions. Such authority includes those defining violations and processes for violation consequences such as A.R.S. §§ 49-460 – 464.

4.4.1.4.2 Applicability

Rules R18-2-B1301 and R18-2-B1301.01 apply to the owner or operator of the primary copper smelter in Hayden, AZ. At the time of the 2017 SIP revision and the development of the 2023 Hayden Pb SIP revision, the smelter is owned and operated by ASARCO LLC.

4.4.1.4.3 Compliance Date and Implementation Schedule

Nonattainment plans contain legally enforceable compliance schedules by which all sources must comply with any applicable requirement of the plan.[83] Rule R18-2-B1301 is effective on the earlier of July 1, 2018 or 180 days after the completion of project improvements authorized by significant permit revision No. 60647 (R18-2-B1301(A)(2)). Rule R18-2-B1301.01 is effective no later than December 1, 2018 (R18-2-B1301.01(A)(2)). ASARCO's compliance schedule for the rules was greatly influenced by deadlines set forth in the Consent Decree. The compliance schedule of controls is listed in Table 4-3 below.

[82] *See* Review of State Implementation Plans and Revisions for Enforceability and Legal Sufficiency, memorandum issued by J. Craig Potter, Thomas L. Adams Jr., and Francis S. Blake, U.S. Environmental Protection Agency. (23 Sept. 1987).
[83] *See* 40 CFR 51.260.

Table 4-3 Control Implementation Schedule

Control Measure	Implementation Schedule	Implementation/ Approval Date
Implementation of chemical dust suppression for unpaved roads	Within 30 days of EPA approval of intensity and schedules in Fugitive Dust Plan[84]	April 14, 2018 (Element approved by EPA on March 15, 2018)[85]
Implementation of wind fences for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate)	Within 120 days of EPA approval of the Fugitive Dust Plan or the date of completion in the approved FDP, whichever is later	October 24, 2017 and April 18, 2018 (EPA approved the wind fence elements of the fugitive dust plan on June 26, 2017 and December 20, 2017)[86]
Implementation of water sprays for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate)	Within 120 days of EPA approval of the Fugitive Dust Plan or the date of completion in the approved FDP, whichever is later	July 13, 2018 (Element approved by EPA on March 15, 2018)[87]
Implementation of new acid plant scrubber blowdown drying system	November 30, 2016	
Implementation of new primary, secondary, and tertiary hooding systems for converter aisle	July 1, 2018	
Implementation of new ventilation system for matte tapping and slag skimming for flash furnace	July 1, 2018	

The 2017 Hayden Pb SIP included a contingency measure as described in Table 4-4. The measure was triggered in January 2022 when the area failed to attain the Pb NAAQS by the applicable attainment date and become a fully implemented part of the control strategy (see Section 1.5). RFP goals and contingency requirements for the new attainment demonstration (2023 Hayden Pb SIP revision) are described in Sections 4.8 and 4.9 below.

[84] The Fugitive Dust Plan referenced in Table 23 above is the Fugitive Dust Plan developed and submitted by ASARCO to EPA to comply with the Consent Decree (see Section IV "Compliance Requirements," Paragraph 25, "Fugitive Dust Plan." In the Consent Decree, certain fugitive dust controls must be implemented within a certain amount of time after EPA's approval of designs and the Fugitive Dust Plan (i.e. within 120 days of approval). Considering the SIP's control strategy relies heavily on the controls in the Consent Decree, the RFP schedule for the fugitive dust controls (chemical dust suppressants, wind fences, water sprays, new drying system) thus incorporates the schedule mandated by the Consent Decree.

[85] 83 FR 31095-31096 (July 3, 2018).

[86] *Id*.

[87] *Id*.

Table 4-4 Contingency Measure Implementation Schedule (2017 SIP)

Contingency Measure	Scheduled Date of Implementation	Implementation Date
Increase the paved road cleaning frequency specified in subsection A.A.C. R18-2-1301.01(D)(9) to twice per day.	Within 60 days of notification by EPA Region IX of either a failure to meet the compliance schedule in subsection A.A.C. R18-2-B1301.01(E)(3) or a failure to attain by the attainment date established in the Act, whichever occurs first.	April 1, 2022 (EPA published a finding of failure to attain on January 31, 2022 [87 FR 4805])

4.4.1.4.4 Standard of Conduct

The provisions of R18-2-B1301 and R18-2-B1301.01 are sufficiently clear so the regulated entity is on notice of all requirements. The 2008 Pb NAAQS became effective on January 12, 2009.[88] The Hayden Pb planning area's nonattainment designation became effective on October 3, 2014.[89] The effectiveness date of the new standard and designation of nonattainment has provided ASARCO sufficient time to determine the appropriate control technology to ensure attainment of the 2008 Pb NAAQS. Furthermore, the appropriate control technology was further developed and dictated by a Consent Decree between EPA and ASARCO, which became effective on December 30, 2015.

4.4.1.4.5 Equivalency Provisions and Discretionary Emission Limits

R18-2-B1301 and B1301.01 do not contain provisions for alternative practices or emission limits.

4.4.1.4.6 Recordkeeping and Reporting

R18-2-B1301(G) requires ASARCO to maintain records for at least five years and keep them on-site for at least two years.[90] ASARCO shall maintain records of its operations and maintenance plans, in addition to all records of maintenance activities and inspections, quality assurance and quality control activities, performance tests, compliance calculations, and any startup, shutdown, and malfunction periods. Furthermore, ASARCO shall report to ADEQ upon the start of construction of any equipment necessary to comply with the operational emission limits. ASARCO must also send semiannual progress reports on such construction postmarked by July 30 for the preceding January – June period and January 30 for the preceding July – December period. Notification to ADEQ is also required of initial startup of any such equipment within 15 business days. Additionally, within 60 days of completing a performance test on smelter equipment, ASARCO shall report results to ADEQ (R18-B1301(H)(6).

Reporting provisions under R18-2-B1301(H) also include a requirement to provide notice to ADEQ of exceedances of emissions limits within 2 business days. There is also a requirement for quarterly reports to ADEQ of any deviations to smelter operations that are inconsistent with the O&M plan as required by B1301(D)(2).

R18-2-B1301.01(H) also requires ASARCO to maintain records for at least five years and keep them on-site for at least two years. Such records shall include fugitive dust plans, physical inspection checklists,

[88] *See* 73 FR 66964 (November 12, 2008).
[89] *See* 79 FR 52205 (September 3, 2014).
[90] This requirement is consistent with the National Emission Standards for Hazardous Air Pollutants (NESHAPs) for the primary copper smelter source category, 40 CFR 63.1440 (Subpart QQQ).

logs of preventative maintenance and housekeeping conducted, ambient air monitoring samples and calculations, opacity readings, corrective actions, etc. Then, on a quarterly basis, ASARCO shall submit reports on observed opacity readings that exceeded the opacity limit, any corrective actions taken, and progress summaries on any construction of new equipment aimed to control leaded fugitive dust emissions (R18-2-B1301.01(I)).

4.4.1.4.7 Test Methods

The Hayden primary copper smelter shall comply with the main stack emission limit set forth in R18-2-B1301(C). Main stack emissions shall not exceed 0.683 pound of Pb per hour.

There are no emission limits in R18-2-B1301.01 for leaded fugitive dust sources, however, there is a 20 percent opacity limit required for all sources (R18-2-B1301.01(D)(2)). Additionally, R18-2-B1301.01(C)(2) states that the owner/operator shall develop, implement, and follow a fugitive dust plan that is designed to minimize lead-bearing fugitive dust from non-smelting process sources. This requirement is intended to provide protection of the NAAQS.

The rules contain other provisions regarding compliance and testing requirements. These provisions include requirements for monitoring and compliance demonstrations.

Monitoring requirements

Requirements for ambient air and meteorological monitoring are in R18-2-B1301.01(F). Similar to Consent Decree requirements, ASARCO is required to monitor Pb concentrations with four monitors. Samples must be collected continuously (24-hour filters placed and collected every six calendar days) in a manner consistent with 40 CFR 58.12. The samples shall be submitted to a laboratory no later than 18 days from the sample's removal from the monitor. ASARCO then shall calculate the applicable rolling average ambient levels of Pb.

Additionally, ASARCO must monitor wind speed and direction with a meteorological station installed and in a location approved by ADEQ (R18-2-B1301(C)(2)(i)). ASARCO must monitor for high wind events in case additional controls or curtailment actions need to be taken for fugitive dust sources covered under R18-2-B1301.01.

Operations and Maintenance (O&M) Plan and Fugitive Dust Plan

Per R18-2-B1301(D)(2), ASARCO is required to develop an O&M plan for the capture systems and control devices used to control or ventilate emissions from the flash furnace, converters, and anode furnaces. This rule stipulated that the plan shall be submitted no later than May 1, 2018 (R18-2-B1301(D)(2)(e)(ii). Any revisions to the O&M plan shall be submitted to ADEQ for review, however, revisions can be implemented upon submittal in order to not restrict necessary operations. Changes to certain parameters deemed critical to successful operation of the capture system and control device require prior approval from ADEQ to provide assurance of fugitive emission control.

ASARCO is also required to develop and submit to ADEQ (under the SIP) and EPA (under the Consent Decree) a fugitive dust plan for review (R18-2-B1301.01(C)(2). Subsection R18-2-B1301.01(C)(2) requires the plan shall include control methods, preventative maintenance procedures, and physical inspections requirements for fugitive Pb dust sources. The initial fugitive dust plan must be submitted no later than May 1, 2017.[91] Any revisions of the fugitive dust plan must be submitted to ADEQ for review.

Compliance Demonstration

Main Stack Emission Limit

R18-2-B1301(C) sets a Pb emission limit (in pounds per hour) for the smelter's main stack. R18-2-B1301(E) provides requirements pertaining to performance testing of the main stack. This subsection requires ASARCO to conduct annual performance tests on the equipment that is routed to the main stack (anode furnace baghouse, acid plant, secondary baghouse, tertiary hooding system, and vent gas baghouse). The performance tests must be conducted in accordance with 40 CFR 60, Appendix A, Reference Method 29 (also referred as EPA Method 29. EPA Method 29 contains mathematical formulas used to determine the amount of Pb within particulate matter samples collected from each piece of equipment. R18-2-B1301(E) contains requirements for the performance tests conducted by Asarco.

Smelter-Process Fugitives

Compliance with smelter process-related fugitive Pb emissions measures is shown by meeting the requirements in R18-2-B1301(F). From the performance test as described above, R18-2-B1301(F) requires ASARCO to calculate the combined amount of Pb emitted from the emission points in pounds per hour to determine compliance with the Pb limit. This subsection states that the owner and operator shall determine compliance with the capture system and control devices by maintaining the operating the emissions capture and control equipment in accordance with the operation and maintenance plan required in subsection R18-2-B1301(D)(2) and recording operating parameters for the capture and control equipment set forth in the approved capture and control system operations and maintenance plans as required in B1301(D)(2)(b).

Appendix 14 requires ASARCO to conduct fugitive studies to derive a measurement or accurate estimate of total fugitive Pb emissions from the Hayden smelter during operations, including planned and unplanned start up and shut down periods and malfunctions. The appendix outlines the processes involved and the criteria for conducting the studies. If a fugitive study shows emissions are higher than those used in an approved modeling demonstration, ASARCO must demonstrate that those higher emissions still support attainment or implement additional controls or both. The revised approach must be submitted to ADEQ, and if approved, ADEQ must submit such changes to EPA Region 9 as a SIP revision.

Leaded Fugitive Dust Compliance

R18-2-B1301.01 requires ASARCO to demonstrate compliance by implementing all control measures specified in the most current fugitive dust plan. To provide additional protection, the control measures required by the dust plan are also independently required in the rule. To monitor compliance, the rule requires ASARCO to report any observed opacity readings that exceed 15 percent, as well as any corrective actions taken. ASARCO must also maintain records of fugitive dust plan revisions, housekeeping of dust sources, preventative maintenance and inspection procedures, as well as opacity readings.

Considering there are no emission limits for leaded fugitive dust in the rule, R18-2-B1301.01 provides extra security by requiring a 20 percent opacity limit. Furthermore, if any visible emissions appear to exceed 15 percent as evident through a Method 9 reading, ASARCO must take prompt action to control

[91] Please note that ASARCO submitted its initial proposed fugitive dust plan to EPA and ADEQ in June 2016 to meet Consent Decree deadlines.

the emissions. Additionally, if any provisions of the fugitive dust plan are not being met, ASARCO must make corrective action that brings the area back into compliance. These corrective actions include, but are not limited to, modifications to water sprayers, material trackout cleaning, and reapplying chemical dust suppressants.

4.4.1.4.8 Exemptions

There are no exemptions from rule requirements for the Hayden primary copper smelter.

4.5 New Control Measures (2023 SIP Revision)

The Hayden Pb nonattainment area did not reach attainment by the required October 3, 2019 attainment date. The failure to attain requires the evaluation and adoption of any new emissions reduction measures needed to demonstrate attainment of the 2008 Pb NAAQS by the new January 31, 2027 attainment date.

4.5.1 Proposed New Emissions Controls

On December 16, 2022 ASARCO submitted a Class I Significant Permit Application to ADEQ, which proposed additional emission capture and control systems at the Hayden Smelter facility. The following list summarizes the emissions control improvements contained in the permit application. Emissions reductions achieved by these additional measures were determined necessary to support the current attainment demonstration.

4.5.1.1 Uptake Improvement Project

This project entails the installation and ventilation of a partial enclosure around the INCO flash furnace uptake shaft to improve capture of any fugitive emissions from the flash furnace and emissions generated during matte tapping and slag skimming activities (reducing "blow-through" emissions from the flash furnace to the converter aisle). These emissions are ducted to the converter secondary hood baghouse, treated, and released to the annulus of the main stack. The uptake enclosure will be ventilated except during brief periods when slag is returned to the flash furnace. ASARCO's air pollution control engineering consultant, Gas Cleaning Technologies (GCT), has determined that the converter secondary hood baghouse system can handle the added ventilation point without an increase in system flow capacity or a decrease in effectiveness of capture elsewhere.

Two fugitive emissions studies are required by paragraph 22 of the Consent Decree that was filed on December 30, 2015 in United States v. ASARCO LLC, No. CV-15-02206-PHX-DLR (D. Ariz.). The first study was partially completed, prior to the temporary shutdown of the smelter that commenced in October 2019. Data generated during that partially completed study indicated the possibility that emissions from the matte tapping/slag skimming area may occasionally migrate from the flash furnace building into the converter aisle, anode aisle or material transfer area. ASARCO and GCT conservatively estimate that fugitive lead emissions from the flash furnace area will be reduced by approximately 3.3-3.5% compared to pre-Uptake Improvement Project emissions.

4.5.1.2 Fuming Ladle Control Project

This project involves the construction of a hood and retaining walls to capture "fuming" ladle emissions (which sometimes occur after a ladle is poured) from the converter aisle and material transfer area that is located between the converter aisle and the anode furnaces. The hood will be ducted to the converter secondary hood baghouse, where the additionally captured emissions will be treated to remove particulate matter including lead and then released to the main stack annulus. GCT estimates that fuming ladles contributed substantially to the peak concentrations seen during the partially completed fugitive emissions study and the additional emissions capture and control that will be achieved by this project will substantially reduce that contribution.

The new hood will operate for the brief periods when a fuming ladle is present in the enclosure. It is anticipated that fuming ladles will be vented for 15-minute periods occurring 0 to 5 times per day. Because ventilation air will be toggled between the Uptake Improvement Project and this project, the secondary baghouse system will be able to handle the added ventilation point without an increase in system flow capacity or loss in capture efficiency elsewhere.

ASARCO and GCT estimate that fugitive lead emissions from the converter aisle will be reduced by approximately 15% due to the estimated control from this project and the disproportionate contribution of fuming ladles to particulate emissions and hence lead loading.

4.5.1.3 The Anode Furnaces Secondary Hood Project

This project requires the construction of secondary hoods, similar to those found on the converters, around the anode furnaces, allowing improved capture during operations. The hoods will be ducted to a new anode secondary hood baghouse, where the additionally captured emissions will be treated to remove particulate matter including lead and then released to the main stack annulus. GCT estimates that this project will achieve reductions in fugitive particulate emissions including lead of approximately 70% during peak emissions periods.

The secondary hoods' operation will control emissions previously uncaptured and emitted as fugitives. Release of the captured emissions through the main stack is not expected to cause an exceedance of the 0.683 lb. lead/hour limit in R18-2-B1301(C) or cause a significant impact on ambient lead levels, based on current modeling.

The three projects described above are designed to reduce peak emissions. This will help avoid short-term elevated ambient lead levels and reduce longer-term, quarterly ambient lead concentrations.

4.5.2 Emissions Limits

Main Stack

The proposed permit revision maintains the current limit of 0.683 pound per hour lead from the main stack even though an additional source of emissions, the anode secondary hood baghouse, will be added to the main stack annulus.[92] The proposed permit adds the anode secondary hood baghouse to the existing 2017 Pb SIP compliance demonstration, along with a continuous means of compliance assurance, in order to strengthen the SIP.

[92] *See* A.A.C. R18-2-B1301(C).

Total Process Fugitive/Roofline Emissions

The proposed permit revision will establish total process fugitive lead emissions (from the smelter furnaces and converters) shall not exceed 0.326 lb/hr calculated as a three-month rolling average in accordance with Permit condition IV.A.2.

The rate of PM emissions is a surrogate for the effectiveness of controls for hazardous air pollutants (HAPs), including lead. This surrogacy is demonstrated in EPA's January 2022 proposed revisions to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Primary Copper Smelting (40 CFR 63, Subpart QQQ).[93] However, isokinetic test methods like Method 5 are inappropriate for measuring PM emissions at the Smelter roofline. The explanation for this is included in Attachment 3 of ASARCO's December 16, 2022 permit revision application.

In the absence of a nationally applicable rule that identifies the use of MiniVol Samplers as a reference or equivalent method for determining fugitive emissions rates, the SIP revision for the Hayden Pb NAA and corresponding permit revision will rely on:

1. The construction of the three projects discussed above,
2. The operation of the resulting capture and control mechanisms,
3. Recordkeeping and reporting requirements to demonstrate that the operation of those mechanisms is being conducted according to their design, to ensure the roofline emission rates used in the attainment model will not be exceeded.

ASARCO's permit revision application proposes supplementing work practice standards with numeric emissions limits at the rooflines, if, the results of two 12-month fugitive emissions studies show that MiniVol Samplers are a reliable means of measuring rates of fugitive emissions, specifically at the Hayden roofline.

4.5.3 Enforceability

The following sections address enforceability requirements[94] for Significant Permit Revision (SPR) No. 97168, *Attachment "I": Hayden Smelter Site-Specific Sip Requirements*, and *Appendix 1 of Attachment "I"* applicable to ASARCO's Hayden Operations. These elements of ASARCO's Hayden Operations Class I Air Quality Permit (Permit No. 39948 as amended by SPR No. 97168) will be submitted to EPA as a revision to the Arizona SIP.

4.5.3.1 Authority

ADEQ has broad statutory authority to adopt and implement plans for the control of air pollutants under A.R.S. §§ 49-104, 49-404, and 49-424. Additionally, ADEQ possesses statutory authority under A.R.S. § 49-426 to issue permits that are necessary to reduce air pollution. While the Hayden Pb NAA includes townships in both Gila and Pinal Counties, under A.R.S. § 49-402, ADEQ has jurisdiction over ASARCO's Hayden Operations.

[93] *See* 87 FR 1616 (January 11, 2022).

[94] *See "Review of State Implementation Plans and Revisions for Enforceability and Legal Sufficiency",* memorandum issued by J. Craig Potter, Thomas L. Adams Jr., and Francis S. Blake, U.S. Environmental Protection Agency. (23 Sept. 1987).

Additionally, ADEQ has authority to carry out the necessary investigations, inspections, and enforcement of any rules and permit provisions. Such authority includes those defining violations and processes for violation consequences such as A.R.S. §§ 49-460 through 49-464.

4.5.3.2 Applicability

SPR No. 97168 (Attachment "I" and Appendix 1 of Attachment "I") applies to the permitee of the primary copper smelter in Hayden, AZ. At the time of this (2023) SIP revision, the smelter is owned and operated by ASARCO LLC.

4.5.3.3 Compliance Date and Implementation Schedule

Nonattainment plans should contain a legally enforceable compliance schedule by which all sources must comply with any applicable requirement of the plan.[95] The requirements in Condition IV (Particulate Limits and Lead Work Practice Standards) of SPR No. 97168 shall become effective 60 days after the Hayden Smelter achieves maximum production or 180 days after restart, whichever occurs first.[96] The requirements of Condition IV are state-only enforceable until the effective date the EPA Administrator approves them as part of the state implementation plan for lead control. A compliance schedule for the new controls is included in the RFP discussion in section 4.6.

4.5.3.4 Standard of Conduct

The provisions of SPR No. 97168 are sufficiently clear so the regulated entity is on notice of all requirements. The 2008 Pb NAAQS became effective on January 12, 2009,[97] and the Hayden Pb planning area's nonattainment designation became effective on October 3, 2014.[98] The effective dates of the new standard and designation of nonattainment has provided ASARCO sufficient time to determine the appropriate control technology to ensure attainment of the 2008 Pb NAAQS.

4.5.3.5 Equivalency Provisions and Discretionary Emission Limits

SPR No. 97168 does not contain provisions for alternative practices or emission limits.

4.5.3.6 Recordkeeping and Reporting

Recordkeeping Requirements

Condition IV.F. of SPR No. 97168 contains the provision that the Permittee shall maintain records for at least five years and keep the records on-site for at least two years. This condition applies to the following:

- All records of major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment, including those set forth in the O&M Plan as required by A.A.C. R18-2-B1301(D)(1)-(3).
- All records of performance tests, test plans, and audits as required by Condition IV.C.
- All output of the PM CEMS required in Condition IV.D.3.
- All records of compliance calculations required by Condition IV.E.

[95] *See* 40 CFR 51.260.
[96] *See* Attachment I: Hayden Smelter Site-Specific SIP Requirements, of SPR. No. 97168.
[97] *See* 73 FR 66964 (November 12, 2008).
[98] *See* 79 FR 52205 (September 3, 2014).

- All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining, and casting emission units; and any malfunction of the associated air pollution control equipment that is inoperative or not operating correctly.
- All records of reports and notifications required by Condition IV.G.
- All Records of the fugitive studies and their supporting data required under Condition IV.D.5.
- After the two fugitive studies are completed, records of daily concentrate processed and operating hours and the corresponding calculation of 30-day average fugitive lead emissions required by Condition IV.E.4.

Reporting Requirements

Condition IV.G. of SPR No. 97168 requires that the Permittee shall provide the following reports to the Department:

- Notification of commencement of construction of any equipment necessary to comply with the operational or emission limits.
- Semiannual compliance reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for the preceding July-December period.
- Notification of initial startup of any such equipment within 15 business days of such startup.
- Whenever the Permittee becomes aware of any exceedance of the emission limit set forth in Condition IV.A, the Permittee shall notify the Department orally or by electronic or facsimile transmission as soon as practicable, but no later than two business days after the Permittee learns about the exceedance.
- Within 30 days after the end of each calendar-year quarter, the Permitee shall submit a quarterly report to the Department for the preceding quarter that shall include dates, times, and descriptions of deviations when the owner or operator operated smelting processes and related control equipment in a manner inconsistent with this permit.
- Reports from performance testing conducted pursuant to Condition IV.C shall be submitted to the Department within 60 calendar days of completion of the performance test. The reports shall be submitted in accordance with A.A.C. R18-2-312(A).
- The Permittee shall submit reports to the Department providing the results of the fugitive studies required in Condition IV.D.5 within six (6) months of completion of each study.
- The Permittee shall submit quarterly, 30 days after the end of each calendar quarter, a summary report showing the date, time and magnitude of any exceedance of the PM CEMS (or approved alternative monitoring system) calculated in accordance with Condition IV.E.2 - 3 and any exceedance of the fugitive parameters calculation in accordance with Condition IV.E.4.
- The Permittee shall submit a report to the Department showing that the contingency measures required in Condition IV.H were implemented within 90 days of receipt of notice from the Department or EPA Region 9 that the requirement for implementing the contingency measures is triggered.

4.5.3.7 Test Methods

Condition IV.C. of SPR No. 97168 requires that performance testing of the anode secondary hood baghouse shall be conducted as follows:

- The gas stream exiting the anode furnaces baghouse prior to mixing with other gas streams routed to the Main Stack.
- The gas stream exiting the acid plant at a location prior to mixing with other gas streams routed to the Main Stack.
- The gas stream exiting the secondary baghouse at a location prior to mixing with other gas streams routed to the Main Stack.
- The gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the Main Stack.
- The gas stream exiting the vent gas baghouse at a location prior to mixing with other gas streams routed to the Main Stack.
- The gas stream exiting the anode secondary hood baghouse at a location prior to mixing with the other gas streams routed to the Main Stack.

In addition, the performance test shall test particulate matter using Method 5 and lead using Method 29.

To comply with Condition IV.C. of SPR No. 97168, the Permittee shall also evaluate opacity at the time of each performance test. The opacity evaluation shall evaluate both the opacity at the roofline monitor and note the opacity exiting from the walls or other openings but shall not include dust entrained from vehicles passing through an entryway. The opacity evaluation of the flash furnace building and anode aisle shall be conducted in accordance with 40 CFR 60.13 and the opacity evaluation of the converter aisle shall be conducted in accordance with 40 CFR 63.1450(c). If complying with 40 CFR Part 63, Subpart QQQ, then testing to demonstrate compliance with that standard shall satisfy this requirement for the converter aisle.

4.5.3.8 Exemptions

SPR No. 97168 does not contain exemptions that are specific for lead.

4.6 Adequate Resources for Plan

Nonattainment plans are required include a description of the resources available to the State and local agencies at the date of submission of the plan and of any additional resources needed to carry out the plan during the five-year period following its submission. The description must include projections of the extent to which resources will be acquired.[99]

As the implementing agency, the cost to ADEQ of issuing permits and enforcement of ASARCO's Title V permit revision will be minimal. ADEQ's current full-time staff coordinated the development of the plan and permit revision with ASARCO and EPA; no additional resources were needed. ADEQ expects that the current staffing level in the Permits and Compliance Sections are adequate to implement and enforce the new measures.

Overall, ADEQ expects that the current resources available to the agency will be adequate to carry out this plan for the Hayden Pb NAA through the next five years.

[99] *See* CAA section 110(a)(2)(E)(i); 40 CFR 51.280.

4.7 RACM/RACT Analysis

The following discussion includes review of the already implemented measures included in the 2017 SIP revision as well as new measures proposed for the 2023 revision. The 2017 measures and proposed new measures are identified in the following sections.

In conducting its RACM/RACT analysis, ADEQ referred to the following guidance documents issued by EPA:

- *Implementation of the 2008 Lead National Ambient Air Quality Standards Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions*, by Doug MacIntyre for U.S. EPA, March 2012.
- Appendix 1 – Available Fugitive Lead-Bearing Dust Control, State Implementation Plans for Lead Nonattainment Areas; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990, 58 FR 67748, Dec. 22, 1993.

There are three factors that should be considered in determining whether a control measure is RACM, as established by EPA:[100]

- Economic feasibility
- Cost effectiveness
- Extent of adoption by other states

In the 2008 Pb NAAQS RACM guidance, EPA explicitly defined potential RACM, including RACT, for specific major point source categories of Pb emissions including secondary lead smelters, lead acid battery manufacturing, iron/still mills, and iron/steel foundries. RACM was not explicitly defined for the primary copper smelter source category in EPA's guidance. EPA suggests comparing RACM for a primary copper smelter to a similar source category in the guidance. Of the three source categories, ADEQ found that secondary lead smelters had the most similar processes and emissions points to those of primary copper smelters, and thus compared the control measures for ASARCO's Hayden Operations to RACM for the secondary lead smelter category.

The guidance also states that a particular control may constitute RACM if it was or will be adopted to comply with other federal regulations such as maximum achievable control technology (MACT) requirements under National Emissions Standards for Hazardous Air Pollutants (NEHSAPs). Since control measures in the Consent Decree are designed to bring the smelter into compliance with NESHAP requirements of 40 CFR Part 63, Subpart QQQ for primary copper smelters, these controls are required to meet prescribed MACT standards, and therefore also meet RACM requirements.

RACT applies to existing sources in an area emitting 0.5 tons per year or more, including stack emissions, process-related fugitive emissions, and lead-bearing fugitive dust.[101] The only source that meets this description is ASARCO's Hayden Operations. Therefore, ADEQ focused its RACM/RACT analysis on control measures applicable to ASARCO.

Consent Decree Requirements for the 2017 SIP Revision

The control measures incorporated into rules R18-2-B1301 and R18-2-B1301.01 were federally required by the Consent Decree or under NESHAPs. Traditionally, RACM/RACT analyses are conducted prior to

[100] *See* Implementation of the 2008 Lead National Ambient Air Quality Standards Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions, U.S. EPA. (March 2012).
[101] *See* 73 FR 66964, 67037 (12 Nov. 2008).

modeling and rule development. However, ADEQ wanted to maximize the use of the controls being implemented under the Consent Decree for meeting SIP requirements. In December 2015, the Consent Decree was finalized, and ADEQ began modeling efforts to determine whether controls from the Consent Decree that regulated Pb emissions would attain the 2008 Pb NAAQS. ADEQ developed an inventory of Pb emissions in the NAA, then modeled the prescribed controls from the Consent Decree on those sources. The model demonstrated attainment with the Consent Decree controls.[102] Soon after, the controls were incorporated into two rules applicable to the Hayden copper smelter.[103]

The implementation schedule for the 2017 SIP controls included:

- Permanently cease operation of the five existing converters and complete installation of two of three new, high-efficiency converters no later than May 1, 2018
- Replace the existing R&R Cottrell ESP with a new vent gas baghouse for the dryers and flash furnace no later than May 1, 2018
- Complete the CRP[104] no later than December 1, 2018
- Start the first study on fugitives from the smelting process no later than six months after the completion of the CRP (at maximum, by June 1, 2019). A study protocol must be submitted six months prior to the study's commencement (at maximum, by December 1, 2018).
- Submit a Fugitive Dust Plan within 180 days of the Consent Decree's effective date (at maximum, by May 2016)
- Implement Fugitive Dust Plan controls roughly between 120-180 days of EPA's approval of Plan

Because the Consent Decree related controls were tied to attainment, the implementation schedule for those controls in the Hayden Pb NAA was based on the schedule required by the Consent Decree.

A RACM/RACT analysis traditionally also includes an analysis on the cost effectiveness of the controls. Because the control measures in the 2017 SIP were independently required under the Consent Decree or NESHAPs, ADEQ did not conduct a traditional cost analysis.[105] For context, ASARCO spent approximately $150 million to install the new control technology under the Consent Decree. The cost of the Converter Retrofit Project alone is estimated to be about $110 million.

Proposed New Measures for the 2023 SIP Revision

Following EPA's finding that the Hayden Pb planning area failed to attain the standards by the October 3, 2019 attainment date, ADEQ was required to develop a new plan for the nonattainment area that includes any new measures determined necessary to demonstrate attainment of the Pb NAAQS by January 31, 2027.

[102] *See "SIP Revision: Hayden Lead Nonattainment Area, March 2, 2017 FINAL."*

[103] Refer to section 4.4.2 of this chapter for more detailed information on the Consent Decree controls incorporated into rule.

[104] *See* Section 4.4.1 for a description of the CRP.

[105] In developing its RACM/RACT analysis, ADEQ referred to the South Coast Air Quality Management District's (SCAQMD) analysis of its rule 1420.1, which controls Pb emissions from lead-acid battery recycling facilities. Because a lead-acid battery recycling facility applicable to 1420.1 (Exide Technologies) was also under a similar settlement agreement as ASARCO, SCAQMD also excluded the controls required by the settlement from its RACM cost analysis. EPA approved SCAQMD's rule and RACM analysis in 2014 (79 FR 13875). For SCAQMD's socioeconomic report on rule 1420.1, see *Draft Socioeconomic Assessment for Proposed Rule 1420.1—Emissions Standard for Lead from Large Lead-Acid Battery Recycling Facilities,* South Coast Air Quality Management District, August 2010, available here: http://www.aqmd.gov/home/library/clean-air-plans/lead-state-implementation-plan.

On December 16, 2022 ASARCO submitted a petition for a state implementation plan (SIP) revision for the Hayden Pb nonattainment area and an application for a significant revision of the Class I air quality control permit for the Hayden smelter. The petition and application proposed additional emissions capture, control and related requirements, focused on 1) the Uptake Improvement Project, 2) Fuming Ladle Control Project, and 3) the Anode Furnaces Secondary Hood Project (see descriptions of the proposed measures in Section 4.5).

As noted above, EPA's 2012 RACM guidance does not directly address primary copper smelting. It does, however, address similar processes at secondary lead smelting facilities. Section 4.4.5 of the guidance concludes that partial or total enclosure of fugitive process sources from "refining kettles" is an appropriate RACM control. Subsequent to controls implemented under the 2017 Hayden Pb SIP, ASARCO has implemented the equivalent of "full or partial enclosure" for all primary process sources of emissions at the Hayden facility. The enclosures are directed to either the Wet Gas Handling System or one of the baghouses. The three projects contemplated in this SIP revision further enhance these controls. The Uptake Improvement Project routes emissions from the flash furnace, matte tapping and slag skimming areas not captured by the primary system to the Converter Secondary Hood Baghouse. The Fuming Ladle Control Project routes emissions from fuming ladles, currently lost to the converter tertiary ventilation system or to the atmosphere through the material transfer area or anode aisle roof monitors to the Converter Secondary Hood Baghouse. The Anode Secondary Hood Project routes emissions from the anode furnaces that are not captured by the anode primary hoods to a new Anode Secondary Hood Baghouse. The resulting multi-layer capture and control system meets or exceeds RACM requirements set forth in the 2012 Lead RACM Guidance.

The following sections present ADEQ's RACM/RACT analysis for control measures included in the 2017 and 2023 SIP revisions.

4.7.1 Rule R18-2-B1301 and Significant Permit Revision 97168 Demonstration of RACM/RACT

In the RACM/RACT demonstration for smelting process controls contained in A.A.C. R18-2-B1301 and Permit Revision 97168, ADEQ referenced EPA's RACM guidance for the 2008 Pb NAAQS, in particular, the RACM/RACT detailed for the secondary lead smelter source category. In the guidance, NESHAP requirements are referred to as meeting RACM, considering requirements under NESHAPs are MACT-level of control. Therefore, ADEQ has compared the rule and permit controls to NESHAP requirements for secondary lead smelters to follow EPA guidance. But because the Hayden smelter is actually a primary copper smelter, and thus must comply with NESHAPs for the primary copper smelting source category, ADEQ also compared the rule to NESHAPs for primary copper smelters.

4.7.1.1 Comparison to Primary Copper Smelting NESHAPs

EPA promulgated emission standards and compliance requirements for primary copper smelters under NESHAPs.[106] Primary copper smelters that emit any single HAP at the rate of 10 tons or more per year or any combination of HAPs at a rate of 25 tons or more per year must comply with NESHAPs for major sources. The NESHAP requirements represent MACT under CAA Section 112. MACT requirements apply

[106] *See* 67 FR 40478 (June 12, 2002); codified at 40 CFR 63.1440.

nationwide, regardless of whether an area attains the Pb NAAQS, so EPA expects MACT requirements are also needed in order to fulfill RACM/RACT requirements.[107]

As stated previously, ASARCO, the owner and operator of the primary copper smelter in the Hayden NAA, entered a Consent Decree with EPA over NESHAP requirements under 40 CFR Part 63, Subpart QQQ. Therefore, in its RACM/RACT analysis, ADEQ compared the rules to NESHAP requirements for primary copper smelters.

A summary of NESHAP-related MACT requirements for primary copper smelters and how they are addressed in rule R18-2-B1301 and significant permit revision 97168 is provided below.

During all times when copper matte or slag is tapped or skimmed from a smelting furnace, a capture system must collect off-gases released from the tapping/skimming port in use. The design and placement of this capture system must be such that the tapping port opening, launder, and receiving vessel (e.g., ladle, slag pot) are positioned within the confines or influence of the capture system's ventilation draft during those times when the copper matte or slag is flowing from the tapping port opening.

2017 SIP Controls. A ventilation system for the flash furnace's tapping port is required to be positioned as described by the Consent Decree, as well as under NESHAPs. This ventilation system is addressed in ASARCO's O&M plan, which is required under R18-2-B1301. Under the rule, the O&M plan must include air flows and other parameters to ensure the capture system is operating properly to control emissions. A fugitive emissions study conducted in accordance with Appendix 14 will verify operational parameters to ensure fugitive Pb emissions from the smelting process are consistent with those modeled in the attainment demonstration.

2023 SIP Controls. The Uptake Improvement Project requires the installation and ventilation of a partial enclosure around the INCO flash furnace uptake shaft to improve capture of any fugitives from the flash furnace and emissions generated during matte tapping and slag skimming activities. These emissions are ducted to the converter secondary hood baghouse, treated, and released to the annulus of the main stack. The uptake enclosure will be ventilated except during brief periods when slag is returned to the flash furnace.

MACT requires a capture system for each existing copper converter. For Pierce-Smith converters (as is the case for the Hayden smelter), a capture system design must include a primary hood and additional hooding (e.g. secondary hoods) to properly control emissions.

2017 SIP Controls. As part of the Consent Decree, ASARCO installed updated primary and secondary hooding over the converter aisle, in addition to new tertiary hooding, which is addressed in the O&M plan required by R18-2-B1301.

2023 SIP Controls. The Fuming Ladle Control Project requires the construction of a hood and retaining walls to capture "fuming" ladle emissions (which sometimes occur after a ladle is poured) from the converter aisle and material transfer area that is located between the converter aisle and the anode furnaces. The hood will be ducted to the converter secondary hood baghouse, where the additionally

[107] *See* Technical Support Document for EPA's Proposed Rulemaking for the California State Implementation Plan, South Coast Air Quality Management District, Rule 1420.1, Emission Standards for Lead from Large Lead-Acid Battery Recycling Facilities, prepared by Adrianne Borgia and reviewed by Andrew Steckel, U.S. EPA. (June 2012) Retrieved: http://www.regulations.gov/.

captured emissions will be treated to remove particulate matter including lead and then released to the main stack annulus.

MACT requires that all copper smelting processes and related control equipment must be operated in a manner consistent with good air pollution control practices for minimizing emissions. All processes and controls must be operated in accordance with an operation and maintenance plan that addresses preventative maintenance, capture system inspections, and operating limits.

The Hayden smelter rule [R18-2-B1301(D)] requires that ASARCO operates smelting processes and control equipment in a manner consistent with good air pollution practices. ASARCO must also submit an O&M plan that must be reviewed by ADEQ [R18-2-B1301(D)(2)]. The plan must address monitoring devices for control devices, operational limits, preventative maintenance, and inspections. The rule prescribes the minimum operational parameters that will be used as representative and reliable indicators of the capture system or control device operation, which will ensure the adequate control of smelting-process fugitive emissions. Such operational parameters are consistent with NESHAPs, and include volumetric flow rates, damper position settings, and blowing hours.

Condition IV.B (Operational Limits) of SPR No. 97168 indicates that minimum specifications for system operation are set forth in Condition II of the permit. These shall be incorporated into the O&M Plan required by R18-2-B1301(D)(2). Revisions to the plan shall be submitted for approval within 180 days of the effective date of Permit Condition IV under Condition I.C.

MACT requires an initial performance test to demonstrate compliance with particulate matter emission and opacity limits. Performance tests can be conducted using a variety of EPA reference methods, including Reference Method 29. Thereafter, continuous compliance is demonstrated through annual performance tests.

To comply with the main stack emission limit in R18-2-B1301(C), ASARCO must conduct initial performance tests on five gas streams routed to the main stack no later than 180 days after the completion of all CRP-related improvements. Thereafter, performance tests must occur annually. The rule mandates that all performance tests must be conducted in accordance with Method 29, *Determination of Metals Emissions from Stationary Sources*.

Condition IV.C from Attachment "I" of SPR No. 97168 provides testing requirements for the anode secondary hood baghouse. These requirements shall be conducted on six gas streams routed to the Main Stack. These performance tests shall use Method 5 for particulate matter and Method 29 for lead. The Permittee shall also evaluate opacity at the time of each performance test. The opacity evaluation shall evaluate both the opacity at the roofline monitor and note the opacity exiting from the walls or other openings but shall not include dust entrained from vehicles passing through an entryway. The opacity evaluation of the flash furnace building and anode aisle shall be conducted in accordance with 40 CFR 60.13 and the opacity evaluation of the converter aisle shall be conducted in accordance with 40 CFR 63.1450(c). If complying with 40 CFR Part 63, Subpart QQQ, then testing to demonstrate compliance with that standard shall satisfy this requirement for the converter aisle.

MACT requires appropriate monitoring devices for capture systems and control devices used to measure accurate parameters of operating limits and to demonstrate continuous compliance with operating limits.

The Hayden smelter rule, R18-2-B1301, requires monitoring devices to be addressed in the O&M plan for control devices and capture systems, in addition to setting operational limits for each system or device.

Additional monitoring requirements are contained in SPR No. 97168, located in Permit Condition IV.D, Attachment "I". These requirements include the parameters for the proposed capture systems and control devices included in the 2023 control strategy presented in this SIP.

MACT requires semiannual compliance reports. MACT also requires that records must be maintained at least for five years and kept on site for at least two years.

R18-2-B1301 requires ASARCO to submit semiannual progress reports of construction for any CRP-related improvement. ASARCO must also submit reports of the performance testing conducted to comply with the main stack emission limit, in addition to calculations for emission limit compliance. The rule requires records to be kept onsite for two years and retained for at least five.

In SPR No. 97168, Permit condition IV.F (recordkeeping requirements) and condition IV.G (reporting requirements) contain provisions for the type, details, and timing of records and reports.

Based on the above comparison to control measures prescribed by NESHAPs for primary copper smelters, the control measures required by R18-2-B1301 and SPR No. 97168 applicable to ASARCO's Hayden Operations meets RACM/RACT requirements.

4.7.1.2 Comparison to Secondary Lead Smelting NESHAPs and EPA Guidance

A summary of the minimum elements required for secondary lead smelters by EPA guidance and NESHAPs, and how they are fulfilled by requirements in R18-2-B1301 is provided below. It is important to note that these rules mirror control measures that are independently required by the Consent Decree.

MACT for an existing source must maintain 1.0 milligrams of lead per dry standard cubic meter in any process vent gas and 0.20 milligrams of lead per dry cubic meter from a secondary lead smelting facility on a rolling 12-month average basis.

While NESHAPs for *secondary lead smelters* requires a Pb emission limit, NESHAPs for *primary copper smelters* does not. To comply with this regulation, R18-2-B1301 requires an emission limit for the main stack that is protective of the 2008 Pb NAAQS and demonstrates attainment for the area (see the Modeling TSD in Appendix B).

Initial performance tests and annual compliance tests are required unless a continuous emissions monitoring system (CEMS) is installed. Method 29 is an available test method.

R18-2-B1301 requires initial performance tests on the emission points that are routed to the main stack no later than 180 days after completion of the CRP. Thereafter, annual tests are required. Tests must be conducted in accordance with Method 29.

Under SPR No. 97168, Permit condition IV.C (Testing Requirements) in Attachment "I" provides testing requirements for the anode secondary hood baghouse. These requirements shall be conducted on six gas streams routed to the Main Stack. These performance tests shall use Method 5 for particulate matter and Method 29 for lead. The Permittee shall also evaluate opacity at the time of each performance test. The opacity evaluation shall evaluate both the opacity at the roofline monitor and note the opacity exiting from the walls or other openings but shall not include dust entrained from vehicles passing through an entryway. The opacity evaluation of the flash furnace building and anode aisle shall be conducted in accordance with 40 CFR 60.13 and the opacity evaluation of the converter aisle shall be conducted in accordance with 40 CFR 63.1450(c). If complying with 40 CFR Part 63, Subpart QQQ, then testing to demonstrate compliance with that standard shall satisfy this requirement for the converter aisle.

Fabric filters controlling uncontrolled lead process emissions from stacks:[108]

EPA gave fabric filters, or baghouses, a RACM rating of 3 for secondary lead smelters.[109] Fabric filters are commonly used on secondary lead smelters, which suggests they are one of the most economically feasible control technologies. Available data shows fabric filters are also a cost-effective way to control Pb emissions, costing on average roughly $400/ton.

Rule R18-2-B1301 requires ASARCO to maintain control equipment to minimize Pb emissions in accordance with an O&M plan. Such equipment will include a vent gas baghouse to capture emissions from the concentrate dryers and flash furnace, a baghouse for the secondary hooding over the converters, and a baghouse for the anode furnaces.

Partial and total enclosures to control fugitive process lead emissions:

EPA gave partial enclosure hoods for smelter process units a RACM rating of 3. All secondary lead smelters use partial (or total) enclosure hooding systems to control fugitive emissions from the smelting process. The enclosure hooding systems ventilate emissions to control devices such as baghouses.

Under R18-2-B1301, ASARCO must operate control devices that minimize Pb emissions in accordance with an O&M plan. This control equipment includes CRP-related improvements to the primary and secondary hooding systems over each converter, as well as a new tertiary hooding system over the converter aisle. Emissions from the secondary hooding are ventilated to a baghouse when the converter is not blowing and routed to the acid plant when the converter is blowing. The tertiary hooding system captures converter aisle emissions not collected by the primary and secondary hooding and route them to the main stack instead of allowing them to escape into the atmosphere as process fugitive emissions. Hooding and enclosure systems were improved on matte and slag tap ports. These hooding improvements and the addition of the tertiary hooding is also required by the Consent Decree.

Under Significant Permit Revision No. 97168, ASARCO must install a partial enclosure around the INCO flash furnace uptake shaft to improve capture of any fugitive emissions from the flash furnace and emissions generated during matte tapping and slag skimming activities (reducing “blow-through” emissions from the flash furnace to the converter aisle). These emissions are ducted to the converter secondary hood baghouse, treated, and released to the annulus of the main stack.

The permit also requires the construction of a hood and retaining walls to capture “fuming” ladle emissions from the converter aisle and material transfer area that is located between the converter aisle and the anode furnaces. The hood will be ducted to the converter secondary hood baghouse, where the additionally captured emissions will be treated to remove particulate matter including lead and then released to the main stack annulus.

Permit requirements also include the construction of secondary hoods, similar to those found on the converters, around the anode furnaces, allowing improved capture during operations. The hoods will be ducted to a new anode secondary hood baghouse, where the additionally captured emissions will be treated to remove particulate matter including lead and then released to the main stack annulus.

[108] For more information on these RACM and EPA’s analysis, see *Implementation of the 2008 Lead National Ambient Air Quality Standards Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions* issued in March 2012 by U.S. EPA, more specifically at section 4.0 on page 16.
[109] In EPA’s RACM guidance for the 2008 Pb NAAQS, certain RACM were rated based on EPA’s criteria and given a rating of 1, 2, or 3, with a score of 3 demonstrating a high likelihood of the control measure constituting RACM.

MACT requires records kept on site for two years and maintained for five years.

The Hayden smelter rule, R18-2-B1301(G), requires records to be kept onsite for at least two years and retained for at least five years. Permit Condition IV.F in Attachment "I" of SPR No. 97168 contains the same requirements for records to be kept on-site for at least two years and retained for at least five years.

Based on the above comparison to control measures prescribed by EPA and NESHAPs for secondary lead smelters, the control measures required by R18-2-B1301 and SPR No. 97168 applicable to ASARCO's Hayden Operations meet RACM/RACT requirements.

4.7.2 Rule R18-2-B1301.01 Demonstration of RACM/RACT

In determining whether the fugitive dust requirements in the Consent Decree, also required by rule R18-2-B1301.01, constitute RACM/RACT, ADEQ referred to the General Preamble of the CAA Amendments, other states' PM_{10} rules, South Coast Air Quality Management District's rule for Pb emissions from lead-acid battery recycling facilities, as well as federal NESHAP requirements.

It was found that the dust controls from the Consent Decree and in R18-2-B1301.01 are very similar to those found in the General Preamble, non-leaded PM_{10} rules, and NESHAPs for primary copper smelters.

4.7.2.1 Comparison to NESHAPs & Evaluation

ASARCO installed its fugitive dust controls to comply with federal NESHAPs for the primary copper smelter source category, which is a MACT level of control. The requirements in R18-2-B1301.01 mirror what's required under the Consent Decree and NESHAPs. For this comparison, ADEQ drew on EPA's RACM guidance document for the 2008 Pb NAAQS and NESHAP requirements for two source categories: Primary Copper Smelters and Secondary Lead Smelters. Generally, R18-2-B1301.01 requirements are consistent with either NESHAPs for copper smelters or NESHAPs for lead smelters, or sometimes both. And because EPA's RACM guidance draws on NESHAP requirements for secondary lead smelters, R18-2-B1301.01 follows EPA's guidance as well.

This comparison, along with ADEQ's evaluation of R18-2-B1301.01, is in Table 4-5 below.

Table 4-5 Comparison & Evaluation of Pb Dust Rule to EPA Guidance & NESHAPs

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
(SELECTED) DEFINITIONS				
"*High wind event*" means any period of time beginning when the average wind speed, as measured at a meteorological station maintained by the owner or operator that is approved by the Department, is greater than or equal to 15 miles per hour over a 15 minute period, and ending when the average wind speed, as measured at the approved meteorological station maintained by the owner or operator, falls below 15 miles per hour over a 15 minute period."	n/a	n/a	n/a	Considering neither NESHAPs nor guidance address high wind events, this fugitive Pb dust rule requirement is considered RACM.
"*Lead-bearing fugitive dust*" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.	n/a	n/a	n/a	NESHAPs nor guidance address this type of definition; however, it is consistent with the similar definition in South Coast's Pb rule (see Table 4-8).
"*Material pile*" means material, including concentrate, uncrushed reverts, crushed reverts, and bedding material, that is stored in a pile outside a building or warehouse and is capable of producing lead-bearing fugitive dust.	n/a	n/a	n/a	Although NESHAPs and guidance do not address this type of definition, the fugitive Pb dust rule is consistent with similar definitions in other non-leaded PM_{10} rules (see Table 4-7).
"*Non-smelting process sources*" means sources of lead-bearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads.	n/a	n/a	"*Fugitive dust source*" means a stationary source of hazardous air pollutant emissions at a secondary lead smelter that is not associated with a specific process or process fugitive vent or stack. Fugitive dust sources include, but are not	Meets RACM. The definition used for secondary lead smelter's is generally consistent with the Hayden Pb dust rule definition.

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
			limited to, roadways, storage piles, lead bearing material handling transfer points, lead bearing material transport areas, lead bearing material storage areas, other lead bearing material process areas, and buildings. (See § 63.542).	
"*Storage and handling*" means all activities associated with the handling and storage of materials that take place at the Hayden Smelter, including, but not limited to, stockpiling, transport on conveyor belts, transport or storage in rail cars, crushing and milling, arrival and handling of offsite concentrate, bedding, and handling of reverts.	n/a	n/a	"Materials storage and handling area" means any area of a secondary lead smelter in which lead-bearing materials (including, but not limited to, broken battery components, reverberatory furnace slag, flue dust, and dross) are stored or handled between process steps including, but not limited to, areas in which materials are stored in open piles, bins, or tubs, and areas in which material is prepared for charging to a smelting furnace. (See § 63.542)	Meets RACM. The definition used for secondary lead smelter's is generally consistent with the Hayden Pb dust rule definition.
"*Trackout/carry-out*" means any materials that adhere to and agglomerate on the surfaces of motor vehicles, haul trucks, and/or equipment (including tires) and that may then fall onto the road.	n/a	n/a	n/a	Although NESHAPs and guidance do not address such definition, the fugitive Pb dust rule is consistent with similar definitions in other non-leaded PM_{10} rules (see Table 4-7).

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
FUGITIVE DUST PLAN & COMPLIANCE				
Development, implement, and follow a fugitive dust plan that addresses sources of fugitive Pb dust. Compliance with the rule is demonstrated through full implementation of the fugitive dust plan, in addition to the housekeeping requirements (which are the same requirements that will go into the fugitive dust plan, but they are also required independently by the rule regardless of a plan to ensure control of emissions).	While NESHAPs for secondary lead smelters and primary copper smelters require a dust plan, such requirement was not discussed in EPA's guidance.	Must operate according to a "written fugitive dust control plan" which must address sources like outdoor piles, bedding areas, conveyor transfer points, and roadways. (See § 63.1445). Compliance is demonstrated through implementing all of the fugitive control measures specified for the source in the fugitive dust control plan. (See § 63.1453).	Must prepare and at all times operate according to a "standard operation procedures" manual that describes in detail the measures to control the fugitive dust emissions from sources listed, which include roadways, storage areas, handling areas, etc. (See § 63.545). Compliance is demonstrated through operating at all times according to the standard operating procedures manual (see § 63.545).	Meets RACM. Requiring a dust plan is consistent with NESHAPs for both source categories, primary copper smelters and secondary lead smelters (although secondary lead smelter uses a "standard operation procedures manual"). Compliance methods are also consistent with both NESHAPs.
PAVED ROADS				
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including paved roads.	n/a	n/a	n/a	Considering guidance nor NESHAPs address an opacity limit, this fugitive Pb dust rule requirement is considered RACM for being consistent with opacity limits in other non-leaded PM_{10} rules (see Table 4-7).

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
Section (D)(9) of the rule requires roads to be cleaned at least once daily with a sweeper, vacuum, or wet broom in accordance with manufacturer recommendations. EPA published a finding of failure to attain on January 31, 2022 [87 FR 4805] which triggered contingency measure requirements under rule section (E) to increase road cleaning to twice per day.	EPA's guidance matches the requirements for NESHAPs for Secondary Lead Smelters, which requires paved roads to be cleaned twice per day (see guidance, page 23). However, no requirement similar to this is required under NESHAPs for ASARCO's source category, which is primary copper smelters.	NESHAPs for primary copper smelters has no specific requirement for cleaning paved roads.	NESHAPs for secondary lead smelters requires paving all areas subject to vehicle traffic and must clean the pavement twice per day (see § 63.545).	Meets RACM. The Hayden rule incorporates a paved road cleaning frequency of twice per day. There are no paved road cleaning requirements under NESHAPs for primary copper smelters, only for secondary lead smelters.
Rapidly clean up track-out and carry out on paved roads that extends a cumulative distance of 50 linear feet or more; clean all other trackout and carry out at the end of the workday.	No specific requirement resembling trackout and carryout clean-up, but guidance does list timely cleaning of accidental releases as a RACM measure (see page 25).	No specific requirement, however, trackout and carryout could be addressed via a facility's "fugitive dust control plan" (see § 63.1445).	No specific requirement, however, trackout and carryout could be addressed via a facility's "standard operating procedures manual" (see § 63.545).	Meets RACM. In addition to mirroring general PM_{10} rule requirements in other states (see Table 4-7) the Hayden rule goes beyond NESHAP requirements by specifying clean-up frequencies for trackout and carry-out.
Speed limit of 15 mph with signs posted.	No requirement.	No requirement.	No requirement.	Meets RACM. While guidance and NESHAPs do not require specific speed limits for paved roads, the Hayden rule is generally consistent with other states' PM_{10} rules (see Table 4-7).
UNPAVED ROADS				
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including unpaved roads. Chemical dust suppression application for high-leaded unpaved roads, including slag hauler road, secondary crusher road, and reverts crushing operations roads.	While EPA's guidance recognizes that there is no known adoption of chemical dust suppression for source categories addressed in the guidance, which are secondary lead smelting, lead	The controls in the fugitive dust plan must address such sources as roadways used by trucks for transporting bulk materials (which would include unpaved roads). Available controls listed in NESHAPs include dust	There are no requirements applicable to unpaved roads for secondary lead smelters. This is due to the fact that all roads subject to vehicle traffic must be paved or otherwise	Meets RACM. Generally, EPA cited paving unpaved roads as a known control measure for source categories like secondary lead smelters, which conforms to the NESHAP requirements for that source category.

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
Soil stabilization requirements for unpaved roads, which are a 20 percent opacity limit, silt loading limit of 0.33 oz/ft2, and silt content limit of 6 percent.	acid battery manufacturing, and iron and steel foundries, this Hayden Pb dust rule requirement is consistent with NESHAP requirements for primary copper smelters. (Note: Other R18-2-B1301.01 requirements listed here were not addressed in EPA's guidance and are therefore not compared in this table.)	suppression agents (see § 63.1445). (Note: Other R18-2-B1301.01 requirements listed here are generally not mentioned in NESHAPs, and are therefore not compared in this table).	encapsulated (see § 63.545(c)(2)). (Note: Other R18-2-B1301.01 requirements listed here are generally not mentioned in NESHAPs, and are therefore not compared in this table).	However, given that the ASARCO smelter is a primary copper smelter, not a secondary lead smelter, the Hayden Pb dust rule stays consistent with NESHAP requirements for the primary copper smelter source category and thus requires chemical dust suppressants to be used on unpaved roads. Chemical dust suppressants are also known BACM for other serious PM_{10} nonattainment areas in the Southwest (see Table 4-7).
Maintain back-up watering trucks and personnel for visible emissions control.				
Immediate, but no later than 30 minutes after observation, application of water or chemical dust suppressant where visible emissions are observed.				
Reapplication of chemical dust suppressants within 24 hours of discovery of breakdown.				
Collection and prevention of runoff and/or sweeping material				
Speed limit of 15 mph with posted signs.				
MATERIAL STORAGE PILES & MATERIAL HANDLING				
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including storage piles.	EPA's guidance lists partial enclosures with wet suppression as available controls for storage areas and storage piles. (Note: Other R18-2-B1301.01 requirements listed here were not addressed in EPA's guidance and are therefore not compared in this table.)	The controls in the fugitive dust plan must address sources like material piles and conveying system transfer points. Controls listed include wind screens/fences and spraying water. (See § 63.1445). (Note: Other R18-2-B1301.01 requirements listed here are generally not mentioned in NESHAPs, and are therefore not compared in this table).	Vehicles must be washed at each exit of material storage and handling areas. Material transport must be conducted within closed conveyor systems or in sealed, leak-proof containers unless activities are contained in a total enclosure. All other lead-bearing material must be contained and covered for transport outside of a total enclosure in a manner that	Meets RACM. The Hayden Pb dust rule combines requirements from both EPA's guidance, NESHAPs for primary copper smelters, and NESHAPs for secondary lead smelters. Like EPA's guidance and NESHAPs for primary copper smelters, the Hayden Pb dust rule requires water sprays and wind fences to be used for material storage piles. Also, material conveyor systems must have minimized
Material conveyor systems drop heights must be minimized to the greatest extent practicable and any spillage must be cleaned within 30 minutes of discovery.				
Storage of concentrate and crushed reverts must be on concrete pads.				
Water sprays for storage piles, requiring a 10 percent surface moisture content, as determined by ASTM method D2216-10, for concentrate, crushed reverts, and bedding materials.				

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
Wind fences for storage piles, with material pile height not to exceed wind fence height, and the wind fence must have a porosity of 50 percent or less.			prevents spillage or dust formation. Material handling areas and other sources of dust must be operated in a total enclosure maintained under negative pressure. (See § 63.545(c)(5) and (c)(7) and § 63.544). (Note: Other R18-2-B1301.01 requirements listed here are generally not mentioned in NESHAPs, and are therefore not compared in this table).	drop heights to lessen fugitive dust emissions. In addition, while NESHAPs for secondary lead smelters require vehicle washings, the Hayden Pb dust rule requires rumble grates at the bedding plant, which is a similar measure used to control dust at a material storage and handling area.
Materials being transported by vehicle must be covered by a tarp and the cargo compartment must be free of holes or other openings.				
Water suppression or handling postponement during high wind events.				
Maintain rumble grates at all of the bedding plant area's entrances and exits for control of dust from loader tires.				

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
Dry acid plant scrubber blowdown solids only in an enclosed system that uses a venturi scrubber, thickener, filter press, and electric dryer that is maintained under negative pressure. The negative pressure of the electric dryer enclosure is maintained using a 2,500 ACFM dyer ventilation fan to be used at all times the electric dryer is operational. Monitoring of the negative pressure is demonstrated through the run and stop states of ventilation fan and electric dryer.	EPA's guidance listed partial/total enclosures in combination with negative pressure for storage areas/process units as RACM due to its widespread use at secondary lead smelters (11 of 14 smelters) and adoption by the South Coast Air Quality Management District (see guidance, page 23).	While total enclosures are required for secondary lead smelters, they are not required for primary copper smelters. Generally, material storage piles are controlled via wind fences and water sprays.	Control sources of fugitive dust emissions within total enclosures that are maintained under negative pressure and vented to a control device designed to capture lead particulate. (See § 63.544).	Meets RACM. Although total enclosures for materials storage, such as the acid plant scrubber blowdown solids, are not required under NESHAPs for primary copper smelters, ASARCO is required to install such system as part of the Consent Decree. The new system dries the acid plant's scrubber blowdown solids in a total enclosure, with a dryer system maintained under negative pressure in order to minimize emissions. Such control then, is more stringent for a primary copper smelter and therefore, constitutes RACM.
RECORDKEEPING & REPORTING				
Current and past fugitive dust plans.	Recordkeeping and reporting requirements were not discussed.	No recordkeeping requirements pertaining to dust sources were identified.	Records that must be kept/maintained in a "form suitable and readily available for expeditious review" include: inspections, cleaning of paved roads, corrective actions, and malfunctions. (See §§ 63.546 and 63.550).	Meets RACM. Even though records for fugitive dust sources are not required under NESHAPs for primary copper smelters, the Hayden Pb dust rule requires similar records to those under NESHAPs for secondary lead smelters.
Physical inspection sheets, checklists, and/or log sheets.				
All records of unpaved road stabilization and opacity tests and materials piles moisture content tests, if any.				
Maintenance, inspections, quality assurance and control, samples, and wind data from ambient air and meteorological stations, in addition to records of periods where monitors are inoperative.				

R18-2-B1301.01 Requirement	2008 Pb NAAQS RACM Guidance for *Secondary Lead Smelter Source Category & Fug. Dust*	NESHAPs for *Primary Copper Smelters (40 CFR Part 63, Subpart QQQ) *MACT*	NESHAPs for *Secondary Lead Smelters (40 CFR Part 63, Subpart X) *MACT*	R18-2-B1301.01 Evaluation
Recordkeeping system for fugitive dust sources, including visible emissions observations, corrective actions, water sprayer operations, chemical dust suppression application, timing of paved road cleaning, Reference Method 9 opacity readings, operating conditions, calibration records for measurement devices, and records for operational deviations.				
Records must be maintained for 5 years and kept onsite for at least 2 years.		Records must be kept on site for at least 2 years after the date of record. Records must be maintained for 5 years. (See § 63.1456).	Records must be kept on site for at least 2 years after the date of record. Records must be maintained for 5 years.	Meets RACM. The records retention requirement is consistent with NESHAPs for both source categories.
Quarterly reports that include visible emissions observations, high wind event dates, corrective actions, progress on control construction, raw monitoring data and calculated ambient air concentrations.		Must submit semiannual compliance reports that include any deviations from work practice standards (which would apply to fugitive dust control practices). (See § 63.1455).	Must submit reports no less frequent than specified under § 63.10(e)(3) of General Provisions (see § 63.550).	Meets RACM. NESHAPs for primary copper smelters require semiannual reports, whereas the Hayden Pb dust rule requires more frequent quarterly reports.

4.7.2.2 Comparison to General Preamble Control Menu & Evaluation

Appendix 1 of the General Preamble for the Implementation of Title I of the Clean Air Act[110] lists specific available control measures for fugitive lead-bearing dust; most measures mirror those in Appendix C1 of the General Preamble for non-leaded particulate matter. Appendix 1 measures are required to be considered in any RACM analysis. These measures, along with ADEQ's evaluation of R18-2-B1301.01, is in Table 4-6 below. Requirements in R18-2-B1301.01 are generally consistent with those in Appendix C1.

[110] *See* 58 FR 67752 (Dec. 22, 1993).

Table 4-6 Comparison & Evaluation of Pb Dust Rule to General Preamble Control Menu

General Preamble Control Measure	R18-2-B1301.01 Evaluation
Pave, vegetate, or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.	Requires application of chemical dust suppressants on high-leaded unpaved roads, including access points where unpaved roads meet paved roads. See subsection (D)(10).
Require dust control plans for construction or land-clearing projects.	Not applicable to any significant source.
Require haul trucks to be covered.	Requires that trucks hauling fugitive lead dust sources to be covered by a tarp and compartments to be free of holes. See subsection (D)(4).
Provide for traffic rerouting or rapid clean-up of temporary (and not readily preventable) sources of dust on paved roads (water erosion runoff, mud/dirt carryout areas, material spills, skid control sand). Delineate who is responsible for cleanup.	Requires clean-up of spillage that extends 50 linear feet or more as expeditiously as practicable, and at the end of the work day for all other spillage. See subsection (D)(9)(c).
Require paving, chemically stabilizing, or otherwise stabilizing permanent unpaved haul roads, and parking or staging areas at commercial, municipal, or industrial facilities.	Requires chemical dust suppression for high-leaded unpaved roads, including haul roads, access points, and areas of vehicle handling of material. See subsection (D)(10)(a).
Develop traffic reduction plans for unpaved roads. Use of speed bumps, low speed limits, etc., to encourage use of other (paved) roads.	Requires a speed limit of 15 mph with posted signs. See subsection (D)(10)(h).
Limit use of recreational vehicles on open land.	Not applicable to any significant source.
Require curbing and pave or stabilize (chemically or with vegetation) shoulders of paved roads.	Paved roads make up roughly 1.3% of the total 2017 base year emissions inventory for the Hayden facility. There are generally more significant emissions reductions achieved through daily paved road cleaning. Additionally, curbing paved roads is identified as BACM in other serious PM_{10} NAAs, such as Imperial and San Joaquin Valley Counties. The Hayden Pb NAA is required to meet RACM requirements. Therefore, due to this being an insignificant source that is already effectively controlled via daily cleaning, a BACM measure like curbing would not significantly reduce emissions to expedite attainment.
Pave or chemically stabilize unpaved roads.	Requires chemical dust suppression for high-leaded unpaved roads, including access points and areas of vehicle handling of material. See subsection (D)(10).
Pave, vegetate, or chemically stabilize unpaved parking areas.	Not applicable to any significant source (see Emissions Inventory TSD in Appendix A).
Require dust control measures for material storage piles.	Requires wind fences, water sprays, and concrete pads for concentrate storage and reverts crushing; requires wind fences and water sprays for all other dust sources (uncrushed reverts and bedding materials). Scrubber blowdown solids from the acid plant that were previously dried outdoors will now be required to be dried in an enclosed system with a dryer maintained under negative pressure. See subsections (D)(11) - (D)(15).

General Preamble Control Measure	R18-2-B1301.01 Evaluation
Provide for storm water drainage to prevent water erosion onto paved roads.	Due to the arid climate of the Hayden NAA, water erosion runoff only infrequently occurs during periods of heavy rain, usually generated by intense, localized thunderstorms that occur in the late summer and early fall. Runoff is generally contained in stream and normally dry wash channels. Any erosion on paved surfaces is usually narrowly restricted to where these flows may cross roadways. Because emissions from entrainment of erosion sediment on paved roads are very localized and minimal, and rerouting of storm water channels or roadways require significant time and infrastructure investment, this measure is not feasible. This measure also would not significantly advance attainment of the NAAQS due to substantial research and infrastructure development. Furthermore, subsection (D)(9)(c) already requires rapid clean-up of trackout and carryout, which would also clean up any erosion of material following these infrequent rain events.
Require revegetation, chemical stabilization, or other abatement of wind erodible soil, including lands subjected to water mining, abandoned farms, and abandoned construction sites.	Not applicable to any significant source.
Rely upon the soil conservation requirements of the Food Security Act to reduce emissions from agricultural operations.	Not applicable.
Require washing of undercarriages and wheels of vehicles immediately prior to leaving the plant area.	While the rule does not explicitly require wheel and/or undercarriage washing, rumble grates are required for the bedding plant area. See subsection (D)(14)(c). Furthermore, wheel washes are considered BACM in Imperial County, CA and Maricopa County, AZ for serious PM_{10} areas. Because the Hayden Pb NAA is required to implement RACM instead, and because roads are a rather insignificant source, rumble grates at the bedding area are sufficient.
Require that water used for dust suppression and vehicle washing contain a limited amount of lead (e.g. less than or equal to 0.1 ppm).	Chemical suppressants, rather than water, are used for control of dust from unpaved roads. Vehicle washing is also not required. Therefore, this RACM measure is not applicable.

While the General Preamble suggests paving unpaved roads, the Hayden Pb NAA's attainment strategy depends on a chemical dust suppression application intensity and schedule that achieves a 90 percent control efficiency. This is greater than the paving control efficiency EPA cites in the 2008 Pb NAAQS RACM guidance, which is 66 percent.[111] Therefore, chemical dust suppression is required rather than paving to achieve the higher control efficiency. The dust suppression control efficiency is required under the Consent Decree, and its inclusion in the Pb dust rule makes this requirement enforceable after the Consent Decree is terminated or expired.

Additionally, while paving is a suggested RACM in EPA's 2008 Pb NAAQS RACM guidance, so is chemical dust suppression, which is considered BACM in Maricopa County as well as other Southwestern states, including California and Nevada (see Table 4-7). As shown in Chapter 5, Hayden is projected to attain the NAAQS using chemical dust suppression on unpaved roads. Considering that chemical dust suppression

[111] *See Implementation of the 2008 Lead National Ambient Air Quality Standards Guide to Developing Reasonably Available Control Measures (RACM) for Controlling Lead Emissions,* U.S. EPA, March 2012, page 24.

already achieves 90 percent control efficiency and that unpaved roads constitute a small portion of the base year emissions inventory, paving would not expedite attainment any quicker than already required.

Furthermore, ADEQ analyzed unpaved roads at ASARCO's Hayden Operations and determined which ones had the highest Pb content, referring to samples taken between 2013 and 2015 during EPA's Remedial Investigation and Feasibility Study. The analysis shows that not all unpaved roads at ASARCO's facility have the same amount of Pb content. The unpaved roads with the highest Pb content are the slag hauler road and the concentrate storage area. The chemical dust suppression application intensity and schedule in the rule mirrors what ASARCO developed for its Fugitive Dust Plan required by the Consent Decree. The rule thereby focuses on the unpaved road that has the highest Pb content, the slag hauler road, which is required to have the most frequent application of chemical dust suppressants (the rule also requires application on additional unpaved roads). While there will be no chemical dust suppression applied on the concentrate storage area roads, the Pb content of the surrounding unpaved roads will decrease due to the use of concrete pads, wind fences, and water suppression for concentrate storage. For ADEQ's complete analysis, refer to the "Unpaved Road De Minimis Analysis" in the Modeling TSD in Appendix B of the 2017 SIP.

In summary, while the General Preamble suggests paving unpaved roads, the fugitive Pb dust rule focuses on those roads that have the most Pb content and requires chemical dust suppression for its higher control efficiency. Chemical dust suppression is also a recognized BACM in other Southwestern states.

In general, R18-2-B1301.01 contains most fugitive Pb dust controls identified by EPA in the General Preamble. While R18-2-B1301.01 is focused on a point source, rather than a county-level distribution of different sources (such as in a PM_{10} NAA), the controls ASARCO will be using to control leaded fugitive dust are similar to those identified in Appendix 1 of the General Preamble.

4.7.2.3 Comparison to Other PM_{10} Rules & Evaluation

While the fugitive Pb dust rule is focused on leaded dust, EPA expects that the rule should also meet RACM for non-leaded particulate matter, or PM_{10}. For this analysis, ADEQ referred to rules approved by EPA in Nevada, California, and Arizona. These rules were approved by EPA as BACM for serious PM_{10} nonattainment areas. The PM_{10} rules incorporated in this analysis include:

- San Joaquin Valley Air Pollution Control District, CA
- Imperial County Air Pollution Control District, CA
- Clark County Department of Air Quality, NV
- Maricopa County Air Quality Department, AZ

PM_{10} emission control rules developed by these areas were reviewed, summarized, and grouped by source category for use in assessing commonalities and differences in the Hayden Pb NAA's control strategy. The results are used to identify the level of control, the applicability for the Hayden Pb NAA, and the general consistency between requirements. The comparative results are summarized in Table 4-7 below.

In summary, the measures that control leaded dust via R18-2-B1301.01 are generally consistent with and conform to non-leaded PM_{10} rules in other Pacific Southwestern states.

Table 4-7 Comparison & Evaluation of Pb Dust Rule to PM_{10} Rules

(SELECTED) DEFINITIONS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
"*High wind event*" means any period of time beginning when the average wind speed, as measured at a meteorological station maintained by the owner or operator that is approved by the Department, is greater than or equal to 15 miles per hour over a 15 minute period, and ending when the average wind speed, as measured at the approved meteorological station maintained by the owner or operator, falls below 15 miles per hour over a 15 minute period."	No similar requirement.	See rule 800, section C, which defines "wind gust" as: "Is the maximum instantaneous wind speed as measured by an anemometer." See also rule 801 for construction and earthmoving activities, which states that the 20% opacity limit shall not apply when wind gusts exceed 25 mph as long as there's a control measure in place.	See rule 8021 for construction and earthmoving activities, which requires activities to cease when VDE exceeds 20 percent opacity.	No similar requirement.	Meets RACM. While the "high wind event" definition is unique for ASARCO's purposes and consistent with the definition in the Consent Decree, it draws similarities with the Imperial County definition which uses a specific tool to measure wind speeds.

(SELECTED) DEFINITIONS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
"*Lead-bearing fugitive dust*" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.	See rule 310, section 200, which defines "fugitive dust" as: "The particulate matter not collected by a capture system, that is entrained in the ambient air, and is caused from human and/or natural activities, such as, but not limited to, the movement of soil, vehicles, equipment, blasting, and wind. For the purpose of this rule, fugitive dust does not include particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering, or welding equipment, and from piledrivers, and does not include emissions from process and combustion sources that are subject to other rules in Regulation III (Control of Air Contaminants) of these rules."	See rule 800, section C, which defines "fugitive dust" as: "The particulate matter entrained in the ambient air which is caused from man-made and natural activities such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly in the exhaust of motor vehicles or other fuel combustion devices, from portable brazing, soldering, or welding equipment, pile drivers, and stack emissions from stationary sources."	See rule 8011, section C, which defines "fugitive dust" as: "any solid particulate matter entrained in the ambient air which is caused by anthropogenic or natural activities which is emitted into the air without first passing through a stack or duct designed to control flow, including, but not limited to, emissions caused by movement of soil, vehicles, equipment, and windblown dust. This excludes particulate matter emitted directly in the exhaust of motor vehicles, from other fuel combustion devices, portable brazing, soldering, or welding equipment, and from pile drivers."	See Section 0, which defines "fugitive dust" as: particulate matter, that is not collected by a capture system, is entrained in the ambient air and is caused from human and/or natural activities, such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. For the purpose of these regulations, fugitive dust does not include particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering, or welding equipment, and from pile drivers, and does not include emissions from process and combustion sources that are subject to other sections of these regulations."	Meets RACM. The "lead-bearing fugitive dust" definition draws several requirements from the other PM_{10} rules (i.e. "entrained in the ambient air" and use of "uncaptured/uncontrolled") but is adapted for leaded particulate matter and to ASARCO's operations. The activities/sources listed in the other PM_{10} rules are consistent with those listed in the Pb dust rule (i.e. movement of soil and wind).

(SELECTED) DEFINITIONS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
"*Material pile*" means material, including concentrate, uncrushed reverts, crushed reverts, and bedding material, that is stored in a pile outside a building or warehouse and is capable of producing lead-bearing fugitive dust.	See rule 310, section 200, which defines "bulk material" as "any material, including but not limited to, the following materials that are capable of producing fugitive dust: earth; rock; silt; sediment; sand; gravel; soil; fill; aggregate less than 2 inches in length or diameter; dirt; mud; demolition debris; cotton; trash; cinders; pumice; sawdust; feeds; grains; fertilizers; fluff from shredders; dry concrete."	See rule 800, section C, which defines "bulk material" as: "Earth, rock, silt, sediment, sand, gravel, soil, fill, aggregate, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing particulate matter with five percent or greater silt content...." etc.	See rule 8011, section 3.0, which defines "bulk material" as "any unpackaged material with a silt content of more than 5 percent." See also "open storage pile" which is defined as: "Any accumulation of bulk material, stored outside a building or warehouse."	No similar requirement.	Meets RACM. While Maricopa County and Imperial County have definitions for "bulk material" that do not include references to a pile, San Joaquin Valley's definition for "open storage pile" is similar to the Pb dust rule's definition. The definitions for "bulk material" use "...capable for producing fugitive dust," which is also used in the Pb dust rule. The San Joaquin rule's definition of "open storage pile" uses "...stored outside a building or warehouse," which is also used in the Pb dust rule. The Pb dust rule combines the language from these rules while adapting it specifically for ASARCO's operations.

(SELECTED) DEFINITIONS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
“*Non-smelting process sources*” means sources of lead-bearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads.	See rule 310, section 200, which defines "dust-generating operation" as "Any activity capable of generating fugitive dust, including, but not limited to, the following activities: Land clearing, maintenance, and land clean-up using mechanized equipment; earthmoving; weed abatement by disking or blading; excavating; construction; demolition; bulk material handling; storage and/or transporting operations; operation of any outdoor equipment; operation of motorized machinery..." etc.	See rule 800, section C, which defines "earthmoving activities" as: "The use of any equipment for an activity that may generate fugitive dust emissions, including, but not limited to, cutting and filling, grading, leveling, excavation, trenching, loading or unloading of bulk materials, demolishing, drilling, adding to or removing bulk materials from open storage piles, weed abatement through disking and back filling."	See rule 8011, section 3.0, which defines "earthmoving activities" as: "The use of any equipment for an activity that may general fugitive dust emissions, including, but not limited to, cutting and filling, grading, leveling, excavating, trenching, loading or unloading of bulk materials, demolishing, blasting, drilling, adding to or removing bulk of materials from open storage piles, weed abatement through disking, and back-filling."	No similar requirement.	Suggests RACM. This Pb dust rule definition is especially unique to ASARCO's operations and is consistent for a rule that controls leaded dust, as opposed to non-leaded dust. The sources of Pb dust listed in the definition are those found to be sources in ASARCO's operations. The PM_{10} rules have definitions for bulk materials used in earthmoving/dust-generating activities, which is somewhat different from ASARCO's operations. While ASARCO's operations do generate dust, the Pb dust rule is focused on those that generate leaded dust. The Pb dust rule definition is consistent with the other PM_{10} rules, in that it addresses storage, handling, and unloading of bulk materials.

(SELECTED) DEFINITIONS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
"Storage and handling" means all activities associated with the handling and storage of materials that take place at the Hayden Smelter, including, but not limited to, stockpiling, transport on conveyor belts, transport or storage in rail cars, crushing and milling, arrival and handling of offsite concentrate, bedding, and handling of reverts.	See rule 310, section 200, which defines "bulk material handling, storage, and/or transporting operation" as "the use of equipment, haul trucks, and/or motor vehicles, including, but not limited to, for the following activities that are capable of producing fugitive dust: loading; unloading; conveying; transporting; piling; stacking; screening; grading; moving bulk materials."	See definition for "Earthmoving Activities" referenced above, which includes loading/unloading of bulk materials, and adding to or removing materials from open storage piles.	See rule 8011, section 3.0, which defines "bulk material handling, storage, and/or transporting operation" as: "includes but is not limited to the use of equipment, haul trucks, and/or motor vehicles for the loading, unloading, conveying, transporting, piling, stacking, screening, grading, or moving of bulk materials at an industrial, institutional, commercial, and/or governmental owned or operated site or facility."	No similar requirement.	Meets RACM. While like in the other definitions the Hayden Pb dust rule is focused on ASARCO's operations, the definition is consistent with the other PM_{10} rules in that it includes loading/unloading of materials, transportation of materials, and other handling. Furthermore, the consistent use of "including but not limited to" in the rules allows the definition to be applied to other sources if needed. This definition in the Pb dust rule is also consistent with the definition in the Consent Decree.
"Trackout/carry-out" means any materials that adhere to and agglomerate on the surfaces of motor vehicles, haul trucks, and/or equipment (including tires) and that may then fall onto the road.	See rule 310, section 200, which defines "trackout/carryout" as "Any and all bulk materials that adhere to and agglomerate on the surfaces of motor vehicles, haul trucks, and/or equipment (including tires) and that have fallen or been deposited onto an area accessible to the public."	See rule 800, section C, which defines "trackout/carry-out" as: "Any and all bulk materials that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement."	See rule 8011, section 3.0, which defines "carryout and trackout" as: "any and all materials that adheres to and agglomerates on vehicles, haul trucks, and/or equipment (including trailers, tires, etc.) and falls onto a paved public road or the paved shoulder of a paved public road."	No similar requirement.	Meets RACM. The Hayden Pb dust rule definition is consistent with the other PM_{10} rules. The other PM_{10} rules apply to paved public roads, or an area accessible to the public. The Pb dust rule is more general, and uses "road" to include unpaved and paved roads in the facility, consistent with clean-up requirements in subsection (D)(9) and (D)(10).

FUGITIVE DUST PLAN					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
Development, implement, and follow a fugitive dust plan that addresses sources of fugitive Pb dust.	See rule 310, section 402, which requires a Dust Control Plan for any dust-generating operation that involves a disturbed surface area equal or greater than 0.10 acre. A plan must also be submitted if any application for a Dust Control permit is submitted.	See rule 800, which requires that Border Patrol, BLM, or any other owner or operator of a recreational OHV use area to prepare and follow a dust control plan for minimizing PM_{10} emissions. The control requirements for each dust plan is tailored to each user's type of operation (i.e. recreational OHV use versus Border Patrol immigration monitoring practices). See also rule 801 which requires dust control plan for construction and earthmoving activities.	See rule 8021, which requires a Dust Control Plan for Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities. Rule 8011 also allows a Fugitive PM_{10} Management Plan for unpaved roads and unpaved vehicle/equipment traffic areas in replace of compliance with applicable requirements in rules 8061 and 8071.	See rule 94, which requires owner or operators of construction activities to develop a Dust Mitigation Plan.	Meets RACM. The Hayden Pb rule is consistent with PM_{10} rules applicable to other dust-generating operations like OHV use and construction.

PAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including paved roads.	See rule 310, section 303, which requires a general 20 percent opacity limit for dust-generating operations.	No requirement for paved roads. (Note that rule 401, "Opacity of Emissions" was adopted prior to 1979 and has opacity-related limits based on the Ringlemann Chart, which does not seem to apply to paved roads.)	No requirement for paved roads. (Note the definition for "Limit Visible Dust Emissions to 20% Opacity" in rule 8011, which does not seem to apply to paved roads.)	See rules 91 and 93, which require a 20 percent opacity limit for unpaved roads and unpaved shoulders/medians of paved roads.	Meets RACM. The general use of a 20 percent opacity limit for dust sources, like paved roads, in Maricopa County (and in other states for sources other than paved roads) signify that this requirement maintains such consistency.
Clean roads at least once daily with a sweeper, vacuum, or wet broom in accordance with manufacturer recommendations.	No requirement. (Referred to Rule 310).	No requirement. (Referred to rules 800 and 805).	See rule 8061, which requires each city, county, or state agency responsible for existing paved roads to purchase and use a PM_{10} efficient street sweeper.	See rule 93, which requires any street sweeping equipment to be PM_{10} efficient. See also rule 94, which prohibits the use of dry rotary brushes and blower devices, unless sufficient water is applied, for cleaning paved roads.	Meets RACM. Both Maricopa County and Imperial County do not require paved road cleaning, and San Joaquin and Clark County require PM_{10}-efficient sweepers, which are considered BACM, whereas the Hayden Pb NAA is required to implement RACM. Furthermore, the control efficiency from cleaning once daily was inputted into the modeling and brings the area into attainment, thereby reducing Pb emissions.
Rapidly clean up track-out and carry out on paved roads that extends a cumulative distance of 50 linear feet or more; clean all other trackout and carry out at the end of the workday.	See Maricopa County rule 310, section 306, which requires immediate clean-up when trackout extends 25 linear feet or more and at the end of the workday for all other trackout from areas accessible to the public.	See Imperial County rule 803, which requires immediate clean-up when trackout extends 50 linear feet or more and at the end of the workday for all other trackout.	See San Joaquin Valley rule 8041, which requires trackout to be cleaned at the end of the work day, and immediately when trackout extends 50 linear feet or more within urban areas.	See Clark County rule 94, which applies to construction activities, and requires that mud or dirt not be tracked out onto a paved road if it extends 50 feet or more in cumulative length. (See also the Dust	Meets RACM. The trackout clean-up requirements are generally consistent with other states' rules, which are considered BACM.

PAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
				Control Handbook, Best Management Practice 20 for Trackout/Carryout). Rule 93 also provides some protection against trackout via stabilized shoulders.	
Speed limit of 15 mph with signs posted.	No requirement. (Referred to rules 310 and 311).	No requirement. (Referred to rules 800 and 805).	No requirement for paved roads, however Rule 8021 requires speed limit of 15 mph for unpaved roads for earthmoving and construction activities.	No requirement (referred to rule 93).	Meets RACM. The speed limit is consistent with the limit set forth in San Joaquin's rules for unpaved roads for construction and earthmoving activities.

UNPAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including unpaved roads.	See rule 310, section 303, which requires a general 20 percent opacity limit for dust-generating operations.	See rule 805, which requires a 20 percent opacity limit for unpaved roads. See also rule 801 for construction and earthmoving activities, which requires a 20 percent opacity limit for a construction site and for persons performing any earthmoving activities.	See rule 8061, which requires a 20 percent opacity limit for unpaved roads. See also rule 8021 for construction and earthmoving activities, which requires a 20 percent opacity limit.	See rule 91, which requires a 20 percent opacity limit for unpaved roads.	Meets RACM. The general use of a 20 percent opacity limit for dust sources in other states signify that this requirement maintains such consistency among sources and states.
Chemical dust suppression application for high-leaded unpaved roads, including slag hauler road, secondary crusher road, and reverts crushing operations roads.	See rule 310, section 305.7, which lists non-water dust suppression as a control measure.	See Rule 805, which lists chemical stabilization as a control measure. See also rule 801 for construction and earthmoving activities, which also requires chemical stabilization or water for unpaved haul/access roads.	See rule 8061, which lists chemical suppressants as a control measure. See also rule 8021 for construction and earthmoving activities, which also requires chemical dust suppressants for unpaved surfaces.	See rule 91, which lists dust palliatives as a control measure.	Meets RACM. The other states' rules constitute BACM and are consistent with Hayden's chemical dust suppression requirement.

UNPAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
Soil stabilization requirements for unpaved roads, which are a 20 percent opacity limit, silt loading limit of 0.33 oz/ft2, and silt content limit of 6 percent.	See Maricopa County rule 310, section 304.2, which requires a 20 percent opacity limit for unpaved haul/access roads as determined by test method in Appendix C, Section 2.1 (EPA-approved unpaved road opacity observations method), and same silt loading and silt content requirements for unpaved roads, as determined by test method in Appendix C, Section 2.1 (EPA-approved soil stabilization method).	See Imperial County Rule 805, which requires a 20 percent opacity limit for unpaved haul/access roads and unpaved roads as determined by test method in Rule 800, Appendix A, Section A (same EPA-approved unpaved road opacity observations method), and same silt loading and silt content requirements for unpaved roads, as determined by test method in Rule 800, Appendix B, Section C (same EPA-approved soil stabilization method).	See San Joaquin Valley rule 8061, which requires a 20 percent opacity limit for any unpaved road segment with 26 or more average annual daily trips, as determined by test method in rule 8011, Appendix A, Section 1 (same EPA-approved unpaved road opacity observations method), and same silt loading and silt content requirements for unpaved roads, as determined by test method in rule 8011, Appendix B, Section 3 (same EPA-approved soil stabilization method).	See Clark County rule 91, which requires a 20 percent opacity limit, as determined by test method in rule 91, subsection 91.4.1 (same EPA-approved unpaved road opacity observations), and same silt loading and silt content requirements for unpaved roads, as determined by test method in rule 91, subsection 91.4.1 (same EPA-approved soil stabilization method).	Meets RACM. The soil stabilization requirements are consistent with other states' rules, which constitute BACM, and are the same methods EPA has approved in Maricopa County, California, and Nevada.
Maintain back-up watering trucks and personnel for visible emissions control.	While back-up water trucks are not explicitly required, Maricopa County rule 310, section 305.7 lists watering as a control measure for unpaved haul/access roads.	While back-up water trucks are not explicitly required, Imperial County rule 805 lists watering as a control measure for unpaved roads.	While back-up water trucks are not explicitly required, San Joaquin Valley rule 8061 lists watering as a control measure for unpaved roads.	While back-up water trucks are not explicitly required, Clark County rule 91 allows other alternative control measures as approved by the Control Officer and Region IX, which could include watering.	Meets RACM. The back-up watering trucks requirement is in addition to the chemical dust suppressants.

UNPAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
Immediate, but no later than 30 minutes after observation, application of water or chemical dust suppressant where visible emissions are observed.	No requirement. (Referred to rule 310).	No requirement. (Referred to rules 800 and 805).	No requirement. (Referred to rule 8061).	No requirement. (Referred to rule 91).	Meets RACM. This corrective measure for visible emissions from unpaved roads provides additional protection.
Reapplication of chemical dust suppressants within 24 hours of discovery of breakdown.	No requirement. (Referred to rule 310).	No requirement. (Referred to rules 800 and 805).	While no specific requirement in rule 8061 is listed, rule 8071 has similar re-application requirements for water or chemical suppressants for unpaved vehicle/equipment traffic areas with more than 50 Average Annual Daily Trips.	No requirement. (Referred to rule 91).	Meets RACM. Like the visible emissions corrective action above, this requirement goes beyond to provide further protection against dust emissions.
Collection and prevention of runoff and/or sweeping material	No specific requirement for unpaved roads, however Maricopa County rule 310, section 306 has trackout/carry-out requirements for paved roads where areas are accessible to the public (see Paved Roads above).	No specific requirement for unpaved roads, however Imperial County rule 803 has trackout/carry-out requirements for *paved roads* (see Paved Roads table).	No specific requirement for unpaved roads, however San Joaquin Valley rule 8041 has trackout/carry-out requirements for *paved public roads* (see Paved Roads table).	No requirement. (Referred to Clark County rules 41, 91, and 93).	Meets RACM. None of the other states included in this analysis have requirements to minimize runoff and sweeping material on unpaved roads. This measure adds additional protection to prevent dust emissions.
Speed limit of 15 mph with posted signs.	See rule 310, section 304.2, which as an alternative to stabilization requirements for unpaved roads, allows for limiting vehicle trips to no more than 20 per day	See rule 800, which lists available control measures for unpaved roads and unpaved vehicle/equipment traffic	See rule 8021 for construction and earthmoving activities, which requires a speed limit of 15 mph with posted signs for uncontrolled unpaved	No requirement. (Referred to rule 91).	Meets RACM. The Hayden Pb rule speed limit is consistent with limits in Maricopa, Imperial, and San Joaquin Counties.

UNPAVED ROADS					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
	and limiting speeds to no more than 15 mph. (See also rule 310, section 305.2, which requires a 15-mph speed limit; rule 310, section 305.6, which requires a 15-mph speed limit; as well as rule 310, section 305.7 which also requires a 15-mph speed limit.)	areas that includes a speed limit of 15 mph.	haul/access roads within construction sites.		

MATERIAL STORAGE PILES & MATERIAL HANDLING					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
Facility-wide, overall 20 percent opacity limit for all fugitive lead dust sources, including storage piles.	See rule 310, section 303, which requires a general 20 percent opacity limit for dust-generating operations.	See rule 802, which requires a 20 percent opacity limit for bulk material handling, storage, haul trucks, and transport.	See rule 8031, which requires a 20 percent opacity limit for bulk material handling, storage, and transport.	See rules 91 and 93, which require a 20 percent opacity limit for unpaved roads and paved roads, but no such specific requirement for storage piles. See also rule 94, which requires a 20 percent opacity limit for construction and earthmoving activities.	Meets RACM. The general use of a 20 percent opacity limit for dust sources in other states signify that this requirement maintains such consistency among sources and states.
Material conveyor systems drop heights must be minimized to the greatest extent practicable and any spillage must be cleaned within 30 minutes of discovery.	See Maricopa County rule 310, section 305.4, which lists control options for bulk material stacking, loading, and unloading, including mixing materials with water or non-water suppressants.	See Imperial County rule 802, which lists several measures for bulk material handling/transfer, which include water sprays at transfer points, chemical stabilization, or sheltering/enclosing.	See San Joaquin Valley rule 8031, which requirements that any transport of bulk material using a chute or conveyor to be either fully enclosed, sprayed with water, or washed.	See Clark County rule 94, which includes materials storage and handling for construction and earthmoving activities. Sources must choose controls listed in Dust Control Handbook (conveyor belts not addressed).	Meets RACM. Although other states require water suppression, enclosing, or other stabilization requirements, these constitute BACM and are therefore not applicable to the Hayden Pb NAA, which must meet RACM requirements. Minimizing drop heights and requiring quick clean-up will provide enough emissions minimization to reach attainment.

MATERIAL STORAGE PILES & MATERIAL HANDLING					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM***	**Imperial County APCD, CA *BACM***	**San Joaquin Valley APCD, CA *BACM***	**Clark County Dept of Air Quality, NV *BACM***	**R18-2-B1301.01 Evaluation**
Storage of concentrate and crushed reverts must be on concrete pads.	No requirement (Referred to rule 310).	No requirement. (Referred to rule 802).	No requirement (referred to rule 8031).	See rule 94, which includes materials storage and handling for construction and earthmoving activities. Sources must choose controls listed in Dust Control Handbook (no use of concrete pads included in Handbook).	Suggests RACM. These particular Pb dust sources must be stored on a concrete pad to prevent re-entrainment. No other states included in this analysis require such concrete pads.
Water sprays for storage piles, requiring a 10 percent surface moisture content, as determined by ASTM method D2216-10, for concentrate, crushed reverts, and bedding materials.	See Maricopa County rule 310, section 305.5, which lists several available options, including watering to achieve a minimum 12 percent soil moisture content, as determined by ASTM method D2216-05.	See Imperial County rule 802, which lists several measures, which include application of water or chemical suppressants on bulk material storage piles. No surface moisture content is required. See also rule 801 for construction and earthmoving activities, which requires water or chemical stabilization in addition to wind barriers.	See San Joaquin Valley rule 8031, which lists several measures, including watering to limit opacity to 20 percent or less, as determined by test method in rule 8011, Appendix A, Section 2. See also rule 8021 for construction and earthmoving activities, which requires water or chemical suppressants to be used along with wind barriers.	See Clark County rule 94, which includes materials storage and handling for construction and earthmoving activities. Sources must choose controls listed in Dust Control Handbook (See Best Management Practice 19 for Stockpiling, which includes water suppression).	Meets RACM. The general use of watering for bulk materials suggests this requirement is consistent with other states. Some variation exists between moisture content limits, but rule's 10 percent moisture content requirement is consistent with ASARCO's Consent Decree with EPA, and the test method provides enforceability. (Please note that uncrushed reverts are not required to have 10 percent moisture content due to the porosity of the materials.)

MATERIAL STORAGE PILES & MATERIAL HANDLING					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
Wind fences for storage piles, with material pile height not to exceed wind fence height, and the wind fence must have a porosity of 50 percent or less.	See Maricopa County rule 310, section 305.5, which lists several measures, including wind barriers, storage silos, or three-sided enclosures to be used in conjunction with watering. The 3-sided enclosure height must equal the pile height and must have 50 percent or less porosity.	See Imperial County rule 802, which lists several measures, which include wind barriers/fences with less than 50 percent porosity in conjunction with water or chemical suppressants. Rule 802 also lists a 3-sided structure as a measure, with less than 50 percent porosity and a height that is at least equal to the bulk material pile height. See also rule 801, for construction and earthmoving activities, which requires wind fences to be used in conjunction with water or chemical suppressants.	See San Joaquin Valley rule 8031, which lists several measures, including wind barriers with less than 50 percent porosity to be used in conjunction with water or chemical suppressants. A 3-sided structure is also an available measure, with a height at least equal to storage pile height. See also rule 8021 for construction and earthmoving activities, which requires wind barriers to be used along with water or chemical suppressants.	See Clark County rule 94, which includes materials storage and handling for construction and earthmoving activities. Sources must choose controls listed in Dust Control Handbook (See BMP 19 for Stockpiling, which includes a 3-sided barrier with height equal to pile height and with a porosity of 50 percent or less).	Meets RACM. This rule requirement blends other states' requirements, which are considered BACM. The rule is consistent with the general 50 percent porosity requirement, as well as material pile height limits. Like the other states, ASARCO must use the wind fences in conjunction with water suppression.
Materials being transported by vehicle must be covered by a tarp and the cargo compartment must be free of holes or other openings.	See Maricopa County rule 310, section 305.1 and 305.2, which requires haul truck loads of bulk materials to be covered by a tarp and that cargo compartments must be free of holes or other openings.	See Imperial County rule 802, which requires all haul truck loads of bulk materials to be completely covered or enclosed and that cargo compartments must be free of holes or other openings.	See San Joaquin Valley rule 8031, which lists several control measures, including covering haul trucks with a tarp and that cargo compartments must be free of holes or other openings.	See Clark County rule 94, which includes materials storage and handling for construction and earthmoving activities.	Meets RACM. This requirement is consistent with the other states' rules.

MATERIAL STORAGE PILES & MATERIAL HANDLING					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ *BACM**	**Imperial County APCD, CA *BACM**	**San Joaquin Valley APCD, CA *BACM**	**Clark County Dept of Air Quality, NV *BACM**	**R18-2-B1301.01 Evaluation**
Water suppression or handling postponement during high wind events.	While there is no requirement in Maricopa County's fugitive dust rule 310, there are similar requirements for nonmetallic mineral processing sources in rule 316, section 306. Rule 316 requires water suppression or ceasing operations during periods of high wind.	See rule 801 for Construction and Earthmoving Activities, where activity postponement and water suppression are available control measures during high winds.	See rule 8021 for Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities, which requires ceasing operations when the 20 percent opacity limit is exceeded due to wind.	See rule 94, which includes materials storage and handling for construction and earthmoving activities.	Meets RACM. This requirement is similar to other states' high wind control measures pertaining to nonmetallic mineral processing and construction.
Maintain rumble grates at all of the bedding plant area's entrances and exits for control of dust from loader tires.	See Maricopa County rule 310, section 306, which requires trackout control devices, including wheel wash systems, gravel pads, grizzly or rumble grates, or paving, for all exits onto areas accessible to the public at certain work sites.	See Imperial County rule 803, which lists control measures, including a track-out control device for all sites with access to a paved road and with 150 or more average vehicle trips per day, or 20 or more average vehicle trips per day by vehicles with three or more axles. Available trackout control devices include gravel pads, grizzlies, wheel wash systems, and paving.	See San Joaquin Valley rule 8041, which requires a trackout control device for any owner or operator of a site with 150 or more vehicle trips per day, or 20 or more vehicle trips per day by vehicles with 3 or more axles, and any owner or operator of an operation subject to a Dust Control Plan. Available trackout control devices include grizzlies, gravel pads, and paving.	See Clark County rule 94, which includes materials storage and handling for construction and earthmoving activities.	Meets RACM. While the other states may require trackout control devices at paved roads on work sites or public areas, these are considered BACM in other states, whereas the Hayden Pb NAA is required to meet RACM. Therefore, the rule requires a trackout control device (rumble grates) at the bedding plant area due to its traffic use. This requirement is consistent with ASARCO's Consent Decree with EPA.

Recordkeeping and Reporting

R18-2-B1301.01 Requirement	Maricopa County AQD, AZ *BACM*	Imperial County APCD, CA *BACM*	San Joaquin Valley APCD, CA *BACM*	Clark County Dept of Air Quality, NV *BACM*	R18-2-B1301.01 Evaluation
Current and past fugitive dust plans. Physical inspection sheets, checklists, and/or logsheets. All records of unpaved road stabilization and opacity tests and materials piles moisture content tests, if any. Maintenance, inspections, quality assurance and control, samples, and wind data from ambient air and meteorological stations, in addition to records of periods where monitors are inoperative. Recordkeeping system for fugitive dust sources, including visible emissions observations, corrective actions, water sprayer operations, chemical dust suppression application, timing of paved road cleaning, Reference Method 9 opacity readings, operating conditions, calibration records for measurement devices, and records for operational deviations.	See rule 310, section 502, which requires records relating to Dust Control Plans, consisting of evidence of inspections, clean-up measures, water usage, dust suppressant application, frequency, implementation of controls, results of test methods, etc. Also requires records for any operations not subject to a Dust Control Plan that provide evidence of control measure application, with type, extent of coverage, and date applied. Records must be retained for 2 years after the date of when such records were initiated. For any Title V sources, records must be retained for at least 5 years.	See rule 800, which requires records that provide evidence of control measure application and compliance with the rule. The records must describe the type of treatment/control measure, extent of coverage, and date applied, include frequency. Records must be retained for 2 years after date of each entry and available upon APCD request.	See rule 8011, which requires records for when a control measure is implemented, including type of control, location, date, frequency, etc. Records must be retained for one year following termination of dust-generating activities. For any Title V sources, records must be retained for at least 5 years.	For unpaved roads, rule 91 requires records that provide evidence of control measure application, coverage, and date applied. Records must be retained for at least 1 year. Written reports must also be submitted to document compliance. For paved roads, rule 93 requires records that provide evidence of control measure application, coverage, and date applied. Records must be retained for at least 1 year. Written reports must also be submitted to document compliance.	Meets RACM. The Hayden Pb dust rule requires that current and past fugitive dust plans be retained for at least 5 years and kept on-site for at least 2 years. Similar records include evidence of type of control applied, frequency, date of application, any corrective measures taken, etc. In general, the Hayden Pb dust rule requires similar records at other states' rules, with the same, if not longer, retention schedule. In addition to recordkeeping, the rule requires quarterly reporting.

Recordkeeping and Reporting					
R18-2-B1301.01 Requirement	**Maricopa County AQD, AZ **BACM***	**Imperial County APCD, CA **BACM***	**San Joaquin Valley APCD, CA **BACM***	**Clark County Dept of Air Quality, NV **BACM***	**R18-2-B1301.01 Evaluation**
Records must be maintained for 5 years and kept onsite for at least 2 years.					
Quarterly reports that include visible emissions observations, high wind event dates, corrective actions, progress on control construction, raw monitoring data and calculated ambient air concentrations.					

4.7.2.4 Comparison to South Coast Air Quality's Lead Acid Battery Recycling Facility Rule

In developing guidance for conducting a RACM/RACT analysis for the 2008 Pb NAAQS, EPA drew heavily upon California's South Coast Air Quality Management District (SCAQMD) rule 1420.1, which aims to control lead and arsenic emissions from large lead-acid battery recycling facilities. The SCAQMD rule was adopted prior to the publication of EPA's guidance document, and is in most cases, more stringent than what's federally required. Considering that SCAQMD rule 1420.1 applies to sources within the secondary lead smelter category, EPA used it for developing suggested RACM for the secondary lead smelter source category.

Because there are only three primary copper smelters in the U.S., RACM was not explicitly developed in EPA's guidance. Therefore, ADEQ drew upon EPA's suggestions for the secondary lead smelter category, a source that has somewhat similar emission points and processes to copper smelters. It should be noted again that rule 1420.1 was developed to comply with NESHAPs for secondary lead smelters, while ASARCO is required to comply with NESHAPs for primary copper smelters. Therefore, some requirements between the ASARCO rule and the South Coast rule differ. The requirements from SCAQMD's rule that are similar to the Hayden Pb dust rule are compared and evaluated in Table 4-8 below.

Table 4-8 Comparison & Evaluation of Pb Dust Rule to SCAQMD's Rule 1420.1

(SELECTED) DEFINITIONS		
R18-2-B1301.01 Definition	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
"*High wind event*" means any period of time beginning when the average wind speed, as measured at a meteorological station maintained by the owner or operator that is approved by the Department, is greater than or equal to 15 miles per hour over a 15 minute period, and ending when the average wind speed, as measured at the approved meteorological station maintained by the owner or operator, falls below 15 miles per hour over a 15 minute period."	No similar requirement.	Suggests RACM. While the South Coast rule does not have a high wind requirement for dust sources, the Hayden Pb dust rule definition is consistent with the Imperial County definition in Table 4-7.
"*Lead-bearing fugitive dust*" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.	See section (c), which defines "fugitive lead-dust" as: "any solid particulate matter containing lead that is in contact with ambient air and has the potential to become airborne."	Meets RACM. Both definitions describe Pb dust as being airborne/entrained, containing Pb, and in the form of particulate matter.
"*Material pile*" means material, including concentrate, uncrushed reverts, crushed reverts, and bedding material, that is stored in a pile outside a building or warehouse and is capable of producing lead-bearing fugitive dust.	No similar requirement.	Meets RACM. While South Coast rule does not have a definition, the Hayden Pb dust rule conforms to other PM_{10} rule definitions (see Table 4-7).
"*Non-smelting process sources*" means sources of lead-bearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads.	A somewhat similar definition for "process" in subsection (c), which is: "using lead or lead-containing materials in any operation including, but not limited to, the charging of lead-containing materials to smelting furnaces, lead refining and casting operations, and lead-acid battery breaking."	Suggests RACM. The South Coast rule does not have a definition for those sources of fugitive Pb dust. However, the definition for "process" in the South Coast rule is somewhat similar to the Hayden Pb dust rule, in that it applies to lead-containing materials from battery breaking, which is a source of fugitive dust. This consistency between definitions suggests that the Hayden Pb dust rule definition meets RACM.

(SELECTED) DEFINITIONS		
R18-2-B1301.01 Definition	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
"*Storage and handling*" means all activities associated with the handling and storage of materials that take place at the Hayden Smelter, including, but not limited to, stockpiling, transport on conveyor belts, transport or storage in rail cars, crushing and milling, arrival and handling of offsite concentrate, bedding, and handling of reverts.	See section (c), which defines "materials storage and handling area" as: "any area of a large lead-acid battery recycling facility in which lead-containing materials including, but not limited to, broken battery components, reverberatory furnace slag, flue dust, and dross, are stored or handled between process steps. Areas may include, but are not limited to, locations in which materials are stored in piles, bins, or tubs, and areas in which material is prepared for charging to a smelting furnace."	Suggests RACM. While the definitions differ and apply in different ways (i.e. storage and handling vs. storage and handling *areas*), the rules are generally consistent. Both address applicable sources of Pb dust as well as the storage and preparation/handling of such sources.
"*Trackout/carry-out*" means any materials that adhere to and agglomerate on the surfaces of motor vehicles, haul trucks, and/or equipment (including tires) and that may then fall onto the road.	No similar requirement.	Meets RACM. While the South Coast rule does not have a requirement or definition for trackout/carry-out, the Hayden Pb dust rule definition meets RACM based on the comparison to PM_{10} rules (see Table 4-7).

PAVED ROADS		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Clean roads at least once daily with a sweeper, vacuum, or wet broom in accordance with manufacturer recommendations.	See subsection (h)(9)(A), which requires vacuum sweeping of paved areas subject to vehicular or foot traffic three times per day.	Meets RACM. Subsection (D)(9) in the Hayden rule requires the frequency of cleaning that gets the Hayden NAA into attainment, as evident in the modeling. South Coast's cleaning frequency for large lead-acid battery recycling facilities is more stringent than what is required under NESHAPs for secondary lead smelters, which requires paved roads to be clean twice per day (see 40 CFR Part 63, Subpart X). However, no cleaning frequency is required under NESHAPs for primary copper smelters, such as ASARCO's Hayden Operations. Therefore, the rules once per day requirement meets RACM considering it is cost-effective and minimizes emissions to bring the area into attainment.
Rapidly clean up track-out and carry out on paved roads that extends a cumulative distance of 50 linear feet or more; clean all other trackout and carry out at the end of the workday.	See subsection (h)(9)(B), which requires vacuum sweeping immediately, no later than one hour after any maintenance activity or event that results in deposition of fugitive lead-dust.	Meets RACM. The Hayden rule requires similar rapid clean-up in subsection (D)(9)(c). Any trackout or carry-out on paved roads must be cleaned up "as expeditiously as practicable" and at the end of the workday. While the Hayden rule does not have a time limit similar to South Coast's rule, the Hayden rule is consistent with similar PM_{10} rules in other Southwest states (see Table 4-7).
Speed limit of 15 mph with signs posted**.**	See subsection (h)(11) which requires a plant-wide speed limit of 5 mph.	Meets RACM. The Hayden rule, subsection (D)(9), requires a speed limit for paved roads, which is consistent with other PM_{10} rules (see Table 4-7). While South Coast's plant-wide speed limit is lower than the Hayden rule, this would not be practical at ASARCO's Hayden Operations, where not all paved roads have the same traffic and operations, and thus vehicle speeds vary. The 15-mph speed limit was factored into the Pb emissions calculations and used to demonstrate attainment.

UNPAVED ROADS		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Chemical dust suppression application schedule for high-leaded unpaved roads, including slag hauler road, secondary crusher road, and reverts crushing operations roads.	Requires that all facility grounds to be encapsulated (paved, with concrete, asphalt, as approved by Executive Director). See subsection (h)(4).	Meets RACM. The Hayden rule, subsection (D)(10), is focused on unpaved roads that have the highest Pb content. While South Coast's rule requires that all facility grounds to be encapsulated, this requirement is consistent with NESHAPs for secondary lead smelters (see 40 CFR Part 63, Subpart X), and no such requirement exists under NESHAPs for primary copper smelters (see 40 CFR Part 63, Subpart QQQ). Furthermore, the control efficiency achieved through the application of chemical dust suppression was used in the modeling to demonstrate attainment.
20 percent opacity limit, silt loading limit of 0.33 oz/ft2, and silt content limit of 6 percent.	No requirement.	Meets RACM. As demonstrated in Table 4-7, the unpaved road stabilization requirements in the Hayden rule, subsection (D)(10)(c), are consistent with other states' PM_{10} rule requirements for unpaved roads. It is assumed that South Coast has no such requirement considering the rule complies with NESHAPs for secondary lead smelters, which requires all areas subject to vehicle traffic to be encapsulated (i.e. paved).
Maintain back-up watering trucks and personnel for visible emissions control.	No requirement.	Meets RACM. The Hayden rule, subsection (D)(10)(d), requires a protective measure should any visible emissions arise from treated unpaved roads. As shown in Table 4-7, other states' PM_{10} rule requirements for unpaved roads do not require such back-up measures. It is assumed that South Coast has no such requirement considering the rule complies with NESHAPs for secondary lead smelters, which requires all areas subject to vehicle traffic to be encapsulated (i.e. paved).
Immediate, but no later than 30 minutes after observation, application of water or chemical dust suppressant where visible emissions are observed.	No requirement.	Meets RACM. The Hayden rule, subsection (D)(10)(e), requires another protective and corrective measure should any visible emissions arise from treated unpaved roads. As shown in Table 4-7, other states' PM_{10} rule requirements for unpaved roads do not require such corrective measures. It is assumed that South Coast has no such requirement considering the rule complies with NESHAPs for secondary lead smelters, which requires all areas subject to vehicle traffic to be encapsulated (i.e. paved).
Reapplication of chemical dust suppressants within 24 hours of discovery of breakdown.	No requirement.	Meets RACM. The Hayden rule, subsection (D)(10)(f), requires an additional corrective action should any portion of treated unpaved road break down and be susceptible to dust emissions. As shown in Table 4-7, other states' PM_{10} rule requirements for unpaved roads do not require such corrective measures. It is assumed that South Coast has no such requirement considering the rule complies with NESHAPs for secondary lead smelters, which requires all areas subject to vehicle traffic to be encapsulated (i.e. paved).

UNPAVED ROADS		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Collection and prevention of runoff and/or sweeping material	No requirement.	Meets RACM. The Hayden rule, subsection (D)(10)(g), requires a protective measure against re-entrainment of Pb dust from runoff or sweeping materials on unpaved roads. As shown in Table 4-7, other states' PM_{10} rule requirements for unpaved roads do not require such protective measures. It is assumed that South Coast has no such requirement considering the rule complies with NESHAPs for secondary lead smelters, which requires all areas subject to vehicle traffic to be encapsulated (i.e. paved).
Speed limit of 15 mph with posted signs.	See subsection (h)(11) which requires a plant-wide speed limit of 5 mph.	Appears to generally meet RACM. The Hayden rule requires the same speed limit for unpaved roads as paved roads. While South Coast's plant-wide speed limit is lower than the Hayden rule, this would not be practical at ASARCO's Hayden Operations, where not all unpaved roads have the same traffic and operations (i.e. slag hauler versus general plant traffic), and thus vehicle speeds vary. The 15 mph speed limit for unpaved roads is consistent with paved roads, which essentially provides a restrictive limit for all roads with high leaded dust content. Furthermore, the Hayden rule says the speed limit shall not "exceed 15 mph," which will allow ASARCO to operate at speeds lower than 15 mph. The speed limit of 15 mph is also consistent with other PM_{10} rules (see Table 4-7).

STORAGE PILES		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Water sprays with a 10 percent surface moisture requirement for concentrate, crushed reverts, and bedding material.	Requires total enclosures for battery breaking areas, materials storage and handling areas, and dryer and dryer areas. Emissions from total enclosures are then vented to a lead emission control device. A sealed, leak-proof container is required for sources not stored in a total enclosure. See subsection (e).	Meets RACM. While South Coast's rule matches the requirements for NESHAPs for secondary lead smelters, ASARCO will be installing MACT measures under NESHAPs for primary copper smelters. Under NESHAPs for primary copper smelters, storage pile control measures include wind fences and water suppression. Therefore, the Hayden rule meets applicable MACT requirements and thus qualifies as RACT (see subsections (D)(11)-(D)(14).
Wind fences for concentrate, uncrushed reverts, crushed reverts, and bedding material.	Requires total enclosures for battery breaking areas, materials storage and handling areas, and dryer and dryer areas. Emissions from total enclosures are then vented to a lead emission control device. A sealed, leak-proof container is required for sources not stored in a total enclosure. See subsection (e).	Meets RACM. While South Coast's rule matches the requirements for NESHAPs for secondary lead smelters, ASARCO installed MACT measures under NESHAPs for primary copper smelters. Under NESHAPs for primary copper smelters, storage pile control measures include wind fences and water suppression. Therefore, the Hayden rule meets applicable MACT requirements and thus qualifies as RACT (see subsections (D)(11)-(D)(14). Furthermore, the use of wind fences helps bring the NAA into attainment.
Concrete pads for concentrate and crushed reverts.	Requires total enclosures for battery breaking areas, materials storage and handling areas, and dryer and dryer areas. Emissions from total enclosures are then vented to a lead emission control device. A sealed, leak-proof container is required for sources not stored in a total enclosure. See subsection (e).	Suggests RACM. While South Coast's rule matches the requirements for NESHAPs for secondary lead smelters, ASARCO is required to install MACT measures under NESHAPs for primary copper smelters. As shown in Table 4-7, no other states' PM_{10} rules require concrete pads. Therefore, the addition of concrete pads for these sources provide further protection when paired with wind fences and water sprays (see subsections (D)(11) and (D)(13).

STORAGE PILES		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Dry acid plant scrubber blowdown solids only in an enclosed system that uses a venturi scrubber, thickener, filter press, and electric dryer that is maintained under negative pressure. The negative pressure of the electric dryer enclosure is maintained using a 2,500 ACFM dyer ventilation fan to be used at all times the electric dryer is operational. Monitoring of the negative pressure is demonstrated through the run and stop states of ventilation fan and electric dryer.	Requires total enclosures for battery breaking areas, materials storage and handling areas, and dryer and dryer areas. Emissions from total enclosures are then vented to a lead emission control device. A sealed, leak-proof container is required for sources not stored in a total enclosure. Ventilation of a total enclosure at any opening must be maintained at a negative pressure of at least 0.02 mm of Hg (0.011 inches of H_2O) measured using a digital differential pressure monitoring system. See subsection (e).	Meets RACM. ASARCO's use of a total enclosure system for drying acid plant scrubber blowdown solids is consistent with South Coast's use of total enclosures for materials storage sources, which is required MACT under NESHAPs for secondary lead smelters (see 40 CFR 63.544). No total enclosure requirements exist for ASARCO's source category, primary copper smelters, under NESHAPs. Therefore, this Hayden rule requirement is more stringent and meets RACM (see subsection (D)(15).

AMBIENT AIR MONITORING		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Minimum four sampling sites required.	Minimum four sampling sites required, as approved by Executive Director. See subsection (j).	Meets RACM. The Hayden rule, subsection (F), is consistent with the South Coast rule.
Lead samples must be collected continuously at all sites, with 24-hour filters placed and collected at minimum, every 6 calendar days.	Lead samples must be collected daily as 24-hour, midnight-to-midnight samples at all sites. See subsection (j).	Meets RACM. South Coast's rule is more stringent than the NAAQS and federal requirements. The Hayden rule is consistent with federal ambient air monitoring requirements for Pb in 40 CFR 58.12.
Submit samples to a certified lab within 18 days after a filter's removal. The lab must then submit analysis/results to owner or operator within 21 days from lab's receipt of samples. The owner or operator must calculate and record within 14 days of results ambient lead concentrations.	Submit samples to SCAQMD-approved lab within 3 calendar days of collection and calculate ambient lead concentrations for individual 24-hour samples within 15 calendar days of the end of the calendar month in which samples were collected. See subsection (j).	Meets RACM. The Hayden rule is consistent with requirements set forth in the EPA/ASARCO Consent Decree and laboratory analysis requirements in the South Coast rule. The Hayden rule's time limits allow for more practicality for samples that are collected every 6 days, rather than South Coast's daily collection.
Must retain lead samples for at least 3 years.	Must retain lead samples for 1 year. See subsection (j).	Meets RACM. The Hayden rule requires samples to be retained longer than the South Coast rule to allow historical comparative analyses.
Follow the owner or operator's Quality Assurance Project Plan (QAPP) and operate monitors in accordance with 40 CFR Part 58, Appendix A.	Collect samples in accordance with 40 CFR Part 50, Appendix B and analyze samples in accordance with 40 CFR Part 50, Appendix G. See subsection (j).	Meets RACM. The Hayden rule is consistent with requirements set forth in the EPA/ASARCO Consent Decree. ASARCO's monitors will not be used for comparison to the NAAQS, therefore, a QAPP is a reasonable requirement. Should the monitors be used for NAAQS-comparison in the future, they will have been sited and operated in accordance with quality assurance requirements in 40 CFR Part 58, Appendix A. At that time, sample analysis and collection can then follow federal requirements rather than the facility's QAPP.
Continuously monitor and record wind speed and direction using station approved by Department.	Continuously record wind speed and direction using station approved by Executive Director. See subsection (j).	Meets RACM. The Hayden rule's meteorological monitoring requirements is consistent with South Coast's requirements.

RECORDKEEPING		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Current and past fugitive dust plans.	No requirement.	Meets RACM. While South Coast does not require a fugitive dust plan, the Hayden rule, subsection (H), is consistent with MACT requirements under NESHAPs for primary copper smelters (see 40 CFR 63.1445).
Physical inspection sheets, checklists, and/or log sheets.	Records of inspections of control equipment (see subsection (m)(1)(C)).	Meets RACM. The Hayden rule, subsection (H)(1), is consistent with South Coast's recordkeeping requirements for inspections.
All records of unpaved road stabilization and opacity tests and materials piles moisture content tests, if any.	No requirement.	Meets RACM. While the South Coast rule does not require an opacity limit to keep record of, or any road stabilization or moisture requirements, the Hayden rule does and such records must be retained to provide evidence of any opacity observations or soil stabilization tests. See subsection (H)(1).
Maintenance, inspections, quality assurance and control, samples, and wind data from ambient air and meteorological stations, in addition to records of periods where monitors are inoperative.	Results of all ambient air lead monitoring and meteorological monitoring. See subsection (m)(1)(B).	Meets RACM. The Hayden rule is consistent with recordkeeping of ambient air and meteorological samples and data requirements in the South Coast rule. See subsection (H)(1).
Recordkeeping system and records for fugitive dust sources, including visible emissions observations, corrective actions, water sprayer operations, chemical dust suppression application, timing of paved road cleaning, Reference Method 9 opacity readings, operating conditions, calibration records for measurement devices, and records for operational deviations. Records must also reflect who conducted the activity or observation, location/nature of activity, and dates and times.	Records of housekeeping activities, including name of person performing activity, and dates and times on which specific activities were completed. See subsection (m).	Meets RACM. The Hayden rule, subsection (H)(2), is consistent with similar recordkeeping requirements for housekeeping provisions in the South Coast rule.
Records must be maintained for 5 years and kept onsite for at least 2 years.	Records must be maintained for 5 years and kept onsite for at least 2 years. See subsection (m).	Meets RACM. The records retention requirement in the Hayden rule is consistent with the South Coast rule, as well as MACT requirements under NESHAPs for both source categories.

REPORTING		
R18-2-B1301.01 Requirement	**Rule 1420.1: South Coast AQMD, CA**	**R18-2-B1301.01 Evaluation**
Quarterly reports that include visible emissions observations, high wind event dates, corrective actions, progress on control construction, raw monitoring data and calculated ambient air concentrations.	By 15th of each month, the results of ambient air lead and wind monitoring. See subsection (n)(1).	Meets RACM. South Coast's reporting is more frequent to follow the daily ambient air monitoring collection requirements in the rule, whereas the Hayden rule, subsection (I), requires the correct reporting frequency to follow the continuous ambient air monitoring requirements (i.e. a 24-hour filter being placed and collected every 6 days).
	Notification and written report for any ambient air concentration exceedances.	Not applicable. The Hayden rule does not require a facility-wide ambient air concentration limit like South Coast. Instead, the Hayden rule requires an emissions limit for the main stack, consistent with the attainment modeling emission rates.
	Initial and ongoing facility status reports. Ongoing facility status reports must be submitted annually. See subsections (n)(3) and (n)(4).	Meets RACM. The Hayden rule, subsection (I), requires quarterly reporting, whereas the South Coast rule requires annual reporting.

4.8 Reasonable Further Progress

4.8.1 Requirements

CAA Section 172(c)(2) requires that nonattainment area plans demonstrate that the area will achieve reasonable further progress (RFP) defined as an incremental reduction in emissions before the attainment date. For Pb nonattainment areas, RFP does not need to be in the form of linear reductions, but instead is achieved through demonstration of adherence to an "ambitious compliance schedule"[112] which is "expected to periodically yield significant emissions reductions, and as appropriate, linear progress."[113]

4.8.2 Compliance Schedule

EPA recommends that Pb nonattainment SIPs provide a detailed schedule for compliance with RACM, including RACT, and accurately indicate the corresponding annual emission reductions to be achieved.[114] EPA notes that it is appropriate to expect early implementation of less technology-intensive measures, followed by more intensive controls later on. Should the area fail to implement such controls, sanctions and contingency measures would be triggered.[115]

Please note that the 2017 SIP control strategy generally coincides with controls in the Consent Decree, therefore, the control implementation schedule for measures included in the 2017 SIP submittal were tied to deadlines mandated by the Consent Decree (see the Control Implementation Schedule in Table 4-3). Controls for fugitive dust like wind fences began installation during 2017, and more intensive controls were implemented in 2018. The compliance date in the smelter rule (R18-2-B1301) is on the earlier of July 1, 2018, or 180 calendar days after completion of CRP improvements.[116] The compliance date in the Pb dust rule (R18-2-B1301.01) is December 1, 2018.[117]

The implementation schedule for new controls included in this 2023 SIP revision are shown in Table 4-9 below. Estimated emissions reductions attributable to implementation of each measure are included in Chapter 5 of the *Modeling Technical Support Document (TSD): Hayden Pb State Implementation Plan Revision* in Appendix B. Given the uncertainty in defining specific dates for implementation of the control measures in Table 4-9, the compliance schedule reflects and is tied to the date of smelter restart. The date of smelter restart is defined in SPR 97168 for the Hayden Smelter as the first day after permit issuance that concentrate is processed through the INCO flash furnace to produce matte. To account for

[112] *See* 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers, memorandum issued by Scott Mathias, U.S. EPA. (8 July 2011).
[113] *See* 73 FR 66964 (Nov. 12, 2008).
[114] 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers, memorandum issued by Scott Mathias, U.S. EPA. (8 July 2011).
[115] *See* 73 FR 66964, 67038 (Nov. 12, 2008).
[116] Note that the compliance date is the same date as the new rule for the 2010 SO_2 NAAQS applicable to ASARCO (R18-2-B1302). The controls mitigating leaded smelting emissions also mitigate SO_2 emissions, therefore, both rules have the same compliance date. The deadlines in the Consent Decree for these controls dictated the compliance date for both the Pb and SO_2 rules.
[117] Note that the compliance date for the Pb dust rule is later than the date for the smelter rule (R18-2-B1301). This is because some fugitive dust controls, like wind fences, are being installed at a staggered schedule due to resource use, meaning cost, personnel, and current facility configuration.

optimization of the control measures, they will be considered implemented when they become effective. This is also described in Attachment I of the permit revision for the Hayden Smelter (SPR 97168).

Table 4-9 Control Implementation Schedule for New Measures

Control Measure	Permit Condition	Implementation Schedule
Implementation of Flash Furnace Area Capture Improvements (Uptake Improvement System)	Install additional hooding and interceptor walls (the "Uptake Improvement System") to improve the capture of fugitive emissions from the flash furnace area, matte tapping and slag skimming areas, route them to the existing converter secondary hood baghouse for fabric filter and high surface area lime injection control, and then to the annulus of the main stack upon smelter restart.	**Upon smelter restart.**
	Establish operational ranges of the damper positions (Conditions II.A.2). Verify the positions by a stack test no later than 180 days after smelter restart.	**No later than 180 days after smelter restart.**
	Establish a timed interlock of the slag return launder. Submit the first analysis to the Director no later than 75 days after smelter restart.	**No later than 75 days after restart.**
Implementation of Converter and Material Transfer Area Capture Improvements (Fuming Ladle Capture System)	Install a hood and interceptor walls (the "Fuming Ladle Capture System") to provide a system for the capture of fugitive emissions from fuming ladles in the converter aisle and material transfer areas, route them to the existing converter secondary hood baghouse for fabric filter and high surface area lime injection control, and then to the annulus of the main stack each day upon smelter restart.	**Upon smelter restart.**
	Develop a training program for the Fuming Ladle Capture System and train the existing employees within 90 days of smelter restart.	**Within 90 days of smelter restart.**
	Conduct an initial flow test to verify that the system achieves the design flow within 180 days of smelter restart.	**Within 180 days of smelter restart.**
Implementation of Anode Furnace Secondary Hood Capture and Control System	Install secondary hoods around each of the anode furnaces to improve the capture of fugitive emissions from the anode furnaces during charging, holding and processing, route the emissions to a new anode secondary hood baghouse for fabric filter control, and then to the annulus of the main stack upon smelter restart.	**Upon smelter restart.**

Control Measure	Permit Condition	Implementation Schedule
	Establish a range of damper positions and total flow conditions based upon the anode secondary hood baghouse flow monitor within 180 days of smelter restart	**Within 180 days of smelter restart.**

For Pb nonattainment areas, RFP and contingency measure requirements are related. EPA recommends that the amount of emissions reduced by a contingency measure (or group of measures) should equal one year's worth of RFP emissions reductions.

Traditionally, emissions reductions contributable to contingency measures were measured in tons per year (tpy). But in areas where a single source is responsible for nonattainment, EPA thinks it reasonable to identify the amount of reductions required for contingency purposes by reference to reductions in ambient air concentrations. Considering that Pb emissions in the NAA are contributable to ASARCO's Hayden Operations, ADEQ used this ambient air concentration approach to measure contingency measure reductions. See section 4.9 below for more discussion on contingency measures.

4.9 Contingency Measures

4.9.1 Requirements

Under CAA section 172(c)(9), Pb nonattainment area plans must include contingency measures to be implemented if the area fails to meet reasonable further progress (RFP) requirements or fails to attain the NAAQS by the applicable statutory attainment date. Key requirements associated with contingency measures for Pb nonattainment areas are:[118]

- Contingency measures must be fully adopted rules or control measures that are ready to be implemented quickly without significant further action by the state or Administrator.
- The SIP should contain trigger mechanisms for the contingency measures.
- The SIP should contain a schedule for implementation of the contingency measures once triggered.
- The SIP must also indicate that the selected contingency measures are not relied upon to demonstrate RFP and are not part of the overall control strategy used to demonstrate attainment.
- Contingency measures should provide SIP-creditable emission reductions generally equivalent to one year's worth of RFP.

4.9.2 Required Reduction

As noted above, a contingency measure, or group of measures, must reduce emissions equal to or greater than the annual average reduction required to meet RFP goals. Annual average RFP is calculated by

[118] *See* 83 FR 31087 (July 3, 2018) and 73 FR 66964 (November 12, 2008).

subtracting attainment year emissions from base year emissions and then dividing that amount by the number of years between the attainment and base years. The basic formula is:

Annual average RFP = (Attainment level emissions – base year emissions) ÷ the number of years between the base year and attainment year

EPA guidance recommends using the year of designation as the base year and the attainment year for calculating the amount of emissions reduction necessary for contingency measures.[119] Although the Hayden area was designated nonattainment in 2014, EPA used ambient air monitoring data from 2012 to make the designation. Therefore, in the 2017 SIP, ADEQ used 2012 as the base year in the calculation to coincide with the monitoring data EPA used for designation and 2019 as the required attainment year.

As a result of EPA's January 31, 2022 determination that the area failed to attain the 2008 Pb standards by the October 3, 2019 attainment date, ADEQ is required to develop a new SIP revision including revised demonstrations for RFP necessary to show attainment of the Pb NAAQS by the new attainment date of January 31, 2027.[120]

EPA guidance explains that, "*traditionally the amount of reductions required for contingency measures has been measured in terms of tpy (tons per year) reductions at a source. However, where a single source is responsible for nonattainment, it may be possible to identify the amount of reductions required by reference to reductions in ambient air concentrations [monitored and modeled concentrations] ... EPA would need to evaluate the approvability of such an approach on a case-by-case basis based on the sources within the nonattainment area, the modeling used, and available control measures*."[121] Since one source contributes the majority of Pb emissions in the Hayden NAA, ADEQ estimated contingency measure reductions using ambient air concentrations.

The same formula for calculating emissions reductions in tpy applies to concentrations. For the Hayden NAA, ADEQ calculated annual average RFP using the following equation:

Annual Average RFP = (2026 modeled concentration – 2017 highest monitored rolling 3-month concentration) / 9 years

Because the necessary reduction is being measured in ambient air concentrations, ADEQ selected 2017 as the base year. This supports the requirement for relevant data as 2017 contains the most excursions above the level of the Pb NAAQS in recent years. Additionally, 2017 was the last year of normal operations at the ASARCO Hayden Smelter. During years 2018-2021 there were several shutdowns resulting in decreased or complete stoppage of production.

The highest monitored rolling 3-month concentration for 2017 was used, considering that in one year, there are actually 12 rolling three-month averages (one for each month). Using the highest recorded rolling 3-month concentration provides a more conservative approach rather than averaging the concentrations.

[119] *See Memorandum, 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers* at page 3, July 8, 2011, Scott L. Mathias, Interim Director Air Quality Policy Division, U.S. Environmental Protection Agency.

[120] *See* 87 FR 4805 (January 31, 2022).

[121] *See Memorandum, 2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers* at page 3, July 8, 2011, Scott L. Mathias, Interim Director Air Quality Policy Division, U.S. Environmental Protection Agency.

The annual average RFP is calculated below:

> *-0.016 μg/m³ (Annual Average RFP) = (0.134 μg/m³ (2026 modeled concentration) – 0.28 μg/m³ (highest rolling 3-month monitored concentration in 2017 highest monitored concentration)) / 9 years*

Therefore, contingency measures for the Hayden nonattainment area must reduce ambient Pb concentrations by -0.016 μg/m³ when triggered.

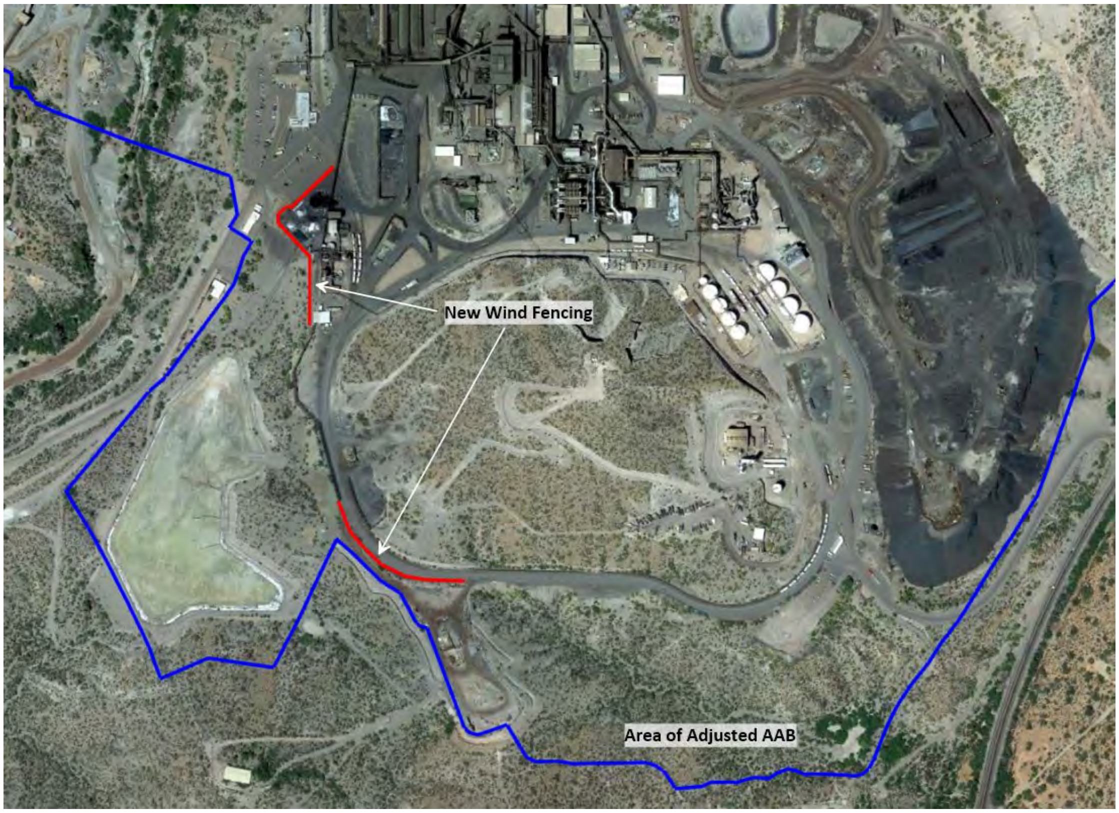
4.9.3 Selected Measures

The contingency measure selected consists of wind fencing on the north side of the filter plant and along the south side of the main haul road. The new wind fencing is indicated in red in Figure 3-3 below. The wind fencing provides control on possible windblown or reentrained dust from filter plant material handling and primary haul road emissions, including possible lead-bearing dust, that may be found in these areas. Wind fencing has been found to be an effective control at other areas of the Hayden smelter. In addition, ASARCO is required to expand the southern perimeter fence further south toward the chlorinator facility. This expansion lessens the likelihood of inadvertent exposure of the general public to possible lead-contaminated dusts reentrained from the southern haul road.

To model the revised emissions for the addition of the wind fencing and expansion of the perimeter fencing as shown in Figure 3-3, ASARCO revised the attainment model emission inventory to add 75% control of windblown or reentrained dust for the wind fence along only those segments of roadway immediately adjacent to the proposed wind fences and revised the southern ambient air boundary to reflect the new fencing boundary. The 75 percent control factor was developed during the EPA consent decree negotiations and appears consistent with observed performance of wind fences at other locations in the Hayden smelter at reducing wind velocities and associated reentrainment of dust particles.

The NAAQS design value from the attainment modeling is 0.134 μg/m³. The NAAQS design value after implementation of the proposed contingency measures is 0.105 μg/m³. The difference between the two concentrations is 0.025 μg/m³, which is more than the required reduction needed for contingency purposes (which is 0.016 μg/m³). Therefore, the addition of the wind and perimeter fencing achieves the required reduction needed to protect RFP and attainment.

Figure 3-3 Contingency Measure Wind Fencing



See Section 5.2 of the *Modeling Technical Support Document (TSD): Hayden Pb State Implementation Plan Revision,* provided in Appendix B, for additional discussion of wind fencing as well as a proposed precautionary expansion of the southern perimeter fencing to reduce the likelihood of exposure in this area.

The contingency measure is triggered upon the occurrence of any of the following:

- Failure to meet RFP, is failure to meet the compliance schedule that represents RFP (Table 4-9 of this document). Given the uncertainty in defining specific dates for implementation of the control measures in Table 4-9, the compliance schedule reflects and is tied to the date of smelter restart. The date of smelter restart is defined in SPR# 97168 for the Hayden Smelter as the first day after permit issuance that concentrate is processed through the INCO flash furnace to produce matte.

- Failure to attain the NAAQS by the statutory attainment date. Violating the permit effective dates for installation of controls would subject ASARCO to penalties. The contingency measure must be implemented within 60 days of notification by EPA Region 9 of such failure. These triggers, 60-day timeframe, as well as the actual contingency measure, are incorporated into the significant permit revision which serves as the regulatory text for this implementation plan revision, consistent with EPA guidance, which states that contingency measures should take effect "without further action by the state or the Administrator." EPA interprets this requirement to mean that no further rulemaking by the state, or EPA, would be needed to implement the contingency measures. By having the contingency measures already in the permit, there is no further action needed to implement the fencing project. ADEQ will ensure that the measures are fully implemented within the relevant timeframes.

The fencing project is also a practical contingency measure, as ASARCO is already operating other wind fences, which have been shown to be effective, as part of the 2017 SIP and consent decree. The location of the fencing is specifically targeted at areas where ASARCO expects that reentrainment may occur and for which control would be important to achieve attainment.

5 Attainment Demonstration

On January 31, 2022[122] EPA determined the Hayden NAA failed to attain the 2008 Pb NAAQS by the applicable attainment date of October 3, 2019. As a result of this determination, ADEQ is preparing a new SIP revision, which will include an updated model attainment demonstration. ADEQ conducted air quality modeling for the Hayden NAA to demonstrate attainment of the 2008 Pb NAAQS by 2026. Air quality modeling is conducted to show that the control measures, emission limits, and rules that will be implemented at the air pollution source(s) are adequate to provide for attainment and maintenance of the applicable NAAQS. The adequacy of control strategies is demonstrated by means of air quality models, databases, and other requirements specified in the Guideline on Air Quality Models in 40 CFR Part 51, Appendix W.[123] The modeling demonstration contains a summary of maximum air quality concentrations expected to result from implementation of the control strategy,[124] as well as a presentation of emission levels expected to result from implementation of each control measure.[125]

Modeling for the Hayden Pb NAA was performed in accordance with the EPA's Guideline on Air Quality Models (GAQM). Additionally, ADEQ referred to the "2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers" guidance document.

This chapter provides an overview of the methodologies and results from the modeling conducted to demonstrate that the control strategy for this SIP will bring the Hayden Pb NAA into attainment. More information can be found in the Attainment Modeling Technical Support Document (Modeling TSD) in Appendix B.

5.1 Modeling Demonstration Overview

There are many types of air quality modeling, and the type is selected based on the characteristics of the pollutant being modeled. Dispersion modeling is EPA's preferred type for modeling Pb. In general, dispersion modeling uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source. A dispersion model uses emission rates and meteorological inputs to predict ambient air concentrations. These air concentrations are modeled at specific locations—referred to as receptors—within the modeled ambient air boundaries. The receptors are located in areas that are accessible to people, therefore, areas that are considered ambient air.[126] The ambient air concentrations at these receptors and in the area as a whole determines attainment of the NAAQS.

5.1.1 Modeling Domain

The first step in modeling is to determine the size of the modeling domain, which depends on the number of sources to explicitly model and size of the receptor network in order to account for the areas of impact (U.S. EPA, 2014a). The modeling domain should at a minimum encompass the nonattainment area and include the sources thought most likely to cause or contribute to NAAQS violations in and around the

[122] EPA published this designation in 40 CFR Parts 52 as document 87 FR 4805 on January 31, 2022.
[123] *See* 40 CFR § 51.112.
[124] *See* 40 CFR § 51.115.
[125] *See* 40 CFR § 51.112.
[126] *See* 40 CFR § 50.1 for the legal definition of "ambient air."

nonattainment area. In the modeling exercise, all modeled receptors should exhibit modeled attainment of the NAAQS.

5.1.1.1 Modeled Emission Sources

ADEQ's Emissions Inventory (EI) for the Hayden Pb NAA includes point and area sources. The point source category contributes 99 percent of the Pb emissions in the NAA. Moreover, the only facility in this category is the ASARCO Hayden Copper Smelter. Due to this inventory make up, ADEQ focused its contributing sources analysis on the aforementioned facility.

At the ASARCO facility, ADEQ has determined the following processes/emissions points to be the contributors of Pb emissions:

- Main stack emissions
- Fugitive emissions from the smelting process
- Slag dumping
- Re-entrained leaded silts/material

5.1.1.2 Ambient Air Boundary and Receptor Grid

The land owned by ASARCO contiguous to and including ASARCO's Hayden Operations covers an area in excess of 15 square miles. This area extends along and on either side of the Gila River Valley approximately 4-1/2 miles to the west of the plant and extends into the Dripping Spring Mountains to the north and northwest. In addition, much of the area is inaccessible to the general public, either because it is fenced or because of the steep and rugged nature of the terrain. Consequently, much of ASARCO's property is not considered ambient air. The area encompassing the actual processes and industrial activities associated with the ASARCO Hayden Operations is considerably smaller and is located immediately to the north and east of the Town of Hayden.

ASARCO followed guidance in Section 3.4.3 of ADEQ's Air Dispersion Modeling Guidelines (ADMG) about how to identify, for permitting modeling purposes, the Ambient Air Boundary (AAB), outside of which modeling receptors are to be placed. This perimeter consists of fencing and steep/rugged terrain, and what ADEQ designates as the process area boundary (PAB).

This AAB used for the Pb SIP modeling is the same as that used for the SO_2 SIP modeling, with one exception: the AAB used for the Pb SIP modeling encompasses an additional narrow area extending down to the crusher, near the rail loading, which is a source of fugitive dust that may contain Pb. The SO_2 modeling over-conservatively treated this area as ambient air, even though it is a secure part of ASARCO's property and operations at the facility. The AAB used for the Pb SIP modeling does not encompass the railcar unloading area that is located across Highway 177, even though that area too is a secure part of ASARCO's property and operations. In this respect, the Pb SIP modeling is as over-conservative as the SO_2 SIP modeling, which also treated that area as ambient air.

A modeling domain with a total coverage of approximately 33 kilometers by 34 kilometers, centered on the ASARCO Smelter facility was developed. The modeling domain covers portions of Gila and Pinal Counties and encompasses the entire Hayden NAA. A total of 2,932 receptors were placed in the modeling domain. Spacing of the receptors is as follows:

- Receptors along AAB at a spacing of 25 m
- Receptors between AAB 500 m and ~1500 m at a spacing of 100 m (including in area of elevated terrain to the north)
- Receptors between ~1500 m and ~5500 m at a spacing of 500 m
- Receptors between ~5500 m and Hayden Pb NAA boundary at a spacing of 1000 m
- Receptors along the Hayden Pb NAA boundary at a spacing of 2500 m.

Additional methods are discussed further in the Modeling TSD.

5.1.2 Model Selection & Approach

5.1.2.1 AERMOD

ADEQ used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD), version 22112 for the attainment demonstration. to predict ambient concentrations in simple, complex and intermediate terrain. AERMOD is the recommended sequential model in EPA's GAQM (40 CFR 51, Appendix W) (U.S. EPA, 2005) for near-field analysis.

There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET (version 22112), a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP (version 18081), a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data. Other non-regulatory components of this system include: AERSURFACE (Version 200606), a surface characteristics preprocessor, and BPIPPRIM, a multi-building dimensions program incorporating the Good Engineering Practice technical procedures for PRIME applications (U.S. EPA, 2004a).

ADEQ used the regulatory default option. This option commands AERMOD to:

- Use the elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Use stack tip downwash (building downwash automatically overrides);
- Use the calms processing routines;
- Use buoyancy-induced dispersion; and
- Use the missing meteorological data processing routines.

5.1.2.2 Hybrid Modeling Approach

Situated in a low-lying portion of a valley, with mountains reaching over 4,000 feet to the north, east and southwest, the Hayden NAA is subject to a distinct mountain-valley diurnal wind pattern. Under stable atmospheric conditions, nighttime winds are typically from the southeast with speeds less than 10 miles per hour. These conditions cause air to pool in low-lying areas at night, causing pollutants within the air to settle in these areas. The up-slope air flows and convection that occur during the day increase dispersion out of the Hayden area. Under normal daytime conditions, surface winds in the Hayden area range from west-southwesterly to west-northwesterly as the atmosphere becomes less stable.

In the Hayden SO_2 SIP, Camera Hill meteorological (MET) data was used because it best represented MET conditions seen at the rooflines, which has the highest impact on ambient SO_2 concentrations. However, for the Hayden Pb SIP, a large number of sources exist near ground level, with a significant elevation difference with Camera Hill. Using the Camera Hill MET data to model these emission sources may not be representative of the actual Pb concentrations in the modeling area. Additionally, the very complex terrain in Hayden area causes the monitoring stations to experience different wind speeds and wind directions for a given time period. Considering all these issues, the previously approved hybrid approach was used to model ASARCO's Pb emissions. In this approach two different MET data sets were used to run AERMOD. Camera Hill MET data were used to model the emissions from the main stack and roofline fugitives, and Hayden Old Jail MET data were used to model the emissions from near ground sources such as material storage and handling and road dust emissions.

ADEQ's performance evaluation of the hybrid approach is in the Modeling TSD in Appendix B.

5.1.2.3 LEADPOST

The NAAQS for Pb is defined as 0.15 $\mu g/m^3$ for rolling three-month averaging time. Therefore, the modeled design value is calculated as the rolling three-month average concentration at each receptor. AERMOD does not calculate the design value, so post-processing is required.

The EPA post-processor, LEADPOST, can be used to calculate the design values. LEADPOST is a FORTRAN program designed to read monthly concentration output from AERMOD or an alternative model and calculate rolling three-month averages by receptor and source group. This program was used to calculate the maximum rolling three-month average concentration for each receptor and overall maximum concentration (across all receptors and source groups).[127]

In the hybrid approach, AERMOD was run separately using each of the MET data sets and their associated emission sources. Post-processing files containing highest monthly concentrations were generated for each run. Post-processing files were then processed to combine the concentrations predicted at each receptor. The combined Post-processing file was then used as an input to LEADPOST to calculate the maximum rolling 3-month average concentration.

5.1.3 Meteorological Data

EPA's AERMET tool (version 22112) was used to process meteorological data for use with AERMOD. AERMET merges National Weather Service (NWS) surface observations with NWS upper air observations and performs calculations of meteorological parameters required by AERMOD. Surface observations from on-site instruments can optionally be included. The latter can be useful because the data are more relevant to the site being modeled and in cases where on-site data are collected at multiple elevations above ground, AERMET can construct a more accurate vertical profile of meteorological data. In addition to the meteorological observations, AERMET further requires the inclusion of the characteristics of land use surfaces that ASARCO calculated using EPA's AERSURFACE tool.

EPA recommends that AERMOD be run with a minimum of 5 years of NWS data or 1 year of on-site meteorological data. As described in Section 5.1.2, a hybrid modeling approach was used for this project. The meteorological data used in the sequential modeling consists of on-site hourly surface observations collected by ASARCO from a 10-meter tower located approximately 0.35 kilometers south of the smelter building, on Camera Hill and also on-site hourly surface observations collected by ADEQ's Hayden Old Jail 10-meter station located approximately 1.06 kilometers west of the ASARCO concentrator and smelter complexes.

[127] EPA's User instructions for LEADPOST (Version 11237) program.

The Camera Hill met data were used to model the Pb emissions from the main stack and fugitive rooflines and Hayden Old Jail met data were used to model the emissions from lower elevation sources such as material storage and handling sources, paved roads, unpaved roads, etc. The meteorological data used in the modeling cover the entire 2020 calendar year, with the raw on-site data provided by ASARCO and ADEQ.

EPA's AERSURFACE tool (version 20060) was used to calculate the surface roughness length, albedo and Bowen ratio inputs required by AERMET. EPA developed AERSURFACE to identify these parameters within a defined radius from a specified point. In this case, ADEQ input the UTM coordinates of the on-site meteorological stations to AERSURFACE along with a 1-kilometer radius per EPA guidance. The modeling used land cover, tree canopy, and impervious surface information for the year 2016 as inputs to AERSURFACE. The parameters for twelve compass sectors of 30° each and by month were calculated. In original Met data processing for Hayden Pb SIP, the user-defined seasonal categories were assigned as follows per ADEQ guidance:

- Late autumn after frost and harvest, or winter with no snow: December, January, February, March;
- Winter with continuous snow on the ground: none;
- Transitional spring (partial green coverage, short annuals): April, May, June;
- Midsummer with lush vegetation: July, August, September; and
- Autumn with un-harvested cropland: October, November.

Meteorological data from the two ambient air monitors is provided in the Modeling TSD in Appendix B.

5.1.4 Background Concentration

EPA requires background air quality estimates to be added to modeling results for comparison to the NAAQS. For the Hayden Pb project ADEQ determined a background concentration based on a regional monitor to be more appropriate than local monitors. This determination was based on the nature of lead emissions from the facility. The smelter has been temporarily shut down since October 2019. Therefore, the background ambient air concentration of Pb used in the modeling analysis is derived from ambient air monitoring data that were generated from November 2019 through September 2022.

Ambient air monitoring data were generated by two state and local air monitoring stations in the Hayden Pb NAA—the one at Globe Highway to the east of the slag dump along Highway 77 and the one at Hillcrest in the town of Hayden. During November 2019 through September 2020, the data from the Hillcrest monitor had higher concentrations of Pb than the data from the Globe Highway monitor. Therefore, to be conservative, BSM's modeling analysis used a background concentration of Pb that has been calculated using the data from the Hillcrest monitor.

5.2 Modeling Results and Emission Limits

The Pb SIP modeling was conducted by executing two separate model runs—one using the Camera Hill meteorological data (for "elevated" sources) and one using the Hayden Jail meteorological data (for "low level" sources). The results of those two runs were combined using the LEADPOST post-processor.

The results of the modeling analysis are summarized in Table 5-1 below.

Table 5-1 Maximum Modeled Ambient Pb Concentration

Highest 3-Month Concentration (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)
0.134[a]	0.010	0.144	0.15
a. Highest 3-Month Concentration predicted to occur at (521358.8 m, 3651137.8 m)			

ADEQ's full modeling demonstration is in the Modeling TSD in Appendix B.

6 Anti-Backsliding Provisions

Section 110(l) of the CAA provides that EPA shall not approve a SIP revision if it interferes with attainment, reasonable further progress, or other CAA requirements:

> *"Each revision to an implementation plan submitted by a State under this Act shall be adopted by such State after reasonable notice and public hearing. The Administrator shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (as defined in section 171), or any other applicable requirement of this Act."*

In addition to 110(l), CAA §193 prohibits the modification of a control, or a control requirement, in effect or required to be adopted before November 15, 1990 in any nonattainment area unless such a modification ensures equivalent or greater emission reductions:

> *"Each regulation, standard, rule, notice, order and guidance promulgated or issued by the Administrator under this Act, as in effect before the date of the enactment of the Clean Air Act Amendments of 1990 shall remain in effect according to its terms, except to the extent otherwise provided under this Act, inconsistent with any provision of this Act, or revised by the Administrator. No control requirement in effect, or required to be adopted by an order, settlement agreement, or plan in effect before the date of the enactment of the Clean Air Act Amendments of 1990 in any area which is a nonattainment are for any air pollutant may be modified after such enactment in any manner unless the modification insures equivalent or greater emission reductions of such air pollutant."*

The 2008 Pb NAAQs proposed rule[128] states that "*any proposed SIP revision being considered by EPA after the effective date of the revised Pb NAAQs would be evaluated for its potential to interfere with attainment or maintenance of the new standard...EPA believes that any area attaining the revised Pb NAAQS would also attain the existing Pb NAAQS, and thus reviewing proposed SIP revisions for interference with the new standard will be sufficient to prevent backsliding*." Furthermore, EPA proposed to retain the existing 1978 Pb NAAQS until one year following the effective date of designations for any new or revised NAAQS, except that for current nonattainment areas, the standard would remain in effect until approval of a SIP for the new standard. EPA finalized[129] the proposed approach effective January 12, 2009.

No area in Arizona has ever been designated nonattainment for the 1978 Pb NAAQS.[130] The only area in Arizona designated nonattainment for the 2008 Pb NAAQS is Hayden. Therefore, Hayden only needs to attain the 2008 Pb NAAQS, and interference with the 1978 standards is not applicable.

The control strategies described in this SIP revision are intended to bring the Hayden area into attainment for the 2008 Pb NAAQS. The information contained in Chapters 4 and 5 evaluate the control strategies and emission reductions that will occur from implementation of the new control technology. The following sections demonstrate that this SIP revision will not interfere with the ability of the Hayden NAA to attain and maintain any other NAAQS under the CAA.

[128] *See* 73 FR 29184, 29275 (May 20, 2008).
[129] *See* 73 FR 66964 (Nov. 12, 2008).
[130] *See* 56 FR 56694 (Nov. 6, 1991).

6.1 Demonstrating Noninterference with Attainment of the NAAQS under CAA Section 110(l)

Title I of the CAA requires EPA to set NAAQS for those pollutants that are considered harmful to public health or the environment. Accordingly, the air quality standards are divided into two types: primary and secondary. Primary standards are designed for the protection of public health and secondary standards are intended to protect public welfare, such as decreased visibility and damage to animals, crops, vegetation, and buildings.[131] To date, EPA has established standards for six common air pollutants referred to as criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ground-level ozone O_3, particulate matter (PM), and sulfur dioxide (SO_2). EPA is also required to periodically evaluate those standards and revise them if scientific analyses indicate new standards would be more protective of public health and welfare.

Under Clean Air Act Section 107(d), states must make recommendations and EPA must designate areas that meet (attainment), cannot be classified, or do not meet (nonattainment) new or revised NAAQS. Based on air quality data and other factors, EPA designates areas as "nonattainment" if those areas are found to violate or contribute to violations of a NAAQS. Reasonable further progress is defined in Section 171 of the CAA as *"… such annual incremental reductions in emissions of the relevant air pollutant … for the purpose of ensuring attainment of the applicable national ambient air quality standard …"*

The Hayden Pb NAA is located in both Gila and Pinal counties in which a primary copper smelter currently owned by ASARCO operates. The area is designated as attainment or unclassifiable for CO, NO_2, O_3, and $PM_{2.5}$. The area is designated nonattainment for SO_2, Pb, and PM_{10}. Table 6-1 shows the current designation status of the area for each criteria pollutant listed in 40 CFR 81.303.[132]

Table 6-1 NAAQS Designations for Hayden

Designation Status for the Hayden Planning Area			
Pollutant	**Primary/Secondary**	**Averaging Time**	**Designation**
Carbon Monoxide (CO)	Primary (1971)	8-hour	Nonclassifiable/Attainment
		1-hour	Nonclassifiable/Attainment
Lead (Pb)	Primary and Secondary (2008)	Rolling 3-Month Average	Nonattainment
Nitrogen Dioxide (NO_2)	Primary (2010)	1-hour	Unclassifiable/Attainment
	Primary and Secondary (1971)	Annual	Cannot be classified or better than national standards
Ozone (O_3)	Primary and Secondary (2015)	8-hour	Unclassifiable/Attainment
	Primary and Secondary (2008)	8-hour	Unclassifiable/Attainment
	Primary and Secondary (1997)	8-hour	Unclassifiable/Attainment
$PM_{2.5}$	Primary (2012)	Annual	Unclassifiable/Attainment
	Primary and Secondary (2006)	24-hour	Unclassifiable/Attainment
	Primary and Secondary (1997)	Annual	Unclassifiable/Attainment
	Primary and Secondary (1997)	24-hour	Unclassifiable/Attainment

[131] U.S. Environmental Protection Agency, http://www.epa.gov/air/criteria.html. Date Accessed: April 12, 2023.
[132] *See* 40 CFR 81.303, July 1, 2015 Edition.

Designation Status for the Hayden Planning Area			
Pollutant	**Primary/Secondary**	**Averaging Time**	**Designation**
PM_{10}	Primary and Secondary (1987)	24-hour	Nonattainment
Sulfur Dioxide	Primary (2010)	1-hour	Nonattainment
	Primary (1971)	24-hour	Does not meet primary standards
	Primary (1971)	Annual	Does not meet primary standards
	Secondary (1971)	3-hour	N/A
Source: 40 CFR 81.303			

6.2 Noninterference with Attainment of the 1978 Pb NAAQS

In 1991, EPA finalized designations for the 1978 Pb NAAQS, in addition to designations for ozone, CO, and PM.[133] Designations became effective on January 6, 1992. In January and February 1991, EPA notified Governors of affected states that they should proceed to designate as nonattainment those areas that had recorded violations of the 1978 Pb NAAQS. States that were designated nonattainment included Alabama, Georgia, Indiana, Minnesota, Montana, but not any areas in Arizona. As stated earlier, Hayden needs to attain the 2008 Pb NAAQS and thus, interference with the 1978 Pb NAAQS is not applicable.

6.3 Noninterference with Attainment of the PM_{10} NAAQS

Along with Miami, the Hayden area was originally designated as a Group I Area under the 1987 PM_{10} NAAQS. The State was required to submit a SIP revision within nine months of promulgation of the NAAQS.[134]

In a 1990 clarification, the combined Hayden/Miami Group I Area was specified to include all or part of 26 contiguous townships in and around the towns of Hayden and Miami. Consistent with EPA's PM_{10} grouping scheme, the Hayden/Miami Group I Area was designated and classified as a moderate PM_{10} nonattainment area upon enactment of the 1990 CAA amendments.[135]

In September 1989 ADEQ submitted the *Final PM_{10} State Implementation Plan for the Hayden Group I Area.* In July 1994, EPA proposed a limited approval/disapproval of the Hayden SIP. EPA proposed the limited disapproval primarily because the plan only addressed the Hayden portion of the nonattainment area. ADEQ submitted a formal petition to exclude the Miami area from the Hayden/Miami PM_{10} Nonattainment Area in November 1994. EPA advised ADEQ that because the Miami area had recorded past exceedances of the TSP standards and had met the 1990 PM_{10} nonattainment designation criteria, the Miami portion could not be excluded from nonattainment area status.

In July 2006, ADEQ requested that the Hayden/Miami PM_{10} Nonattainment Area be separated into two nonattainment areas. The request was based on topographical and climatological differences between the Hayden and Miami areas (the areas are in separate airsheds) and the clean PM_{10} air quality record in

[133] *See* 56 FR 56694 (Nov. 6, 1991).
[134] *See* 52 FR 24672 (July 1, 1987) and 52 FR 29383 (Aug. 7, 1987).
[135] Effective November 15, 1990.

the Miami area (no exceedances have been recorded since PM_{10} monitoring began in 1987). On March 28, 2007 EPA concurred with ADEQ's request and the Hayden/Miami PM_{10} Nonattainment Area was officially split into two independent nonattainment areas.[136] In the same action, EPA also determined that the Miami Nonattainment Area had continued to meet the PM_{10} NAAQS and issued a clean data finding for the area. Currently, both Miami and Hayden are still designated nonattainment until ADEQ submits maintenance SIPs and redesignation requests.

Table 6-2 shows the potential PM_{10} emissions from operations at the Hayden Smelter. The data show that potential emissions have not changed from previous years and are not anticipated to change in future years.

Table 6-2 Potential PM_{10} Emissions for Hayden Smelter

Potential PM_{10} Emissions from Hayden Smelting Operations (tpy)						
Facility	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Hayden Concentrator	197	197	197	197	197	197
Hayden Smelter	290	290	290	290	290	290
Source: ADEQ Annual Emissions Data Reports						

Table 6-3 shows the actual emissions of PM_{10} at ASARCO's Hayden Concentrator and Hayden Smelter. While the potential to emit remains constant, actual emissions of PM_{10} for the smelter and concentrator decreased between 2018 and 2021.

Table 6-3 Actual PM_{10} Emissions for Hayden Smelter

Facility PM_{10} Actual Emissions (tons/year)				
Facility	**2018**	**2019**	**2020**	**2021**
Hayden Concentrator	0	0	0	0
Hayden Smelter	335.06	226.0	0.87	5.29
Source: ADEQ Annual Emissions Data Reports				

The area is nonattainment for PM_{10}; however, the addition of fugitive Pb dust controls implemented by ASARCO to comply with the Consent Decree and the Hayden NAA Pb SIP will reduce dust emissions in the area. The material handling PM_{10} emissions are subject to the fugitive controls from the 2017 Hayden Pb SIP. The evidence that those controls have been working is clean data (Pb) at the Hillcrest monitor in late 2018 and 2019. The controls being installed as part of this SIP revision will improve the capture of smelting fugitives, which will also reduce PM emissions as well. The reductions in fugitive Pb dust emissions, and thus PM emissions, achieved by the controls demonstrates noninterference with the PM_{10} NAAQS in the Hayden area.

[136] *See* 72 FR 14422 (March 28, 2007).

6.4 Noninterference with Attainment of the 1971 and 2010 SO_2 NAAQS

The Hayden SO_2 Nonattainment Area was initially designated under the 1971 SO_2 NAAQS in March 1978 and comprised all of Gila County.[137] The current boundaries of the nonattainment and unclassified areas are codified at 40 CFR 81.303.

In 2006, EPA initiated a review of the air quality criteria for oxides of sulfur and the 1971 SO_2 primary NAAQS.[138] Taking into consideration available literature, technical information, and scientific recommendations, EPA proposed that the 24-hour and annual 1971 SO_2 NAAQS were not adequate to protect public health with a satisfactory margin of safety against respiratory problems associated with short-term SO_2 exposures.[139] On June 22, 2010 EPA promulgated the new 2010 SO_2 NAAQS establishing a new short-term primary standard with a 1-hour (daily maximum) averaging time and a form defined as the 3-year average of the 99th percentile of the yearly distribution of 1-hour daily maximum concentrations, and a level of 75 ppb.[140] In the same action, EPA also revoked the 1971 24-hour and annual standards recognizing that a 1-hour standard set at 75 ppb will have the effect of generally maintaining 24-hour and annual SO_2 concentrations well below the levels of the 1971 24-hour and annual standards.

In the 2010 SO_2 NAAQS final rule, EPA determined that the 1971 24-hour and annual primary standard will remain in effect for at least one year following the effective date of the initial area designations before being revoked under 40 CFR 50.4(e). For any SO_2 areas with EPA-approved attainment and maintenance SIPs for the 1971 SO_2 NAAQS, all provisions in the SIPs need to continue to be implemented until they are subsumed by any new EPA-approved SIPs for the 2010 SO_2 NAAQS. This would ensure that both the new nonattainment NSR requirements and the general conformity requirements for a revised standard are in place so that there will be no gap in the public health protections provided by these two programs. It will also ensure that all nonattainment areas under the current NAAQS and all areas for which SIP calls have been issued would continue to be protected by currently required control measures.

The final regulations also stipulate that the 1971 SO_2 NAAQS shall remain in place for nonattainment areas not satisfying the requirements for a SIP call under the prior NAAQS. The 1971 SO_2 NAAQS will be revoked only after an air agency submits a SIP providing for attainment of the 2010 SO_2 NAAQS and it is approved by EPA.

ADEQ submitted to EPA the Hayden SO_2 Nonattainment Area State Implementation and Maintenance Plan for the 1971 SO_2 NAAQS in June 2002. EPA has not acted on the June 2002 submittal. Per EPA's guidance, the 1971 standard will not be revoked until the SIP revision for the 2010 SO_2 NAAQS is submitted to and is approved by EPA. Therefore, the state is required to continue to implement provisions of the 2002 Hayden SO_2 SIP. When the 24-hour and annual SO_2 standards are officially revoked, all statutory requirements related to future state submission regarding the 1971 SO_2 standards under CAA Sections 110, 172, 175A, 191 and 192 no longer apply. This includes any remaining requirements for the submittal of second 10-year maintenance plan required under CAA Section 175A.

ADEQ submitted the *Arizona State Implementation Plan Revision: Hayden Sulfur Dioxide Nonattainment Area for the 2010* SO_2 *NAAQS* and accompanying rules to EPA on March 8, 2017. On January 31, 2022, EPA

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[137] *See* 43 FR 8968 (March 3, 1978).
[138] *See* 71 FR 28023 (May 15, 2006).
[139] *See* 75 FR 35520 (June 22, 2010).
[140] *Id.*

published in the federal register the agency's findings that the Hayden Nonattainment Area failed to attain the 2010 1-hour SO_2 primary NAAQS by the applicable attainment date of October 4, 2018.

In March 2023 ADEQ submitted to EPA the draft *Arizona State Implementation Plan Revision: Hayden Sulfur Dioxide Nonattainment Area for the 2010 SO_2 NAAQS*. The attainment demonstration summarized in Chapter 5 of that draft revision and provided in Appendix C of that same revision show that the emission limit established for the Hayden Smelter will allow the area to attain the 2010 SO_2 NAAQS. Given the area will attain the new standard, which is more stringent than the previous standard, the control measures in this SIP revision addresses all outstanding requirements for the 1971 SO_2 NAAQS.

Furthermore, the control equipment part of the SO_2 SIP is the same equipment used in this Pb SIP's control strategy. The purpose of the control measures is to reduce emissions of SO_2, Pb, and leaded-PM_{10}. Given that the modeling for the 2010 SO_2 SIP shows attainment, implementation of the controls for Pb will not interfere with attainment of the 2010 SO_2 NAAQS.

6.5 Noninterference with Attainment of the CO, NO_2, $PM_{2.5}$, and Ozone NAAQS

The Hayden planning area is designated as attainment or unclassifiable for NO_2, CO, $PM_{2.5}$, and ozone (O_3).

Table 6-4 shows the potential emissions for NO_X, CO, and volatile organic compounds (VOCs). These estimates are for 2017 SIP controls. Post-control emissions from implementation of the 2017 SIP are expected to decrease or remain the same as current levels. New Pb controls included in the 2023 SIP are not expected to increase emissions of these pollutants. Given that the area is attainment/unclassifiable for NO_2 and CO, it is unlikely that the controls will interfere with those NAAQS in the Hayden area.

Table 6-4 Potential Emissions of NO_x, CO, VOCs

Potential Emissions (in tons per year)				
Pollutant	**Current Potential Emissions (tpy)**	**Post-Control Potential Emissions (tpy)**	**Emissions Difference (tpy)**	**Percent Difference**
NO_X	31.3	31.2	-0.1	-47.8
CO	26.3	26.2	-0.1	-2.4
VOC	1.7	1.7	0	0
Source: Arizona Department of Environmental Quality (2016). Technical Review and Evaluation of Application for Air Quality Significant Permit Revision No. 60647 to Operating Permit No. 1000042, ASARCO LLC – Hayden Smelter				

The primary constituents of O_3 (NO_X and VOC) are projected to decrease slightly or remain constant. Based on the recommendation of attainment/unclassifiable for NO_X, CO, and VOCs, the reductions in potential emissions achieved by the new control technology will result in noninterference with the O_3 NAAQS in the Hayden area. The control technology will also assist in capturing $PM_{2.5}$ emissions. Considering the area is attaining the $PM_{2.5}$ NAAQS, interference with continued attainment is not expected.

6.6 Noninterference with Regional Haze Requirements

The Hayden Smelter is subject to FIP requirements for NO_x and SO_2, and SIP requirements for PM_{10} under the Regional Haze Program. Under the FIP, the Hayden Smelter must comply with an annual emission limit of 40 tons per year of NO_x from the converters and anode furnaces.[141] To control PM_{10}, the smelter must continue to use the existing controls and meet specified provisions of the NESHAPs for Primary Copper Smelters.[142] The smelter must reduce SO_2 at both the converters and anode furnaces.[143] The converters must comply with an emission limit of 99.8 percent control efficiency on a 365-day rolling average for the primary system and 98.7 percent efficiency on a 365-day rolling average for the secondary capture system. The smelter must impose a work practice standard requiring the anode furnaces to be charge only with blister copper or higher purity copper.

Lead is not a pollutant regulated under the Regional Haze Program. However, the controls and requirements for PM_{10} will provide protection against any particulate matter with any leaded materials. Furthermore, the upgrades and improvements in the control technology at the Hayden smelter are in accordance with FIP and SIP requirements and thus will result in noninterference with the federal standards for Regional Haze.

Further, on August 15, 2022 ADEQ submitted its State Implementation Revision: Regional Haze Program (2018-2028). ADEQ deferred examination of the Hayden Smelter during the second implementation period due to existing effective controls to the facility.

6.7 Noninterference with Requirements for Consent Decree, CV-15-2206-PHX-DLR

On December 30, 2015 EPA and the Department of Justice announced a settlement with ASARCO LLC requiring the company to install new equipment and pollution control technology to reduce emissions of toxic heavy metals at the Hayden Smelter. ASARCO will also provide funding for local environmental projects, replace a diesel locomotive with a cleaner model, and pay a civil penalty.

The requirements outlined in the Consent Decree served as the foundation for the CRP and other control measures proposed in the SO_2 and Pb SIPs for the Hayden NAA. The control technology and other requirements all comply with the settlement and will result in noninterference with Consent Decree, CV-15-2206-PHX-JZB.

6.8 Air Toxics

The Mercury and Air Toxics Standards (MATS) are designed to reduce air pollution from coal and oil-fired power plants under CAA Section 111 (New Source Performance Standards) and 112 (Hazardous Air Pollutants/Air Toxics). Copper smelters are not subject to the MATS rules but they are required to comply with the National Emission Standards to Hazardous Air Pollutants (NESHAP) for Primary Copper Smelting.

The applicable NESHAPs for copper smelters are 40 CFR Part 63, Subpart QQQ and Subpart ZZZZ. ASARCO asserts that the Hayden Smelter is not a major source of hazardous air pollutants as prescribed in CAA Section 112 and the CFR. The upgraded controls and enhancements that were implemented per the requirements of the December 30, 2015 Consent Decree comply with CAA Section 112. Therefore, ADEQ concludes that this SIP revision will not interfere with any applicable air toxics requirements of the CAA.

[141] *See* 79 FR 52420 (Sept. 3, 2014).
[142] *See* 78 FR 46142 (Sept. 30, 2013), 79 FR 52420, 52448 (Sept. 3, 2014).
[143] *Supra* Note 130.

7 Environmental Justice

This section describes environmental justice (EJ) concerns that may be relevant to this SIP revision.

EPA defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA further defines the term fair treatment to mean that "no group of people should bear a disproportionate burden of environmental harms and risks, including those resulting from the negative environmental consequences of industrial, governmental, and commercial operations or programs and policies.[144]

First, this section examines EPA's EJ analysis in its proposed national emissions standards for hazardous air pollutants (NESHAP) for primary copper standards. Second, this section reviews the EJ Screen analysis performed by ASARCO.

7.1 EPA's Proposed Subpart QQQ Analysis

As part of EPA's Residual Risk and Technology Review (RTR) for the primary cooper smelting NESHAPs, EPA performed a baseline demographic analysis to identify how risks are distributed among different demographic groups of populations living within 5 km and 50 km of the Hayden and Miami copper smelters.[145]

EPA's proposed fugitive lead controls for the Subpart QQQ RTR noted that benefits of process fugitive emissions reductions at the Hayden smelter will go primarily to those living closest to the Hayden smelter as fugitive emissions have the greatest impact on frontline/fenceline communities in the Hayden Nonattainment Area.

In the Subpart QQQ RTR for lead, EPA found that "modeled exceedances of the NAAQS based on estimated actual emissions were estimated to occur only in a small area near Freeport (located in Miami, AZ)" rather than near the Hayden smelter.[146]

EPA noted in the Subpart QQQ RTR proposed fugitive controls, the benefits of process fugitive emissions reductions at the Hayden smelter will go primarily to those living closest to the Hayden smelter as fugitive emissions tend to have the greatest impact on frontline/fenceline communities.[147]

7.2 Screening Analysis

As part of its permit application, ASARCO conducted a screening analysis utilizing EPA's EJ Screen. EJ Screen is a mapping and screen tool developed by the EPA that uses a nationally consistent dataset and approach for combining environmental and demographic socioeconomic indicators.[148] This screening

[144] National Emissions Standards for Hazardous Air Pollutants: Primary Copper Smelting Residual Risk and Technology Review and Primary Copper Smelting Area Source Technology Review, 87 FR 1616, 1654 (Jan. 11, 2022) (internal citation omitted).
[145] *Id.*
[146] 87 FR 1616, 1642 (Jan. 11, 2022).
[147] *Id.* at 1644.
[148] Environmental Protection Agency, *What is EJ Screen?* (Oct. 11, 2022). Retrieved from https://www.epa.gov/ejscreen/what-ejscreen.

analysis is attached as Appendix D. EJ Screen provided the information contained in Table 7-1, looking at communities within a 10-mile radius from the Hayden smelter.

Table 7-1 EJ Screen Summary

Demographic Indicator	Value	State Average	State Percentile
People of color	60%	45%	70th
Low income population	42%	35%	66th
Linguistically isolated population	1%	4%	48th
Unemployment rate	10%	6%	81st
Population < high school education	17%	13%	70th
Population > 64 years of age	23%	17%	32nd
EPA calculated Demographic index	51%	40%	70th

As EPA points out in its *Interim Environmental Justice and Civil Rights in Permitting*, tools like EJ Screen can help support consistent approaches by using standard benchmarks to characterize the potential for disproportionate impacts.[149] EJ Screen indices simplify the use of benchmarks for initial screening by highlighting indices at the 80th, 90th, or 95th percentiles.[150] The 80th, 90th, or 95th percentiles are highlighted by EJ Screen to examine the potential for disproportionate impacts relative to state, regional and national averages.[151]

Based on the EJ Screen analysis (Appendix D), the Hayden area only exceeds the 80th percentile for unemployment. All of the indicators are at or below the 70th percentile. EJ Screen reported one indicator, for lead paint as exceeding the 50th percentile. This is based on a percentage of housing that is pre-1960. Under the EJ Screen analysis the communities within the Hayden nonattainment area do not appear to be overburdened.

EPA's EJ Screen Tool does not explicitly include either the SO_2 NAAQS or the lead NAAQS in its calculations. State and Local Air Monitoring System (SLAMS) data show exceedances of the 1-hour SO_2 NAAQS prior to the CRP and that some exceedances occasionally occurred at a much lower ambient concentrations after the CRP was completed. Those exceedances were due in large part to damage at the double contact acid plant preheater, which allowed strong SO_2 gas to escape. The escaping strong gas caused most of the elevated SO_2 readings in the vicinity of the Hayden smelter after the completion of the Converter Retrofit Project. These episodes came to a stop when the smelter was temporarily shut down as a result of a work stoppage on October 13, 2019. Similarly, there were some exceedances of the lead NAAQS before the Converter Retrofit Project. Almost all exceedances stopped after the Converter Retrofit Project was completed. Since that time, there have been a few exceedances, likely related to construction work conducted in the vicinity of the monitor showing the elevated reading. Because the NAAQS are designed to be protective of human health, albeit with a margin of safety, persistent occasional exceedances of a NAAQS as occurred in the Hayden area prior to the temporary shutdown in 2019 could make these fenceline/frontline communities within the Hayden Nonattainment Area potentially overburdened, at least with respect to SO_2 and potentially Pb. On the other hand, in the Subpart QQQ RTR for lead, EPA

[149] Environmental Protection Agency, Interim Environmental Justice and Civil Rights in Permitting (Aug. 2022), pp. 8-9, https://www.epa.gov/system/files/documents/2022-08/EJ%20and%20CR%20in%20PERMITTING%20FAQs%20508%20compliant.pdf.
[150] *Id*.
[151] *Id*.

found that "modeled exceedances of the lead NAAQS based on estimated actual emissions were estimated to occur only in a small area near Freeport" rather than near the Hayden smelter.[152]

In its permit application, ASARCO notes that data support the conclusion that the CRP, with the Uptake Improvement Project, Fuming Ladle Control Project and Anode Secondary Hoods Project, will reduce fugitive lead emissions from smelter process sources an additional 30 percent. Based on this data, the controls in this SIP revision will reduce the number of individuals in communities of concern potentially overburdened by elevated Pb emissions. Therefore, ADEQ asserts this SIP revision will reduce emissions sufficient to achieve the NAAQS and not interfere with EJ.

[152] *See* 87 FR 1616, 1642 (Jan. 11, 2022).

8 Conclusion

The 2008 Pb NAAQS were promulgated on November 12, 2008 based on EPA's research on human health effects of Pb pollution. As a result of violations at ambient air quality monitors, the Hayden planning area was designated nonattainment in 2014. The primary source of Pb emissions in the area is the primary copper smelter owned and operated by ASARCO LLC.

This SIP demonstrates, through modeling, an emissions inventory, and control measures that meet RACM/RACT requirements, the Hayden Pb planning area will attain the 2008 Pb NAAQS by its statutory attainment date. The attainment strategy for this SIP integrates control equipment already independently required by a Consent Decree between EPA and ASARCO in addition to new controls proposed in a 2023 permit revision. Should the area fail to attain, or fail to meet the compliance schedule required for Reasonable Further Progress, ASARCO must implement the required contingency measures.

By complying with nonattainment area related regulatory requirements under the Clean Air Act and applicable guidance, this SIP provides an enforceable vehicle to successfully mitigate Pb emissions in the Hayden nonattainment area in order to protect public health and the environment.

Appendix A: Emission Inventory Technical Support Document (TSD) for the 2008 Hayden Lead Nonattainment Area

Air Quality Division
April 15, 2024

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1 Introduction

On August 20, 2014, The United States Environmental Protection Agency (EPA) took final action to re-designate the Hayden Planning Area from unclassifiable to nonattainment for the 2008 Lead (Pb) National Ambient Air Quality Standard (NAAQS). The EPA published the final rule in the Federal Register (FR) on September 3, 2014, and the rule went into effect on October 3, 2014[1]. On January 31, 2022[2] the EPA determined the Hayden Nonattainment Area (NAA) failed to attain by the applicable attainment date of October 3, 2019.

Figure 1-1: ASARCO Copper Smelter

The Arizona Department of Environmental Quality (ADEQ) must prepare a new State Implementation Plan (SIP) revision demonstrating attainment with the 2008 Pb NAAQS. ADEQ has developed a comprehensive emission inventory of all Pb emissions within the Hayden Pb NAA.

The Hayden Pb NAA encompasses the portions of Gila and Pinal county bound by the townships and ranges outlined in Table 1-1. In Pinal County, the NAA excludes portions of townships and ranges found in the San Carlos Indian Reservation.

Table 1-1: Portions of Arizona Counties Designated Nonattainment

County	Portions of County Designated Nonattainment
Gila County	The portions of Gila County that are bounded by: T4S, R14E; T4S, R15E; T4S, R16E; T5S, R15E; T5S, R16E
Pinal County	The portions of Pinal County that are bounded by: T4S, R14E; T4S, R15E; T4S, R16E; T5S, R14E; T5S, R15E; T5S, R16E; T6S, R14E; T6S, R15E; T6S, R16E

Figure 1-2 is a detailed map of the portions of Gila and Pinal Counties that are bounded by the townships and ranges listed in Table 1-1. Figure 1-2 also includes the towns and Census Designated Places (CDP) within the Hayden Pb NAA.

[1] FR#: 2014-20920; Docket ID: EPA-R09-OAR-2014-0266
[2] EPA published this designation in 40 CFR Parts 52 as document 87 FR 4805 on January 31, 2022.

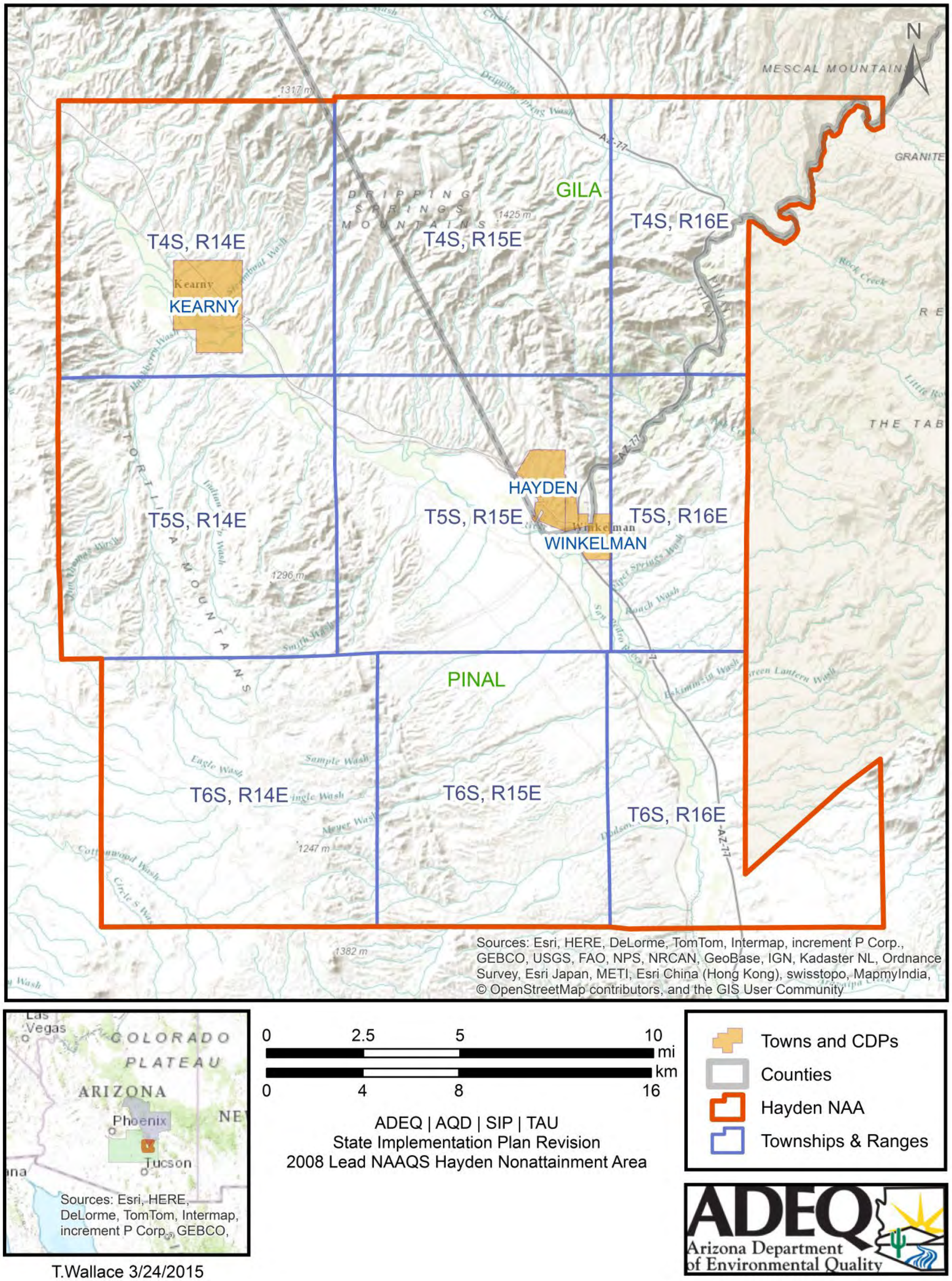

Figure 1-2: Nonattainment Area

1.1 Purpose

The purpose of this Technical Support Document (TSD) is to provide an emission inventory (EI) of Pb emission sources within the Hayden area. This document provides a detailed account of the processes ADEQ undertook to develop the emission inventory for the Hayden NAA. ADEQ will use the EI and analyses in this TSD as a regulatory tool to bring the area back into attainment with the NAAQS, and as the basis for the development of a modeling protocol for the attainment demonstration.

1.2 Lead Emissions in the Hayden Planning Area

Since 1965, with Clair Patterson's findings regarding leaded fuels, the phenomenon of airborne lead and its adverse health effects has been a focus of environmental policy makers. The largest at-risk demographics include children and pregnant women. In children, extensive exposure can lead to anemia, hearing problems, slowed growth, and behavior and learning issues. Regarding pregnant women, lead accumulates within the mother's bones, along with calcium. When released, the maternal calcium and lead is used to form the bones of the fetus. With this in mind, ADEQ has meticulously reviewed all significant sources in the Hayden NAA.

Within the 275 square mile NAA, the following source categories of Pb emissions were found: mobile nonroad, nonpoint, and point source. Mobile nonroad sources include modes of transportation that still use leaded fuels, comprising of piston-engine aircraft. The lead compound found in aviation fuel is tetraethyl lead. This compound is added to increase fuel octane, prevent engine knock, and prevent loss of compression for engines lacking hardened valves[3]. The Kearny airport is the only airport found in the bounds of the NAA.

Nonpoint sources of lead in the NAA are related to the storage and transport of gasoline, miscellaneous industrial sources, and miscellaneous non-industrial sources. Finally, the point source category is limited to one source, the ASARCO LLC (American Smelting and Refining Company) primary copper smelter found in the City of Hayden. The focus of the SIP revision will be on the ASARCO smelter due to it comprising the majority of the emission inventory (see Summary of 2017 Base Year Emission Inventories).

1.3 Emission Inventory Base Year Determination

ADEQ's Technical staff proposes a base year of 2017 for the SIP revision. The selection of 2017 as the base year supports the requirement for relevant data. The year 2017 contains the most excursions above the Pb NAAQS in recent years. Figure 1-3 and Figure 1-4 depict the 3-month rolling average Pb concentrations at both State and Local Air Monitoring Stations (SLAMS) monitors from 2017 to 2021. As seen in the figure, both monitors show the highest average concentrations in 2017.

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[3] EPA (December 2010). Calculating Piston-Engine Aircraft Airport Inventories for lead for the 2008 National Emissions Inventory. Office of Transportation and Air Quality. Ann Arbor MI. EPA-420-B-10-044

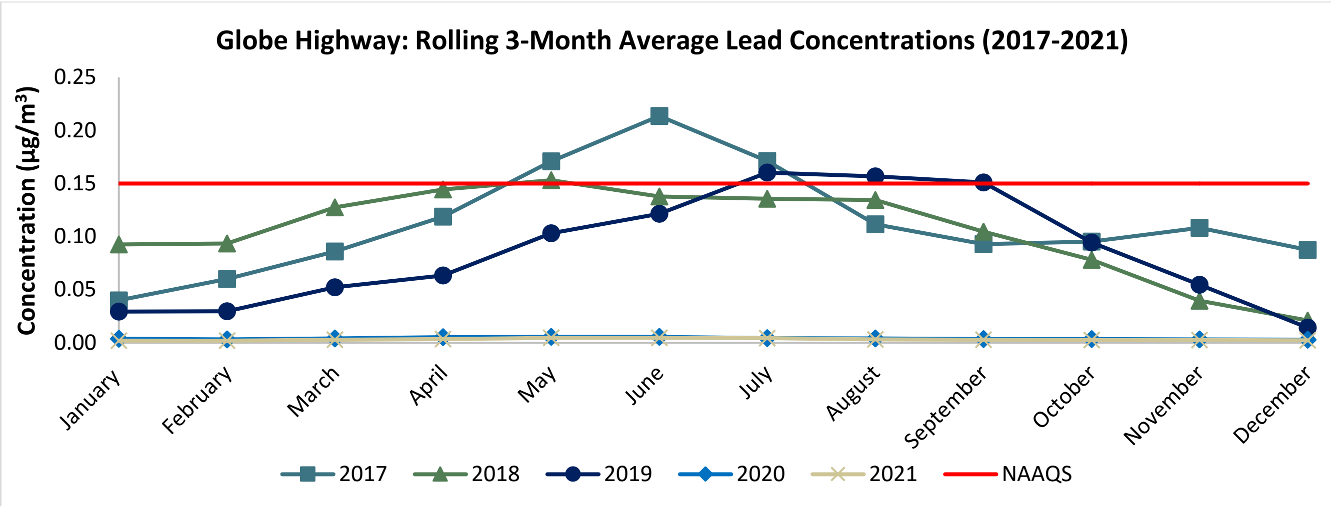


Figure 1-3: Globe Highway Rolling 3-Month Average

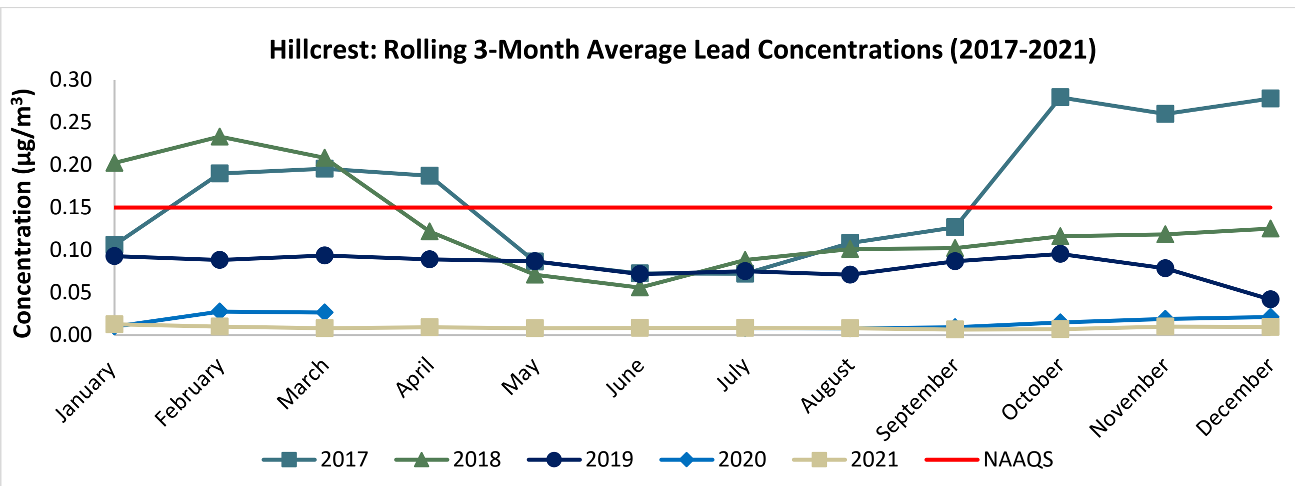


Figure 1-4: Hillcrest Rolling 3-Month Average

Additionally, 2017 was the last year of normal operations at the ASARCO Hayden Smelter (largest Pb source in the NAA). During the years of 2018-2021 there were several shutdowns at the Smelter, resulting in decreased or complete shutdown of production. Throughput of annual concentrate feed correlates with the reduction of operating hours throughout 2016-2021, as seen in Table 1-2 below. The ASARCO facility emissions are provided in Table 1-3 for comparison in tons per year (tpy) units.

Table 1-2: ASARCO Hayden Smelter Annual Operation

Smelter Annual Operation	
Year	**Hours**
2016	7,876
2017	7,848
2018	7,204
2019	6,408
2020	0
2021	0

Table 1-3: Annual ASARCO Smelter Emissions Data (tpy)

EMISSION UNIT	2016	2017	2018	2019	2020	2021
PRIMARY COPPER SMELTING	1.5799	2.6829	0.1422	-	-	-
PROCESS VENTILATION	0.988	1.1509	0.2393	-	-	-
Anode Refining Area	0.1044	0.1477	-	-	-	-
VEHICLE TRAFFIC	0.0545	0.0546	0.1043	0.0899	0.0052	0.005
STORAGE AND HANDLING	0.0149	0.011	0.0055	0.0042	0.0011	0.00087
SLAG DEPOSITION AREA	0.043	0.0404	0.033	0.0314	-	-
Coarse Revert Crushing Circuit	-	0.0153	0.0438	0.0739	0.0061	-
Fines Crushing Circuit	-	0.0498	0.1175	0.1501	0.0032	-
Anode Furnaces	-	-	0.0248	0.0033	-	-
CRUSHING OPERATIONS	-	-	0.0018	0.003393	-	-
FINE ORE OPERATIONS	-	-	0.0023	0.00157	-	-
Pierce Smith Converters	-	-	0.220222	0.124602	-	-
Flash Furnace	-	-	0.9685	0.7077	-	-
Flash Furnace/Converter Primary Ventilation	-	-	0.0041	0.0069	-	-
Slag Screening Ops	-	-	0.003	0.0061	0.0001	-
Annual Totals	**2.785**	**4.153**	**1.910**	**1.203**	**0.016**	**0.006**

In summary, ADEQ proposes 2017 as the base year for the following reasons:

- 2017 had the highest monitored ambient concentrations in recent years
- 2017 was the last year of normal operations at the ASARCO Hayden Smelter
- 2017 also had the highest reported emissions from ASARCO in recent years

1.4 Emissions Inventory Attainment Year Determination

ADEQ proposes 2026 for the attainment year EI. A 2026 attainment year incorporates the current uncertainty surrounding the timeline for ASARCO's proposed control installation and the required permitting process. Additionally, 2026 was selected to provide alignment with the SO_2 SIP (includes 2026 attainment year), which is being concurrently developed for Hayden area.

2 Population and Urbanization

Gila County is one of five interior counties in the central part of Arizona; it is surrounded by Yavapai and Maricopa Counties to the west, Coconino and Navajo Counties to the north, Pinal County to the south, and Graham County to the southeast. The county seat of Gila County is Globe, which lies approximately 74 linear miles east by south from Phoenix. The incorporated communities of Hayden, Miami, Payson, Star Valley, and Winkelman also reside within Gila County, as does the town of San Carlos, which is located on the San Carlos Apache Reservation. The Arizona Department of Administration (ADOA) estimated the 2017 population of Gila County at 53,325 persons. Gila County had a 2020 population density of only 11.2 persons per square mile, compared to 480.4 and 62.9 persons per square mile for Maricopa County and the state respectively[4].

Pinal County is one of five interior counties in the central part of Arizona; it is surrounded by Gila County to the north, Graham County to the east, Pima County to the south, and Maricopa County to the north and west. The county seat of Pinal County is Florence, which lies approximately 61 linear miles southeast from Phoenix. The incorporated communities of Apache Junction, Casa Grande, Coolidge, Eloy, Kearny, Mammoth, and Superior also reside within Pinal County. ADOA estimated the 2017 population of Pinal County at 400,950 persons. Pinal County had a 2020 population density of 79.3 persons per square mile, compared to 480.4 and 62.9 persons per square mile for Maricopa County and the state respectively[5].

2.1 Hayden Lead Nonattainment Area

The Hayden Pb NAA has been codified in 40 CFR 81.303 and is comprised of the portions of Gila County and Pinal County bound by the townships and ranges listed in Table 2-2 and represented geographically in Figure 1-2. Population estimates for the entire Hayden Pb NAA as well as the respective proportions of Gila and Pinal Counties are also presented in Table 2-2. The Hayden NAA encompasses the towns of Hayden, Winkelman and Kearny, for which population data have been included in Table 2-1.

Table 2-1: Towns in Hayden Pb NAA

Hayden Pb NAA Towns[6]	
Location	**2017 Population**
Kearny	1,787
Hayden	548
Winkelman	308

[4] Note: from US Census Bureau, *State and County QuickFacts.* U.S. Department of Commerce. Retrieved from: https://www.census.gov/quickfacts/fact/table/gilacountyarizona,US/PST045221 on October 6, 2022.
[5] Ibid. Retrieved from: https://www.census.gov/quickfacts/fact/table/pinalcountyarizona,gilacountyarizona,US/PST045221 on October 6, 2022.
[6] ADOA 2017 population estimate. *Population Estimates for Arizona Counties, Incorporated Places & Balance of County.* Retrieved from: https://www.azcommerce.com/oeo/population/population-estimates/

Table 2-2: Geographic Location and Population

Hayden Pb NAA[7]			
Land Area:		275 square miles	
2017 Population:		4,409	
2026 Projected Population:		3,679	
Gila County Portion		**Pinal County Portion**	
Land Area:	58 square miles	Land Area:	217 square miles
2017 Population:	1,176	2017 Population:	3,233
2026 Projected Population:	982	2026 Projected Population:	2,697
Township, Range		**Township, Range**	
4S, 14E		4S, 14E	
4S, 15E		4S, 15E	
4S, 16E		4S, 16E	
5S, 15E		5S, 14E	
5S, 16E		5S, 15E	
-		5S, 16E	
-		6S, 14E	
-		6S, 15E	
-		6S, 16E	

2.2 Hayden Lead Nonattainment Area Population and Land Use

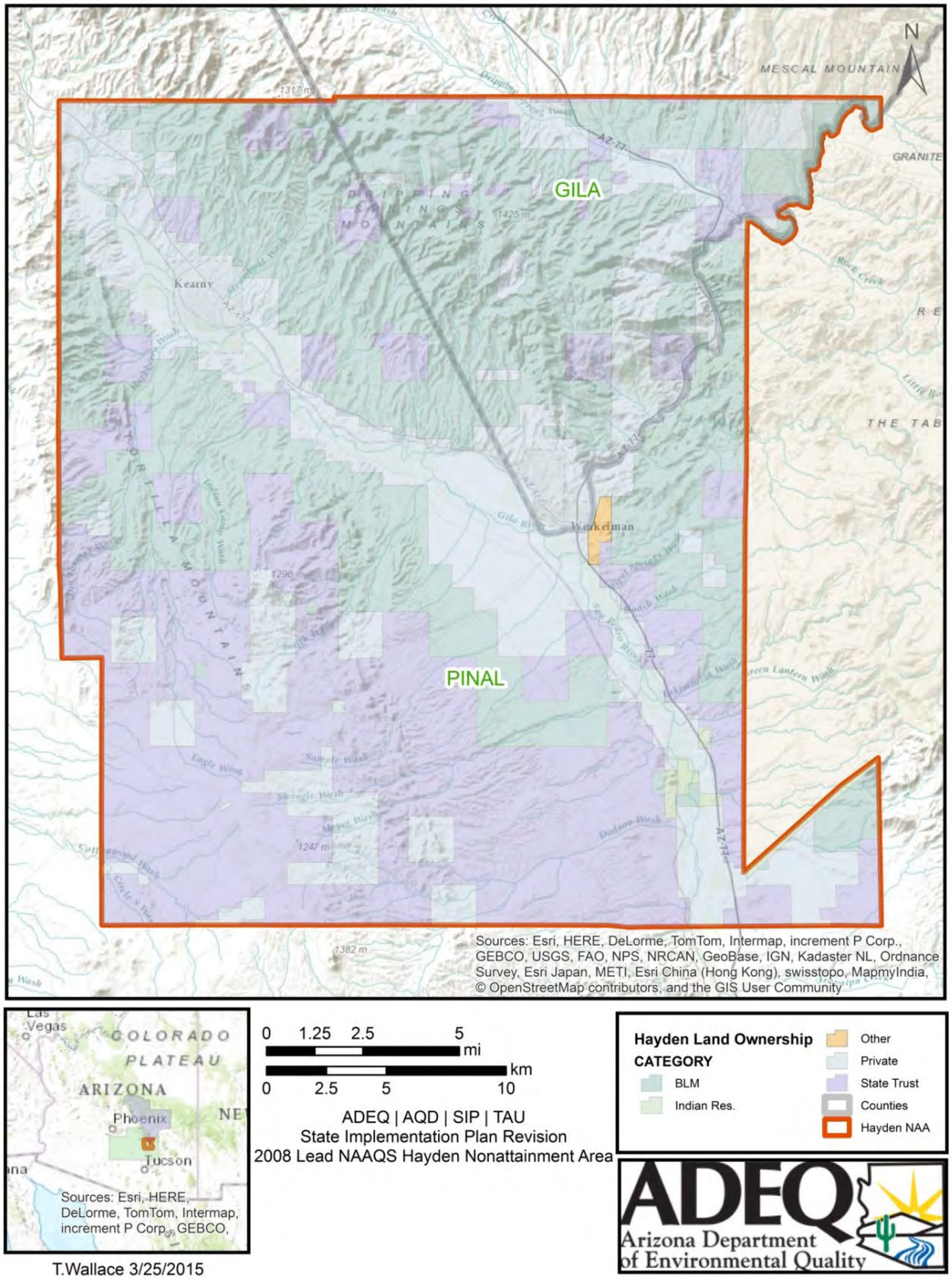
The Hayden NAA encompasses portions of two counties: Gila and Pinal. The Gila County portion of the NAA is approximately 58 square miles[8] while the Pinal County portion is 217 square miles[9]. The majority of the land within the NAA is owned and managed by either the Bureau of Land Management (39.1%) or the Arizona State Land Department (35.5%). The remainder of the land within the NAA is comprised of privately held land along with a small area of land located to the east of Winkelman, which the Bureau of Reclamation manages. The San Carlos reservation, which is located east of Hayden, is not included in the NAA. A breakdown of the land owners in the Hayden Pb NAA are presented in Table 2-3 and Figure 2 1.

Table 2-3: Land Use Area

Hayden Pb NAA[10]		
Land Owner	**Area (square miles)**	**Area (percentage of NAA total)**
Bureau of Land Mgmt.	106.816	39.1%
State Trust Land	96.876	35.5%
Private Land	68.932	25.2%
Bureau of Reclamation	0.499	0.2%

[7] ADOA provided land area estimates and population estimates and projections for ADEQ in an internal report.
[8] ADOA provided land area of Gila & Pinal Counties
[9] ADOA provided population & population projections for Gila & Pinal Counties
[10] Land use information for both Gila County and the Hayden NAA was garnered from the Arizona Land Resource Information System (ALRIS) GIS tool managed by the Arizona State Land Department.

Figure 2-1: Hayden Lead Nonattainment Area Land Use Map



3 Nonattainment Area Meteorology and Monitored Ambient Lead Concentrations

This section discusses the meteorological (MET) conditions and ambient air Pb concentrations pertinent to the SIP revision. Since the nonattainment designation was based on data from a monitor adjacent to the ASARCO Hayden smelter, this discussion will focus on the town of Hayden (where the smelter and monitors are located). Section 3.1 describes the network of MET and ambient air Pb monitoring stations present in the NAA. This network is comprised of monitors owned and operated by ADEQ and ASARCO. Section 3.2 discusses the meteorological and ambient concentration analysis.

3.1 Meteorological & Ambient Lead Monitoring Network

Three meteorological monitors are found within the area of study; two are maintained by ADEQ and the other by ASARCO. The two MET monitors maintained by ADEQ are located at the Hayden Old Jail and Globe Highway monitoring sites. The Hayden Old Jail monitor is located approximately 0.66 miles west of the ASARCO concentrator and smelter complexes, and the Globe Highway monitor is located approximately 0.59 miles to the east of the ASARCO Smelter. The ASARCO monitor is located at the Camera Hill site, about 0.22 miles south of the smelter.

Table 3-1 summarizes the locations of the MET and Pb monitoring stations used in ADEQ's meteorology and ambient air analysis. A map of these monitoring locations is provided in Figure 3-1. In October 2010, ADEQ established an air quality monitor at the Globe Highway monitoring site within the Hayden NAA. ADEQ installed an additional air quality monitor at the Hillcrest monitoring site in January 2016. These two monitors are currently the only SLAMS monitors in the NAA with AQS-certified data that can be used to determine NAAQS compliance.

Table 3-1: Hayden MET & Ambient Pb Monitoring Stations

Hayden Monitoring Stations				
Site Name	**Distance to Smelter (miles)**	**Latitude**	**Longitude**	**Elevation (feet)**
ADEQ MET Monitors				
Globe Highway	0.59	33.00251	-110.76545	1,962
Hayden Old Jail	0.66	33.00621	-110.78645	2,043
ASARCO MET Monitors				
Camera Hill	0.22	33.00046	-110.775	2,292
ADEQ Pb Monitors				
Globe Highway	0.59	33.00251	-110.76545	1,962
Hillcrest	0.39	33.00363	-110.78232	2,111

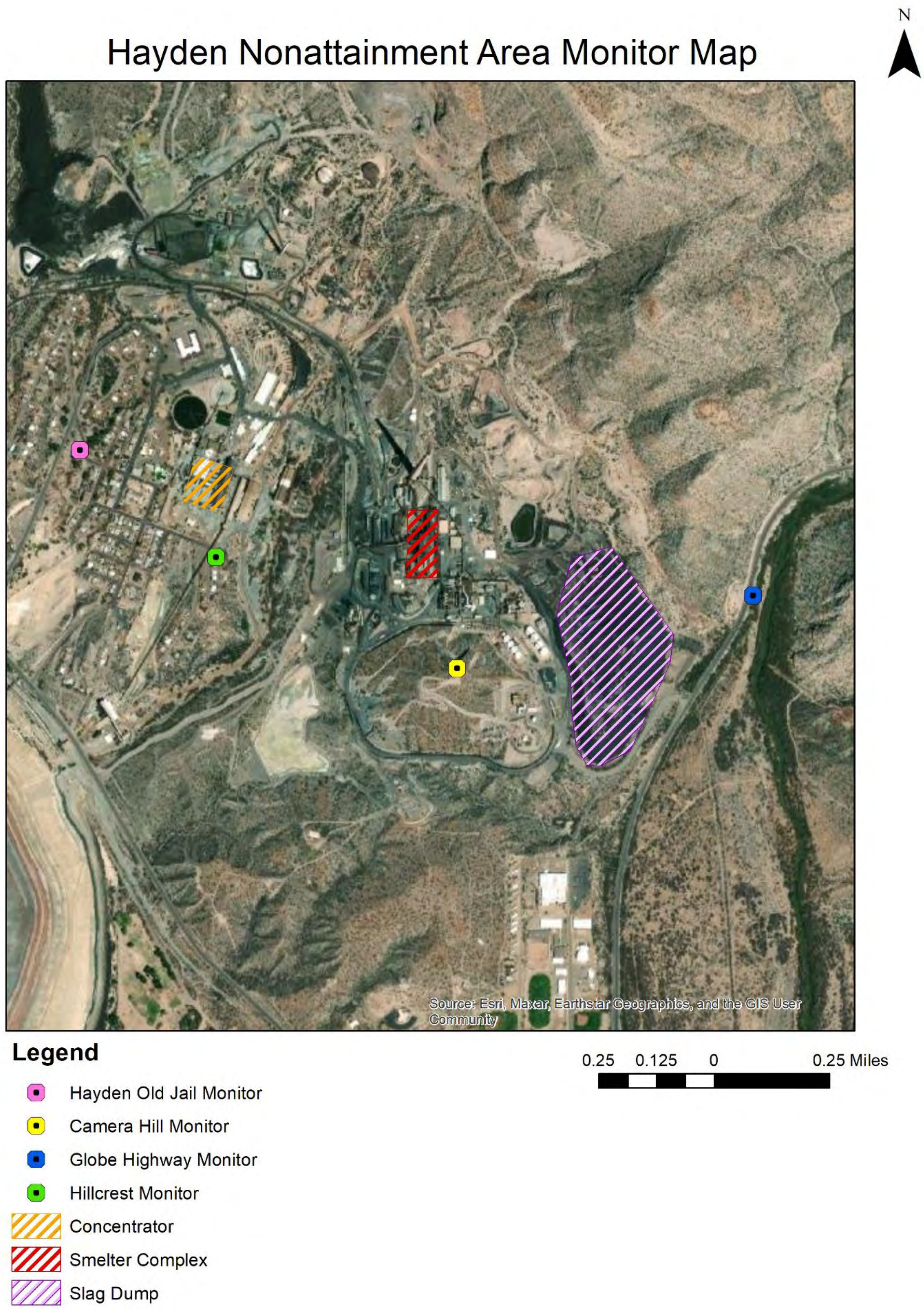


Figure 3-1: Map of Hayden MET & Ambient Monitoring Stations

Figure 3-2 is provided below to illustrate the monitor elevations relative to the ASARCO smelter.

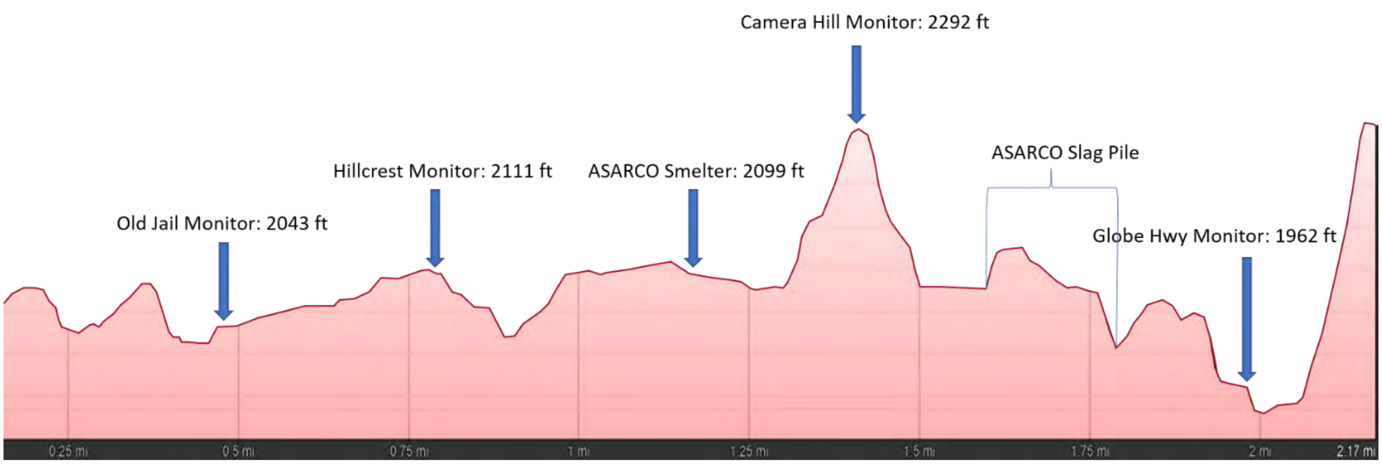


Figure 3-2: Hayden Monitoring Network Elevation Profile

3.2 Hayden Planning Area Meteorological and Ambient Lead Analyses

The purpose of this analysis is to understand how various meteorological scenarios affect ambient air Pb concentrations within the town of Hayden. This is accomplished by analyzing meteorological patterns within the area and identifying which patterns correspond to high ambient lead concentrations at relevant monitors.

Although the emission inventory base year is 2017, this analysis includes ambient and meteorological data from 2017-2021. When comparing monitored concentrations from different years, it is important to keep in mind controls ASARCO installed in April of 2018 as part of the Converter Retrofit Project (CRP) and their indefinite shutdown in October 2019.

3.2.1 Meteorological Profile

Situated in a low-lying portion of a valley, with mountains reaching over 4,000 feet to the north, east and southwest, Hayden is subject to a distinct mountain-valley diurnal wind pattern. Under stable atmospheric conditions, nighttime winds are typically from the southeast with speeds less than 10 miles per hour (4.47 meters per second). These conditions cause air to pool in low-lying areas at night, causing pollutants within the air to settle in these areas. The up-slope air flows and convection that occurs during the day increase dispersion out of the Hayden area. Under normal daytime conditions, surface winds in the Hayden area range from west-southwesterly to west-northwesterly as the atmosphere becomes less stable. This pattern is repeated throughout the complex terrain found in the Hayden area.

During the wintertime, relatively strong inversions (where cold air becomes trapped at the surface by warmer air aloft) create extremely stable atmospheric conditions. Depending on the strength of the inversion and amount of daytime surface heating, the inversion may break by the early afternoon, permitting the air to mix vertically. Sometimes, however, the inversion may not break at all. Under these conditions, vertical and horizontal movement of the air is very limited, causing pollutants in the air to accumulate up to several days with little dispersion.

The following subsections describe the meteorological conditions in the area surrounding the ASARCO copper smelter. The Globe Highway, Hayden Old Jail, and Camera Hill MET monitors are analyzed to determine the prevailing meteorological conditions in the Hayden NAA, specifically wind speed and direction. These conditions are then analyzed alongside ambient concentrations to characterize dispersion of the pollutant.

3.2.1.1 ADEQ Monitor (Globe Highway)

The Globe Highway monitor sits a half mile northeast of the smelter complex and is adjacent to the Gila River (Figure 3-1). The monitor is located in a river valley with the valley crest roughly 350 feet above the monitor elevation. This river valley runs northeast to southwest. Although there is some seasonal variation, the winds at this monitor follow this same general pattern (Figure 3-3). This pattern consists of winds out of the northeast in the early to mid-morning hours, and southwesterly winds in the afternoon and into the night. Wind speeds at this monitor are generally low; between 2017 to 2021, the maximum hourly wind speed reached 10.5 mph and the average hourly wind speed was 1.8 mph.

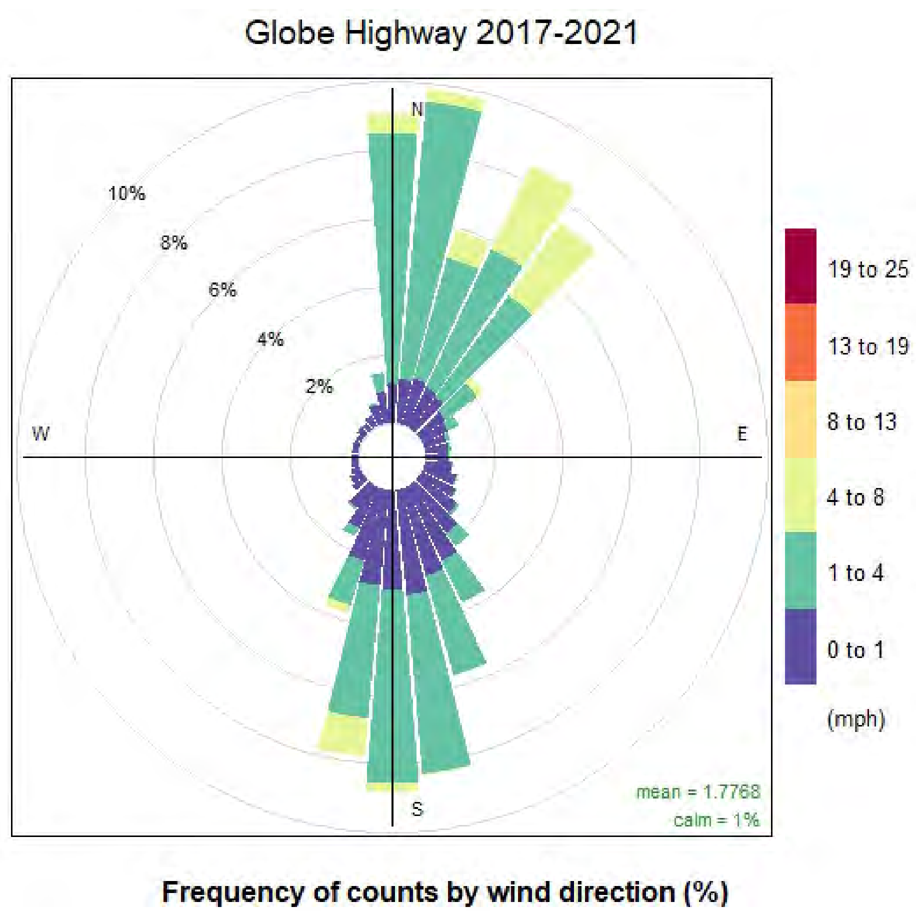


Figure 3-3: Globe Highway Wind Rose

3.2.1.2 ADEQ Monitor (Hayden Old Jail)

The Hayden Old Jail monitor is located approximately 0.66 miles to the west of the ASARCO smelter, at a bearing of ~286°. The wind rose in Figure 3-4 shows that winds are primarily out of the southeast and west, although they are observed to originate from all directions. This effect is due to the bowl-like topography present at the Hayden Old Jail monitor (Figure 3-2), which is situated in a low-lying area surrounded by points of higher elevation. Between 2017-2021, the maximum hourly wind speed was 23.3 mph and the average hourly wind speed was 2.8 mph.

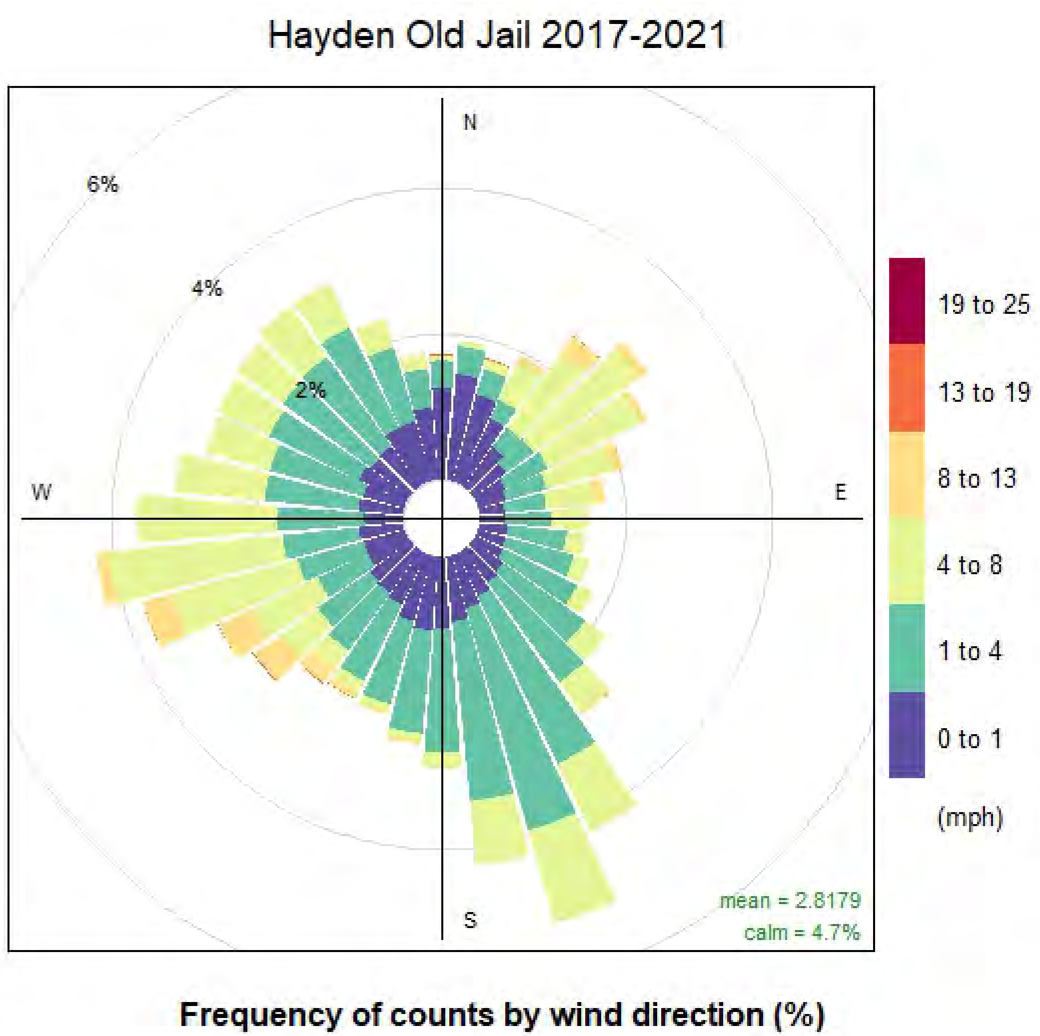


Figure 3-4: Hayden Old Jail Wind Rose

3.2.1.3 ASARCO Monitor (Camera Hill)

The Camera Hill monitor is located approximately 200 feet higher in elevation than the smelter complex (still significantly lower than the main stack) and 0.22 miles southeast of the concentrator aisle. This monitor is sited at the highest elevation of all MET monitors being analyzed and therefore reports the highest wind speeds. From 2017-2021, the max hourly wind speed reached 41.6 mph and the average hourly wind speed was 8.8 mph. The wind rose in Figure 3-5 illustrates the wind patterns from 2017 to 2021. In early morning hours the winds are out of the east/southeast and in the afternoon winds out of the west dominate. On average, these western winds are highest in speed. Although strong winds are also seen out of the northeast, these northeasterly winds only make up roughly 19% of the hourly wind directions seen from 2017-2021.

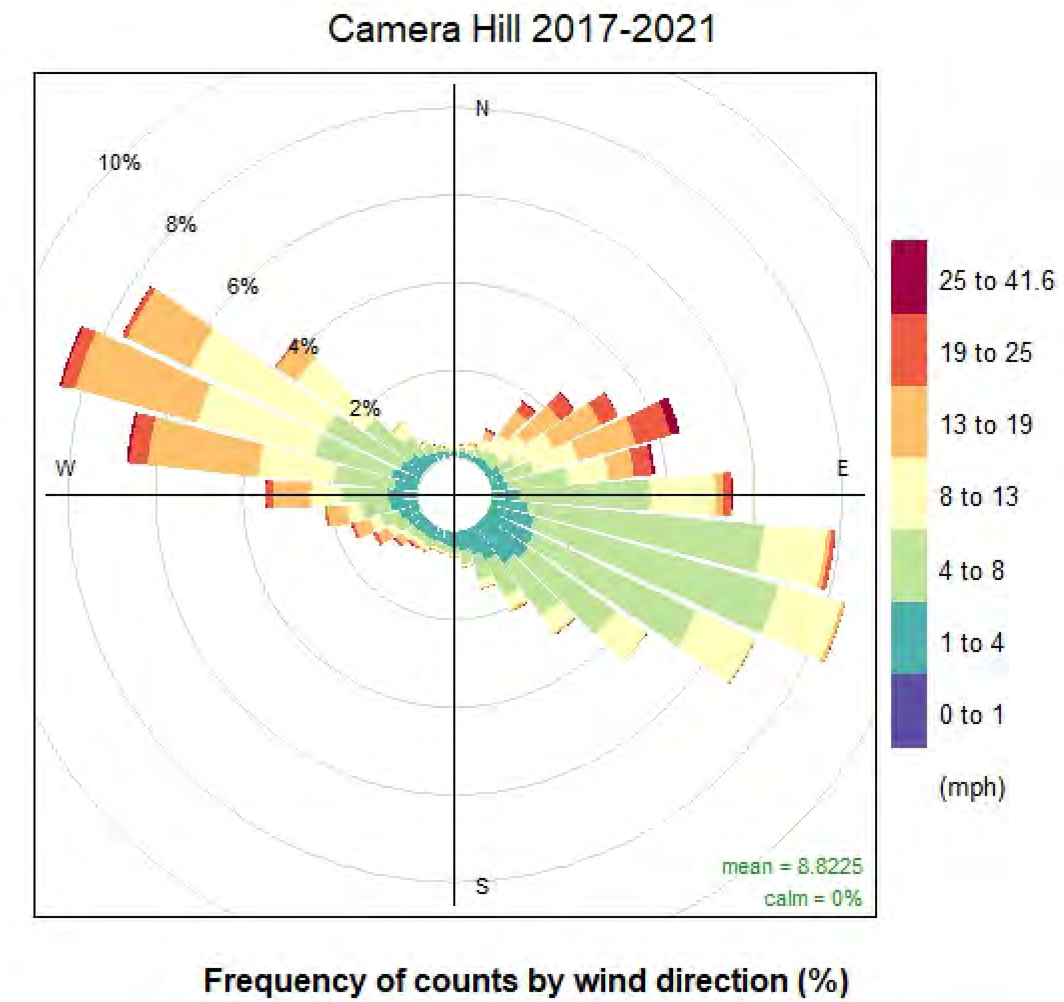


Figure 3-5: Camera Hill Wind Rose

3.2.2 Analysis of Lead Concentrations

The following section describes reported ambient air lead concentrations at the Globe Highway and Hillcrest SLAMS monitors. The Hillcrest monitoring site was not established until 2016 and, therefore, only the Globe Highway monitor was used in the nonattainment designation. 24-hour ambient air lead concentrations were typically reported on a weekly basis between 2017 to 2021. Both the primary and secondary NAAQS for lead are defined as a 3-month rolling average with a level of 15 μg/m^3. Herein, the term "exceedance" refers to any ambient lead concentration over the NAAQS of 0.15 μg/m^3. Whereas, the term "violation" is used to refer to a rolling 3-month average concentration that violates the NAAQS for lead.

3.2.2.1 Globe Highway Monitor Lead Concentrations

As discussed in previous sections, the Globe Highway monitor is located roughly a half mile east of the smelter in a river valley. Figure 3-6 presents the rolling 3-month average ambient lead concentrations at the monitor from 2017 to 2021.

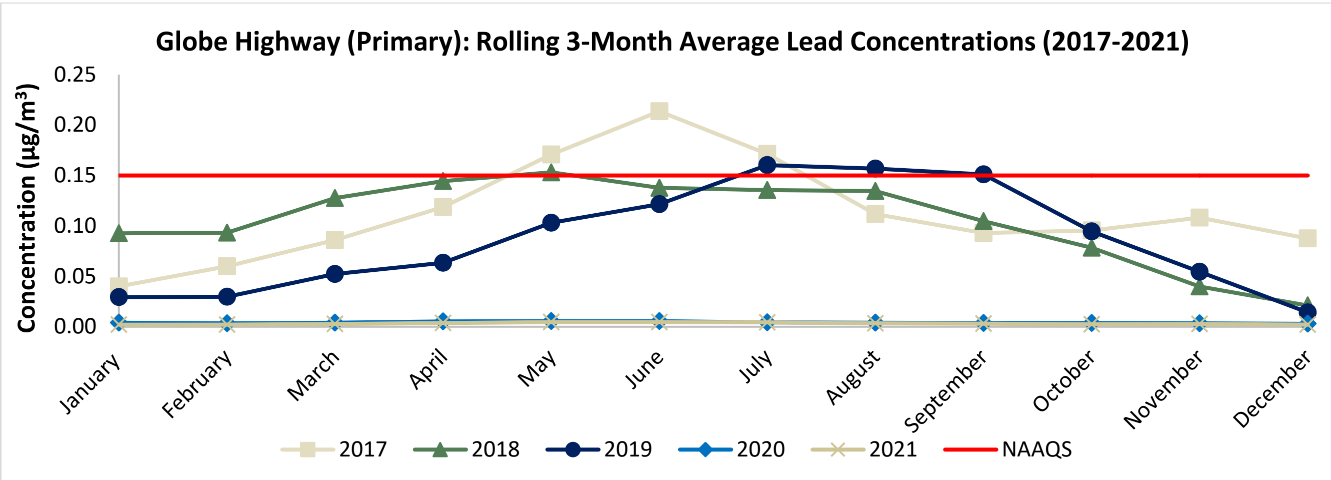


Figure 3-6: Globe Highway Rolling 3-Month Average Lead Concentrations

In 2017, three rolling 3-month average ambient lead concentrations violated the NAAQS standard of 0.15 µg/m^3. These months were May, June, and July with concentrations of 0.17, 0.21, and 0.17 µg/m^3, respectively. Data from the following year (2018) showed only one NAAQS violation, in May, with a rolling 3-month average concentration of 0.153 µg/m^3. With the exception of May, the rolling 3-month average concentrations began to decline after implementation of the CRP controls in April 2018. Still, there were twenty-one exceedances between the time of CRP implementation and Smelter shutdown. In 2019, violations occurred in July, August, and September with concentrations of 0.16, 0.16, and 0.151 µg/m^3, respectively. These violations were primarily the result of four exceedances that occurred in July 2019, where the monthly average concentration was 0.21 µg/m^3.

On October 13th of 2019, the ASARCO Smelter was shut down due to the declaration of a work stoppage by the ASARCO bargaining unit and has not since been in operation. Between January 2017 and October 13th 2019, there were forty-five exceedances reported at the Globe Highway monitor. Following the shutdown, no violations or exceedances occurred for the remainder of 2019 and the entirety of 2020 and 2021.

3.2.2.2 Hillcrest Monitor Lead Concentrations

The Hillcrest Monitor is located 0.39 miles east of the smelter complex, at roughly the same elevation. Figure 3-7 displays the rolling 3-month average lead concentrations at the monitor from 2017-2021. Note that rolling averages could not be determined for April – June 2020 due to missing April data.

In 2017, NAAQS violations occurred from February to April and again from October to December. Violations continued to occur each month until April of 2018 when CRP controls were implemented. Since then, no violations have been reported at the monitor. Figure 3-7 also shows that the highest ambient air lead concentrations occur in the winter months, which is most likely due to inversions that are typical of the area.

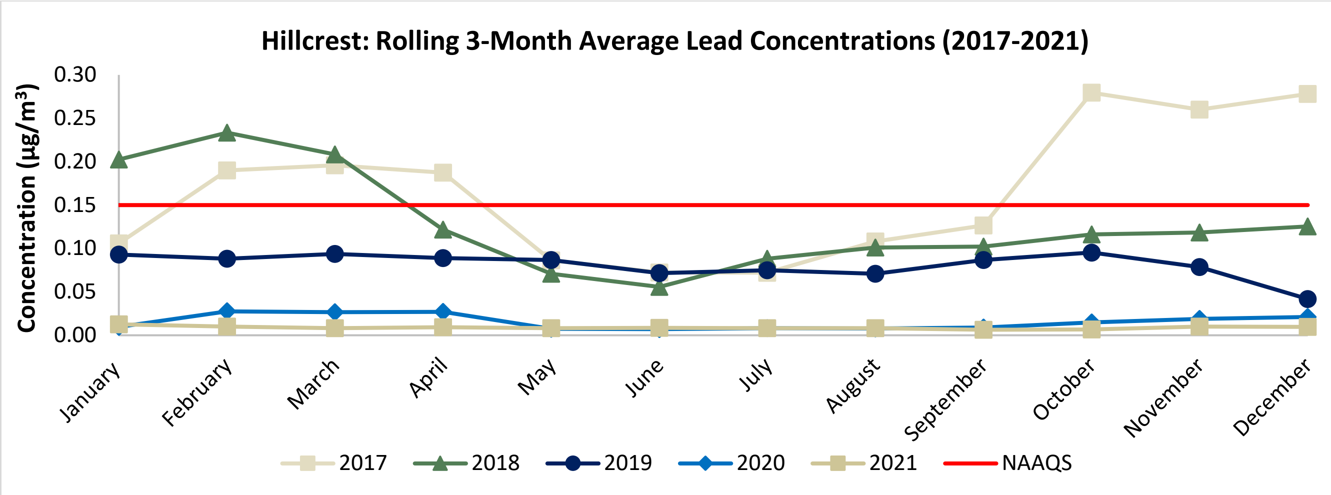


Figure 3-7: Hillcrest Monitor Rolling 3-Month Average Concentrations

Although no violations have been reported since March 2018, there were thirteen 24-hour exceedances during the time period between implementation of CRP controls and smelter shutdown. Additionally, one 24-hour exceedance (0.29 µg/m^3) was recorded in February 2020 after the smelter had been shut down for over four months.

3.2.3 Observational Post-Control Exceedance Analysis

The following section contains an observational exceedance analysis performed by ADEQ staff to better understand the lead sources at the smelter complex. As previously mentioned, possible sources include: stack emissions, process fugitive emissions (smelting process), leaded road dust, materials handling and storage, and re-entrained leaded silts (from the areas surrounding the smelter).

Given the height of the stack (1,000 ft), ADEQ excluded stack emissions as a likely cause of exceedances at the nearby monitors. Instead, ADEQ suspects the monitor exceedances are due to a combination of fugitive emissions from the high temperature smelting process and re-entrained leaded silts from material storage and handling operations. In order to conduct this analysis, an assumption was made as to the size of particles emitted from the aforementioned sources. These two particle sizes are coarse (> 2.5 µm) and accumulation mode (0.1 to 2.5 µm) particles. In this analysis, leaded coarse mode particles are associated with material handling and storage, while accumulation mode particles are associated with fugitive emissions from the flash furnace, converters, and anode furnace.

Coarse mode particles are introduced into the ambient air through mechanical actions such as windblown dust, grinding operations, and vehicular movement. Accumulation mode particles are primarily attributed to condensation of hot gases and coagulation of ultrafine particles. It is assumed that lead emissions from the smelting process first enter the atmosphere in the gaseous state and then cool to become accumulation mode particles. At this particle size, settling velocities are much lower, making the particle more mobile. However, while suspended, these particles can adhere strongly to coarse mode particles, thus increasing the contaminant's settling velocity. This particle behavior makes an origin and transport analyses difficult.

In the previous SIP revision, ADEQ performed an emission source analysis to evaluate how lead sources were causing exceedances at the CERCLA monitors. Two of these CERCLA monitors, ST-23 and ST-05, were collocated with ADEQ's Hillcrest (ST-23) and Globe Highway (ST-05) monitors. For each CERCLA monitor, the data analyzed consisted of 15-minute meteorological data and 24-hour lead concentrations (in 2.5 and 10 micron particle size ranges), temporally ranging from August 2013 to June 2015, prior to CRP implementation. Particle ratios, the ratio of $PM_{2.5}$-to-PM_{10}, were defined for each day in the data set and three ranges of ratios were chosen for analysis. The lower range (LR) included ratios below the lower quartile (0.22 – 0.45) and was solely associated with material storage piles. The middle range (MR) included ratios in the interquartile range (0.47 – 0.69) and was theorized to be from a mixture of material storage piles and smelter fugitive emissions. The upper range (UR) included ratios in the upper quartile (0.72 – 0.96) and was associated primarily with smelter fugitive emissions.

In that analysis, ADEQ determined that the Globe Highway monitor (ST-05) exceeded 0.15 $\mu g/m^3$ exclusively in the higher range, which implies that leaded windblown dust/material had little to no impact at this monitor. It was considered more likely that accumulation mode particles from slag dumping and roofline fugitives, sources that are roughly a quarter mile away, were impacting the monitor. The fact that the Globe Highway monitor experiences low wind speeds for the majority of the year further supports this assumption. On the other hand, the majority of exceedance days at the Hillcrest monitor (ST-23) had particle ratios in the lower range of bin sizes, with the highest lead concentrations in the 0 – 0.10 bin. This suggested that the Hillcrest monitor was more affected by re-entrained dust than smelter fugitive emissions. These results are to be expected given each monitor's proximity to the material storage piles and what is known about particle settling velocities.

The purpose of the following analysis was to determine the significant sources of lead remaining in Hayden after implementation of CRP controls in April 2018. This was accomplished by evaluating how local MET conditions coincide with the 24-hour exceedance values at the monitors of interest.

3.2.3.1 Globe Highway Monitor

The MET conditions on all exceedance days following April 2018 were compiled and transformed into a wind rose (Figure 3-8), revealing the prevailing wind speeds and directions associated with elevated ambient lead concentrations at the monitor after the CRP controls. Twenty-one exceedances occurred after implementing said CRP controls. Figure 3-8 shows that on these exceedance days, the vast majority of winds came from the south at low speeds and the average wind speed was 1.37 mph. A maximum wind speed of 5.8 mph occurred on 6/14/2019, hailing from the south, when the monitor lead concentration was 0.17 $\mu g/m^3$.

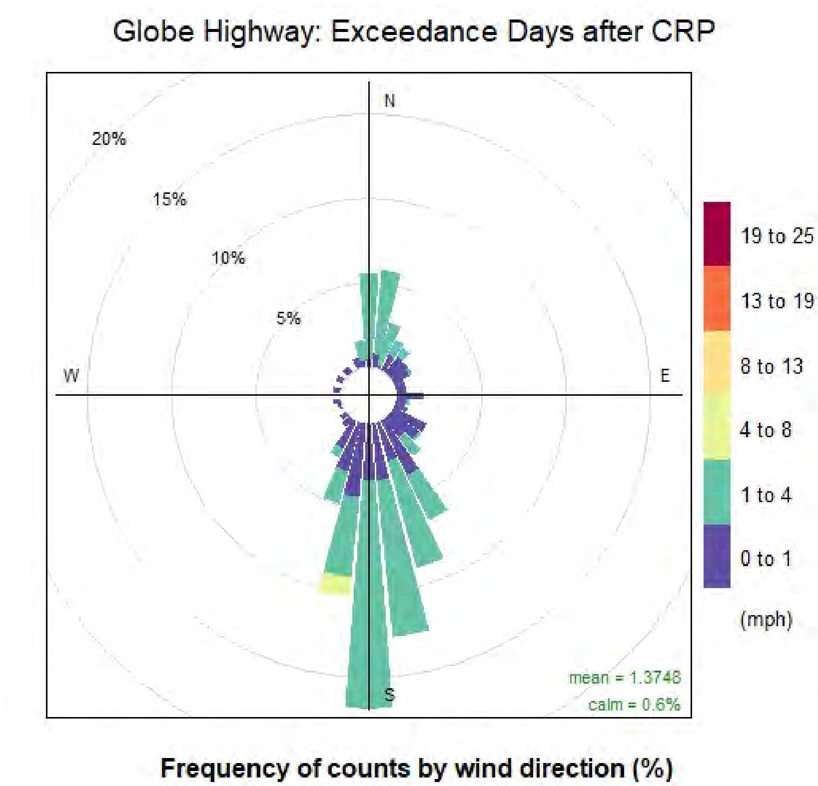


Figure 3-8: Globe Highway Wind Rose for Exceedance Days after April 2018

Unlike the Hillcrest monitor, NAAQS violations were reported at the Globe Highway monitor even after CRP controls were implemented. These violations, occurring from July to September of 2019, were investigated to potentially identify the cause of elevated ambient lead concentrations at the Globe Highway monitor. As previously stated, these violations can largely be attributed to four exceedances that occurred on July 2nd, 14th, 20th, and 26th of 2019.

For each of these exceedance days, the wind roses from all three MET monitors were analyzed to determine how local MET conditions may have contributed to heightened ambient lead levels. These wind roses and corresponding hourly MET data revealed a similar pattern in MET conditions for each of the exceedance days.

At the Camera Hill monitor, the majority of each exceedance day was dominated by westerly/west-northwesterly winds above 8 mph. This monitor typically experienced low speed winds from the east/east-southeast during the early mornings, followed by a reversal in wind direction and increase in wind speed between 8 - 9 AM. A similar pattern was observed at the Hayden Old Jail monitor, where wind speeds typically began increasing and shifting from southeasterly to westerly around mid- to late-morning (9 AM – 12 PM). After the shift, wind speeds above 4 mph generally persisted until 6 - 7 pm.

Conversely, meteorological conditions at the Globe Highway monitor were relatively stagnant for all of the July 2019 exceedance days, with the exception of July 2, 2019. On this day, wind speeds above 4 mph were recorded at the Globe Highway monitor from 12 - 7 pm, and the mean wind speed was 3.4 mph. However, the other three exceedance days followed the same general pattern consisting of low speed winds from the north/northeast in the early to mid-morning hours, and southeasterly winds for the remainder of the day. These three exceedance days all shared a daily mean wind speed of 1.1 mph.

Given the local meteorological conditions, the particle ratios associated with the Globe Highway monitor (2017 SIP), and the monitor's location relative to the ASARCO smelter (Figure 3-9), it is theorized that the July 2019 exceedances were caused by fugitive smelter roofline emissions. It is probable that these accumulation mode particles were pushed by westerly winds from the smelter towards the Globe Highway monitor. Since the monitor sits in a low-lying area (~137 feet below the smelter) and was experiencing mostly stagnant wind conditions, especially at night and in the early morning, the polluted ambient air was allowed to sink and settle into the Globe Highway area, thus impacting monitor concentrations.

Considering the generally low speed winds and high particle ratios that the Globe Highway monitor experiences, it is unlikely that material handling sources were a major contributor to elevated monitored concentrations. Additionally, the fact that many material handling controls have been implemented since the previous analysis in 2017 further reduces the likelihood of the monitor being impacted by windblown material from storage piles. Instead, it is more probable that exceedances recorded after CRP controls were implemented were caused by smelter roofline fugitives, rather than by leaded dust from material storage and handling operations.

3.2.3.2 Hillcrest Monitor

The Hillcrest ambient lead monitor is significant because it is located at the edge of a residential area, and is therefore more representative of the air quality in said area. However, the current Hillcrest monitor does not collect MET data. In the previous 2017 SIP revision, MET data from the ST-23 CERCLA monitor was employed for analyzing ambient air data at the Hillcrest location. These CERCLA monitors (ST-09, ST-14, ST-23, ST-26) are no longer maintained by ASARCO, so MET data is not available for the ST-23 site after 2015.

Since current MET data is not available for the Hillcrest monitor, Figure 3-9 has been excerpted from the 2017 EI TSD to illustrate the wind speeds and directions typically experienced at the Hillcrest SLAMS monitor (ST-23). Figure 3-9 includes former wind roses from the following MET monitors: Hayden Old Jail, Camera Hill, Globe Highway, ST-09, ST-14, ST-23, and ST-26. At the same time, the Hayden Old Jail MET data corresponding to each Hillcrest exceedance day after April 2018 was compiled and plotted a wind rose in Figure 3-10. Eleven exceedances were reported after CRP implementation, including one exceedance on February 21, 2020 that occurred after the facility had been shut down for several months. When comparing the ST-23 wind rose (Figure 3-9) and the Hayden Old Jail wind rose for Hillcrest exceedances (Figure 3-10), both wind roses show the majority of winds to be northeasterly at speeds over 4 mph.

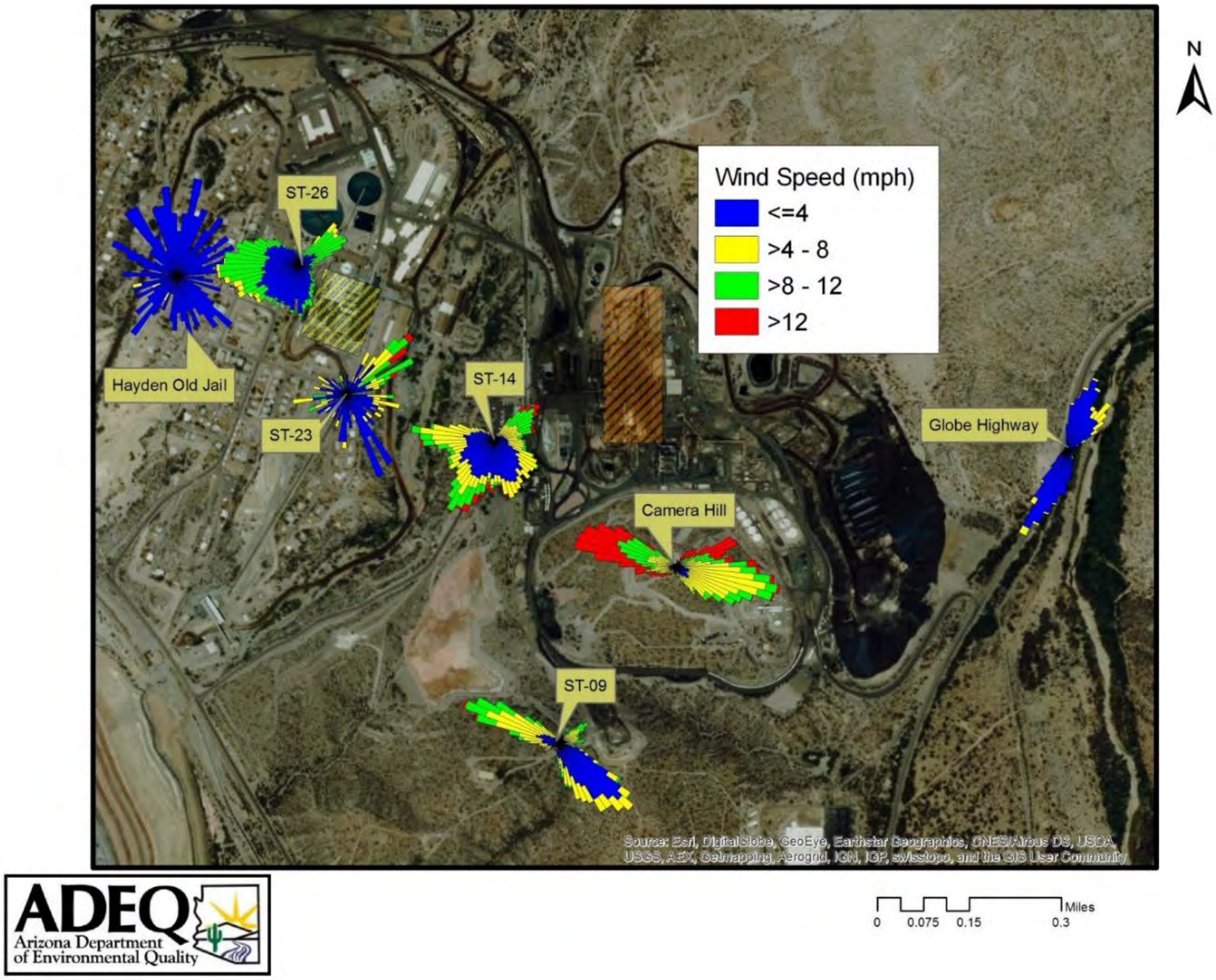


Figure 3-9: CERCLA Monitor Wind Roses

Looking at Figure 3-10, east-northeasterly winds above 4 mph dominate days where exceedances were reported at the Hillcrest monitor. The highest wind speeds, occurring on February 21, 2020, corresponded to a monitor lead concentration of 0.29 µg/m^3. Exceedance days generally experienced the same trends in wind direction, consisting of southeasterly winds in the morning and northeasterly winds in the afternoon. This mid-day reversal in wind direction carries ambient air from the area of the facility towards the Hillcrest monitor. Assuming the previous particle ratio analysis for Hillcrest still applies, these results suggest that re-entrained leaded silts from material storage piles were the primary cause of exceedances at the Hillcrest monitor. The fact that an exceedance occurred while the facility was in a period of shutdown, and during high winds, further supports this conclusion.

However, as previously mentioned, on October 13th of 2019, the ASARCO Smelter was shut down due to the declaration of a work stoppage by the ASARCO bargaining unit and has not since been in operation. Although the ASARCO Smelter has not been smelting concentrate since October 2019, maintenance activity has still taken place during this shutdown period. Appendix C contains an atypical events report detailing a material handling operation that took place on October 12, 2020, which led to elevated levels of Pb at the Hillcrest monitor. Like the February 21, 2020 exceedance, this October exceedance also occurred while the facility was in "maintenance". It should be noted that when the facility begins regular operations it will still be subject to the fugitive dust plan requirements. These same requirements were in place in late 2018 and 2019 when the Hillcrest monitor was recording clean data (see Figure 3-7).

Additionally, issues with the facility's acid plant preheater may have had a minor contribution to elevated lead concentrations at the monitor. Inspections at the end of 2018 and throughout 2019 found cracks in the preheater's expansion joint and tubes, allowing process gas to escape into the atmosphere. Exceedances in October and November of 2018 and in March of 2019 align with the preheater problems discovered at the ASARCO facility.

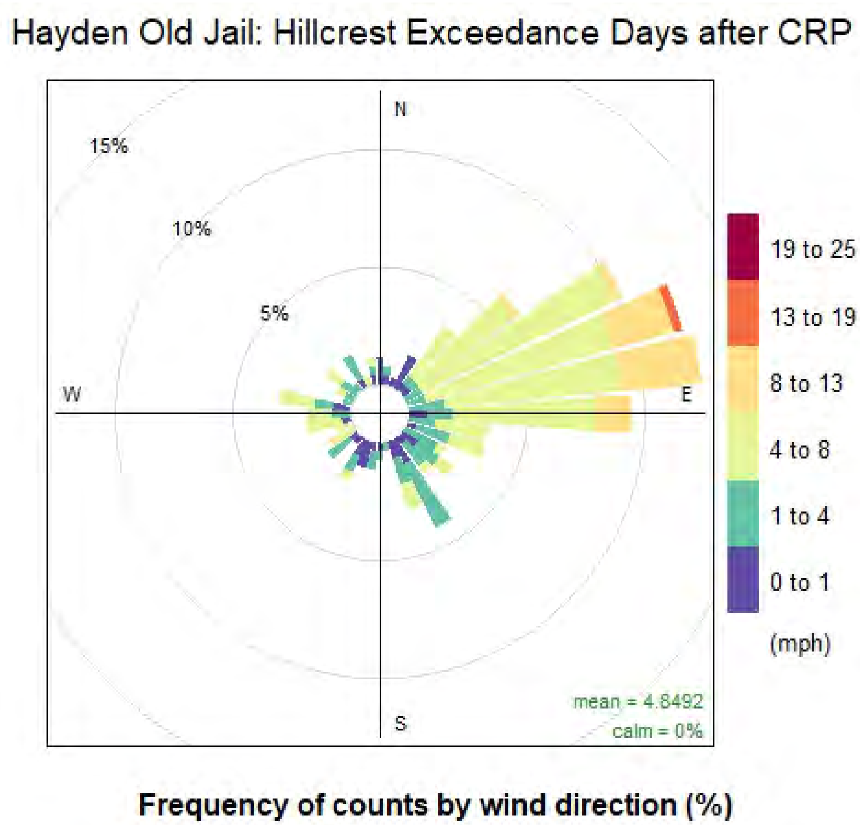


Figure 3-10: Hayden Old Jail Wind Rose for Hillcrest Exceedance Days after April 2018

4 Emission Estimation Methodology

ADEQ employed a multi-method approach when compiling the base year and projected attainment year inventories. Table 4-1 is a summary of the approaches used to estimate Pb emissions in the Hayden NAA. ADEQ has taken a bottom up approach to determining point source emissions in the Hayden NAA. ADEQ derived the remaining portions of the inventory from national-level data obtained from EPA's 2017 National Emissions Inventory (NEI). ADEQ allocated these data to the Hayden NAA based on various methodologies explained throughout this section of the TSD.

Table 4-1: Emission Inventory Source Category, Approach and Data Source

Emission Inventory Source Category	Inventory Estimation Approach	Primary Data Sources
Point	Bottom-Up	Permit, Annual Emission Inventory Questionnaires
Nonpoint	Top-Down	2017 NEI
Mobile Nonroad	Top-Down	2017 NEI

4.1 ASARCO LLC Smelter Lead Emission Estimation Methodologies

As seen in Table 4-1, ADEQ has taken a bottom-up approach to determining the point source category emissions. ADEQ considered point sources which emit more than 0.5 tons of lead in a year. Applying this criterion, ADEQ found that the only point source in the NAA was the ASARCO Copper Smelter. ADEQ's emission inventory sectioned this source into three categories. These are: point sources (including smelter fugitives), road dust, and process fugitives (materials handling emissions). The main data sources used includes lead data submitted by ASARCO to the State & Local Emissions Inventory System (SLEIS). The following sections outline ADEQ's approach in quantifying these emissions for the base year (2017).

4.1.1 Point Sources

The copper smelting process consists of a concentrator operation (concentrator complex) and a smelting operation (smelter complex). In short, the concentrator operation processes ore from offsite mines by crushing, chemically concentrating, and then dewatering a product referred to as concentrate. In this process, lead concentrations in the material (crushed ore) start at 17 parts per million (ppm) and are increased to roughly 2,600 ppm[11] (concentrate). In comparison to the smelting operations, this portion of the process emits a negligible quantity of lead, and thus was not quantified in the point source inventory.

A brief description of the smelting process is as follows. After the concentrate leaves the concentrator complex, it is taken by rail car to the smelter complex. The rail cars are unloaded into outside storage bins and then dried in the wet feed bins. This dried concentrate is stored in dry feed bins before being introduced into the Inco Flash Furnace; this step starts the "smelting process". From the flash furnace the matte copper (56% copper) is further

[11] U.S. EPA, Final Phase II Remedial Investigation/Feasibility Study (RI/FS) Work Plan, March 2012.

processed in the converters, which are Pierce-Smith converters. This converter step creates blister copper (95% copper), which is then introduced into the anode furnace. The anode furnace further processes the blister copper into anode copper (99% copper). This anode copper is tapped into launders and poured into molds to cool, before being shipped offsite for further processing.

In ADEQ's point source inventory, the following were included:

- Ore Concentrate Dryer – Emission Point: Annulus Main Stack
- Dryer with Flash Furnace and Converter – *Emission Point: Annulus Main Stack*
- Flash Smelting – Emission Point: Flash Furnace Fugitives
- Flash Smelting – Emission Point: Acid Plant Inner Main Stack
- Converter (All Configurations) – Emission Point: Converter Fugitives
- Anode Refining Furnace – Emission Point: Baghouse Stack
- Anode Refining Furnace – Emission Point: Fugitive Emissions

Base year emissions for all sources listed above were supplied to ADEQ by ASARCO in an annual emissions report. Emission rates in this workbook are given in either units of pounds per hour or pounds per day. These rates were then multiplied by the hours of operation in the base year.

4.1.2 Road Dust

Due to the interaction between high temperature atmospheric lead emissions and coarse mode particles, ADEQ decided to quantify leaded road dust emissions from the ASARCO concentrator and smelter complexes.

This portion of the inventory was divided into unpaved and paved roads for both the concentrator and smelter. To quantify emissions from these scenarios, ADEQ used a percent Pb factor applied to PM totals of **0.47%** for road dust. This factor was created using historic Pb assays from Smelter clean-up/sweeper sampling. Sampling years ranged from 2003 to 2012. The 0.47% factor is conservative, in that, the value represents the mean plus two standard deviations of the road dust composites data.

Table 4-2: Road Dust Vehicle Traffic Type

Road Dust Emissions: Vehicle Traffic Type			
Smelter Complex		Concentrator Complex	
Paved	Unpaved	Paved	Unpaved
Concentrate, anode, and blister receipts & shipments	Hauling of flux from the crusher to the stockpiles	General Plant Traffic	General Plant Traffic
General Plant Traffic	Hauling of slag from the slag dump to mill for recycling	18 Wheeler Traffic	18 Wheeler Traffic
Water truck	Hauling of slag from the furnace to the slag dump	-	-
Street Sweeper	-	-	-
Plant Service Haul Truck	-	-	-
Scrap handling forklifts	-	-	-
Miscellaneous use forklifts	-	-	-
Miscellaneous Delivery Trucks	-	-	-
Sulfuric acid trucks	-	-	-
Storage pile front-end loaders	-	-	-
Miscellaneous use front-end loaders	-	-	-

4.1.3 Process Fugitives

In ADEQ's EI the term "process fugitives" covers four main activities occurring at the smelter complex. These activities relate to the handling of feed material or byproducts of the smelting process. These activities are:

- Slag Pouring
- Reverts Crushing
- Reverts Storage & Handling
- Concentrate Storage & Handling – bedding area & overflow storage
- Cold Dope Storage

4.1.3.1 Slag Pouring

Slag is a byproduct of all three smelting processes and primarily consists of iron silicates. However, heavy metals are also found in this material to varying degrees, with lead concentrations reported to be 1,190 ppm[12]. The slag is created when the concentrate mixture becomes molten and partitions into layers (slag being the top layer), or when slag blowing occurs (introduction of oxygen enriched air). Slag is reintroduced into the smelting process if it's still high in copper. Slag with less copper is transported by truck to the slag dump where it is poured and air cooled.

Base year Pb emissions due to slag pouring were provided by the facility in their annual emissions submission. The calculation method used can be found in AP-42 chapter 12.3 using tables 12.3-19. The formula used and exact calculation can be seen below.

Equation 4-1: Slag Pouring Emissions Quantification

$$E = E_1 * E_2 * FT_1 * FT_2 * FT_3$$

where:

- E_1= AP-42 Emission Factor Table 12.3-11 (0.072 lb/ton)
- E_2= Tons of concentrated ore processed (in base year 547,884 tons)
- FT_1= Ratio of slag Pb per ton of anode produced (0.41)
- FT_2= Slag skimming fraction of total smelting furnace emissions (0.02)
- FT_3= Pouring fraction of total slag skimming emissions (0.25).

With the above values,

$$E = 0.072 \frac{\text{lb}}{\text{ton}} * 547{,}884 \frac{\text{tons}}{\text{year}} * 0.41 * 0.02 * 0.25$$

$$= \mathbf{80.87} \frac{\text{lbs}}{\text{year}}.$$

4.1.3.2 Reverts Crushing and Reverts Storage & Handling

Reverts are primarily matte and slag shells which form on the cool surface of the ladles used in the converter aisle. Reverts larger than 24 inches are sent through the reverts crushing process. This process consists of a primary jaw crusher that crushes the reverts to less than one inch[20]. ADEQ has chosen to quantify reverts crushing and handling emissions because previous soil sampling around these operations have shown elevated soil lead concentrations. Therefore, reverts crushing and handling is a quantifiable source of fugitive emissions and windblown leaded dust.

The reverts crushing operations are handled on-site by a contractor, Smithco. Smithco performs both the course revert crushing circuit and the fine crushing circuit. To quantify emissions from these scenarios, ADEQ used a

[12] U.S. EPA, Final Phase II Remedial Investigation/Feasibility Study (RI/FS) Work Plan, March 2012.

percent Pb factor applied to PM totals of **1.04%** for reverts crushing. This factor was submitted by the contractor and was applied to PM totals in ASARCO's 2017 SLEIS submission.

At the smelter complex, reverts storage and handling operations take place in two areas: reverts crushing north and reverts crushing south. Three emissions scenarios were considered for each reverts handling area: wind erosion, batch drop emissions, and load out emissions. To quantify emissions from these scenarios, ADEQ used a percent Pb factor applied to PM totals of **0.7981%** for reverts handling. This factor was submitted by the source and was applied to PM totals in ASARCO's 2017 SLEIS submission.

An additional revert storage pile was added in 2018, referred to as the "cold dope" pile. This pile has similar characteristics to the north reverts pile and thus similar emission scenarios. Since emissions for the cold dope pile did not exist in 2017, 2018 emissions will be used since this was the highest emissions for this pile since it was created. Additionally, ADEQ used the percent Pb factor discussed above for reverts storage and handling operations.

4.1.3.3 Concentrate Storage & Handling

Concentrate is the copper containing material that is mixed with other silica materials (flux) and fed into the smelting process. As previously mentioned, concentrate has been found to have lead concentrations at roughly 2,670 ppm. Therefore, an area where this material is handled is a potential source of lead emissions. Like reverts crushing, the three emissions scenarios ADEQ quantified were: wind erosion, batch drop emissions, and load out emissions. These scenarios were applied to the concentrate bedding and overflow storage areas.

ADEQ quantified these scenarios by applying a percent Pb factor, which was provided by the source, to PM totals reported in the sources 2017 SLEIS submission. The percent lead factor applied to the PM totals for the overflow storage areas was **0.1683%**. The percent lead factor applied to the PM totals for the bedding area was **0.315%**.

4.1.3.4 Dewatering of Venturi Scrubber Slurry

At the smelter complex, sulfur from process gas is repurposed into 93 – 98% sulfuric acid at the on-site Acid Plant. In order for this plant to operate, the process gas it receives must be relatively free of PM. A venturi and wet scrubber are used to accomplish this. In the base year, slurry from the venturi scrubber was dewatered in the open air wet/dry bins. However, as part of the fugitive dust plan introduced with the 2017 SIP revision, the acid plant scrubber blowdown material (venturi scrubber slurry) is handled in a different manner.

Post-CRP, this slurry is diverted to a thickener. From the thickener, the material is sent to two electric dryers, and the dried cake is then discharged directly into bags. Because the CERCLA investigation found high lead concentrations in the open air wet/dry bins, ADEQ feels this operational change greatly reduced the ambient air Pb concentrations in the NAA.

For the sake of consistency, emissions from the wet/dry bins were quantified using the same methods the source used in their 2017 SLEIS report (for materials handling). This particular method can be found in AP-42, section 11.2.3 (May, 1983) Aggregate Handling and Storage Piles.

A sensitivity analysis was performed on the equations and important parameters were retrieved from the source, namely silt % and PM10 fraction. The PM10 fraction was important because the percent lead factor used applied only to PM_{10}. Once again, the percent lead fraction for this specific source was obtained from the CERCLA resuspension investigation, and was **44.1%**.

4.2 EPA 2017 National Emission Inventory

The EPA's NEI database contains nationwide data on the emissions and sources of emissions of the Criteria Air Pollutants (CAP) as well as hundreds of other Hazardous Air Pollutants (HAP) and greenhouse gases (GHG). The NEI includes estimates of annual air pollutants from all point, nonpoint, mobile and event sources in the United States and its territories. The NEI is a collaborative effort between the states, tribal nations, and federal agencies that provide a snapshot of emissions from the county and tribal to national scale.

EPA estimated 2017 NEI emissions with data from the following sources:

- State, Local, and Tribal (S/L/T) agencies submitted CAP and HAP emissions required and/or enabled under the Air Emissions Reporting Rule (AERR)
- EPA and other federal agency databases (e.g. Toxics Release Inventory)
- MOVES2010b model runs
- EMission FACtor (EMFAC) model runs
- NONROAD model runs
- OFFROAD model runs
- National Mobile Inventory Model (NMIM) model runs
- Academic and private sector research institutes and databases

ADEQ used the 2017 NEI as the basis for the nonpoint and mobile nonroad emission estimates in this inventory. Specifically, ADEQ allocated the county level emissions estimates from the NEI down to the NAA based on the allocation methodologies described in the following sections.

The 2017 NEI identified the following nonpoint source sectors for Pb emissions in the Hayden area:

- Gas Stations
- Industrial Processes - Mining
- Industrial Processes - NEC
- Industrial Processes - Non-ferrous Metals
- Miscellaneous Non-Industrial NEC

All of these nonpoint sectors have been included in this inventory, with the exception of Industrial Processes – Mining and Non-ferrous Metals. The ASARCO mine and smelter are the only active operations in the Hayden NAA, and emissions for this facility are already captured in the point source category. Therefore, emissions for these NEI sources were excluded due to point source reconciliation.

The only nonroad source sector identified by the 2017 NEI was aircraft, due to piston-engine aircraft still using leaded fuels. In prior NEIs the nonroad sector of locomotives was identified as a source of Pb emissions, but the 2017 NEI no longer estimates Pb emissions for this sector, so it was not included.

4.3 Population Allocation Methodology

ADOA calculated population growth and population estimates for the Hayden Pb NAA using the population methodology attached in Appendix A. ADEQ used these estimates in creating the population adjustment and population growth-rate factor used in the Hayden Pb NAA base year and projected EIs.

ADEQ utilized the ratio of the NAA population to the county population to allocate emissions tied to population. As 2017 is the base year for the emission inventory, ADEQ used the ADOA county level and NAA level population estimates from 2017 to determine the population allocation factor.

Equation 4-2: Population Allocation Factor

$$\frac{P_{na}}{P_c} = AF_p$$

where:

- P_{na} = ADOA population estimate of county portion of Nonattainment Area
- P_c = ADOA population estimate of entire county
- AF_p = Population allocation factor.

As the Hayden Pb NAA encompasses portions of both Gila and Pinal Counties, ADEQ developed separate allocation factors for each. ADEQ did this to 1) simplify the calculations and 2) provide more accurate future-year projections as each county has drastically different growth estimates.

Equation 4-3: Gila County Population Allocation Factor

$$AF_p = \frac{1{,}176}{53{,}509} \approx \mathbf{0.02198}$$

Equation 4-4: Pinal County Population Allocation Factor

$$AF_p = \frac{3{,}233}{400{,}950} \approx \mathbf{0.00806}$$

Using this method, ADEQ developed a population allocation factor for Gila County of **0.02198** and Pinal County of **0.00806**. In other words, **2.20%** of the population of Gila County and **0.81%** of the population of Pinal County resides within the Hayden Pb NAA. ADEQ multiplied this factor by county-level source category specific emission estimates where population drives emissions.

4.4 Airport Allocation Methodology

In the United States, one hundred octane, low lead aviation gasoline (avgas) is the primary fuel used in piston-engine powered aircraft. This lead is added to boost fuel octane, prevent engine knock, and prevent valve seat recession and subsequent loss of compression for engines without hardened valves[13]. However, in the U.S., this fuel additive constitutes a sizable source of lead emissions. For example, the 2002 National Emissions Inventory (NEI) found 45% of lead emissions were due to leaded avgas[14]. Because of this fuel additive, ADEQ has quantified avgas emissions. The following section outlines ADEQ's approach for quantifying avgas emissions.

ADEQ started by determining the number of airports in the NAA and found that there was only one: the Kearny Airport. Because the Kearny Airport is located in Pinal County, and no Gila County airports are found in the NAA, emissions were allocated based on Pinal County aircraft emissions from the 2017 NEI. This allocation was based on annual aircraft operations at all airports located in Pinal County. Total annual aircraft operations (counting landings and takeoffs as separate operations) at the Kearny Airport were divided into the Pinal County total, giving the Kearny airport's percentage of all county operations. This calculation is illustrated below. In order to capture piston powered aircraft and not jet engine powered, the Pinal Airpark was excluded from the Pinal County total. This was because no non-jet engine crafts were located at this Airport, primarily because 86% of operations taking place there are military.

Equation 4-5: Airport Allocation Factor

$$\frac{AO_K}{AO_{PC}} = AF_K$$

where:

- AO_K = Annual airport operations at the Kearny Airport
- AO_{PC} = Annual airport operations for Pinal County
- AF_K = Allocation factor for the Kearny Airport

Equation 4-6: Kearny Airport Allocation Factor

$$AF_K = \frac{415}{74{,}121} \approx \mathbf{0.0056}$$

Using this method, ADEQ developed an allocation factor for Pinal County of **0.0056**. Therefore, **0.56%** of the total aircraft emissions within Pinal County are contained within the Hayden Pb NAA. ADEQ multiplied this factor by county level airport Pb emissions to provide an estimate of emissions within the Hayden NAA.

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[13] EPA, Calculating Piston-Engine Aircraft Airport Inventories for Lead for the 2008 National Emissions Inventory, December 2010.

[14] U.S. Environmental Protection Agency (2008) EPA's Report on the Environment EPA/600/R-07/045F. Available at: http://www.epa.gov/roe

5 2017 Base Year Emission Inventory for Lead in the Hayden Planning Area

ADEQ has accounted for all anthropogenic sources of Pb within the Hayden Pb NAA. These sources have been defined as either: point (Section 5.1), nonpoint (Section 5.2), or mobile nonroad (Section 5.3). ADEQ has used the 2017 NEI as the basis for nonpoint and mobile nonroad sources because it is the most complete and accurate data set available which includes those emissions. For point sources (PTE ≥ 0.5 tons Pb), ADEQ used emissions data collected from annual emission inventory reports and percent lead factors derived from several sources (see Section 0 for details).

5.1 Base Year Point Source Emission Inventory

The point source category of the EI is the most significant, making up roughly 96.3% of emissions in the NAA. The only source in the NAA that ADEQ found which qualifies as a point source was the ASARCO LLC Copper Smelter. In this context, the term "point source" is inclusive of all emissions at the ASARCO Smelter, which includes: stack emissions, smelter fugitives, leaded road dust, and process fugitives (slag pouring, reverts crushing/handling, concentrate handling, and the dewatering of venturi scrubber slurry). The methodology used to determine emissions from this source are covered in Section 4.1.1. In addition, Table 5-1 through Table 5-6 summarize the base year emissions from this source.

Table 5-1: Smelter Stack & Fugitive Emissions

Point Source Inventory		
Smelter Stack & Smelting-Process Fugitive Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
Concentrate Dryer, Flash Furnace, Converter	Emission Point #HP-2 Annulus Main Stack-R&R	1.1509
Acid Plant	Emission Point #HP-1 Acid Plant Inner Main Stack	0.0223
Flash Furnace	Emission Point #HP-25 Flash Furnace Fugitives	0.8135
Converter (All Configurations)	Emission Point #HP-41 Converter Fugitives	1.8471
Anode Furnace	Emission Point #HP-24 Anode Baghouse Stack	0.0923
Anode Refining Furnace: Fugitive Emissions	Emission Point #HP-24 Anode Refining Furnace Fugitives	0.0554
Smelter Stack & Fugitive Emissions Total		**3.9815**

Table 5-2: Smelter Road Dust Emissions

Point Source Inventory Cont.		
Smelter Paved Road Dust Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
Concentrate, anode, and blister receipts & shipments	Road emissions from the hauling of concentrate, oxygen, anodes, and blister copper	0.0002
General Plant Traffic	Road emissions from the flow of general plant traffic	0.0052
Water truck	Road emissions from the maintenance of roads by water truck	0.0084
Street Sweeper	Road emissions from the maintenance of roads by street sweeper	0.0026
Plant Service Haul Truck	Road emissions from the hauling of material by plant service haul trucks	0.0050
Scrap handling forklifts	Road emissions from the traffic of forklifts	0.0108
Miscellaneous use forklifts	Road emissions from the traffic of forklifts	0.0015
Miscellaneous Delivery Trucks	Road emissions from delivering various items to tanks or heavy items to point of use.	0.0003
Sulfuric acid trucks	Road emissions from the hauling of sulfuric acid	0.0024
Storage pile front-end loaders	Road emissions from the traveling of front-end loaders	0.0100
Miscellaneous use front-end loaders	Road emissions from the traveling of front-end loaders	0.0083
Smelter Paved Roads Emissions Total		**0.0546**
Smelter Unpaved Road Dust Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
Flux Trucks	Road emissions from the hauling of flux from the crusher to the stockpiles	0.0037
Slag Trucks	Road emissions from the hauling of slag from the slag dump to mill for recycling	0.0053
Slag Trucks	Road emissions from the hauling of slag from the furnace to the slag dump	0.0047
Smelter Unpaved Roads Emissions Total		**0.0136**

Table 5-3: Concentrator Road Dust Emissions

Point Source Inventory Cont.		
Concentrator Paved Road Dust Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
General Plant Traffic (Includes 18 Wheelers)	Road emissions from travel to concentrator storage area	0.0002
Concentrator Paved Roads Emissions Total		**0.0002**
Concentrator Unpaved Road Dust Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
General Plant Traffic (Includes 18 Wheelers)	Road emissions from travel to concentrator storage area	0.0146
Concentrator Unpaved Roads Emissions Total		**0.0146**

Table 5-4: Road Dust Summary

Point Source Inventory Cont.	
Road Dust Summary	
Source	**2017 Pb Emissions (tpy)**
Paved Roads	0.0548
Unpaved Roads	0.0282
Road Emissions Total	**0.0830**

Table 5-5: Process Fugitive Emissions

Point Source Inventory Cont.		
Non-Smelting Process Fugitive Emissions		
Source	**Description**	**2017 Pb Emissions (tpy)**
Pouring of Slag at the Slag Dump	Fugitive emissions are released when molten slag is poured at the dump	0.04043
Pile Bedding Area	Emissions resulting from wind erosion	0.00014
Batch drop from truck/rail to bedding area	Unloading of copper concentrate and by-products from truck or rail to the hopper which feeds into the dryers.	0.00002
Load out from storage piles onto belt	Emissions from load out of concentrate in outdoor storage	0.00037
Overflow concentrate storage	Emissions resulting from wind erosion	0.00441
Batch drop from truck concentrate storage	Emissions from transfer of copper concentrate to storage	0.00005
Load out from storage piles/overflow storage	Emissions from the load out of copper concentrate in outdoor storage	0.00011
South Reverts	Wind erosion at the south reverts crushing area	0.00081
South Reverts	Reverts transfer from truck to storage piles-south	0.00029
South Reverts	Reverts load out from storage piles-south	0.00232
North Reverts	Wind erosion at the North reverts area	0.00001
North Reverts	Reverts transfer from truck to storage piles-north	0.00014
North Reverts	Reverts load out from storage piles north by converter area	0.00232
Cold Dope Reverts	Wind erosion at the Cold Dope reverts area	0.00001
Cold Dope Reverts	Reverts transfer from truck to storage piles-cold dope	0.00014
Cold Dope Reverts	Reverts load out from storage piles- cold dope by converter area	0.00029
SmithCo Reverts	Reverts operations carried out by contractor	0.06505
Wet/Dry Bins #1	Emissions resulting from wind erosion	0.00805
Wet/Dry Bins #1	Emissions from load out of scrubber slurry	0.00003
Wet/Dry Bins #2	Emissions resulting from wind erosion	0.00732
Wet/Dry Bins #2	Emissions from load out of scrubber slurry	0.00001
Filter Plant	Emissions resulting from wind erosion	0.00262
Filter Plant	Emissions from load out	0.00001
Process Fugitive Emissions Total		**0.13494**

Table 5-6: Point Source Inventory Summary

Point Source Inventory Summary	
Source	**2017 Pb Emissions (tpy)**
Smelter Stack & Fugitive	3.9815
Roads	0.0830
Process Fugitive	0.1349
ASARCO Smelter Emissions Total	**4.1994**

5.2 Base Year Nonpoint Source Emission Inventory

Nonpoint sources in the NAA are relatively insignificant when compared to the remaining source categories, making up 3.7% of the NAA emissions. ADEQ quantified the nonpoint source category using 2017 NEI data, and the allocation methodology is discussed in Section 4.2. Table 5-7 summarizes the base year emissions from this source category.

Table 5-7: Nonpoint Source Inventory Summary

Nonpoint Source Inventory		
Source	**Description**	**2017 Pb Emissions (tpy)**
Gas Stations	Storage and Transport-Petroleum and Petroleum Product Storage	0.000006
Industrial Processes - NEC	Miscellaneous Industrial Sources	0.001570
Miscellaneous Non-Industrial NEC	Miscellaneous Nonpoint Sources	0.000011
Nonpoint Source Emissions Total		**0.001587**

5.3 Base Year Mobile Nonroad Emission Inventory

The nonroad source category consists of emissions from piston aircraft and makes up 0.1% of the NAA emissions. The methodology used to quantify nonroad emissions can be found in Sections 4.4. Table 5-8 summarizes the base year emissions from this source category.

Table 5-8: Nonroad Source Inventory Summary

Nonroad Source Inventory		
Source	**Description**	**2017 Pb Emissions (tpy)**
Aircraft	Pinal County Portion of NAA	0.003311
Nonroad Source Emissions Total		**0.003311**

5.4 Summary of 2017 Base Year Emission Inventories

Table 5-9 below summarizes the Hayden Pb NAA emission inventory. The calculation methodology used to obtain these values can be found in Section 4.

Table 5-9: Hayden Pb NAA Emission Inventory Summary

Emission Inventory Summary	
Source Category	**2017 Pb Emissions (tpy)**
Point Source	4.1994
Nonpoint Source	0.001587
Mobile Nonroad	0.003311
Hayden Pb NAA Emissions Total	**4.2**

6 Emission Projection Methodologies

ADEQ developed a number of growth factors to project emissions to the 2026 attainment year. These projected emissions will inform planning decisions, including what Reasonably Available Control Measures (RACM) or Reasonably Available Control Technologies (RACT) ADEQ may need to apply. ADEQ has summarized the methodology for projecting emissions to the attainment year in the remainder of this section.

6.1 Point Source Emission Projection Methodology

ADEQ conservatively assumes that in any future year, point sources will emit the maximum allowable quantity of Pb emissions, that is, their permitted (and federally enforceable) Potential To Emit (PTE). ADEQ consulted the permitting authorities and representatives of the point source to identify any anticipated permit revisions. ADEQ focused on revisions that would impact the Pb emissions limits or Pb PTE between the base year and the attainment year. For sources ADEQ anticipates will change emissions limits or facility PTE before the attainment date, ADEQ used the new or expected emission limits or PTE to project future year emissions.

Due to the ASARCO smelter being the only point source in the inventory, ADEQ's point source projection efforts centered on this facility. For the previous SIP revision, ASARCO submitted a Class I Significant Permit Application to ADEQ, proposing upgrades to enhance emission capture and control systems at its Hayden Smelter facility (hereafter referred to as the "Converter Retrofit Project"). The following list summarizes the enhancements ASARCO proposed for the Converter Retrofit Project (CRP):

- The five existing converters were replaced with three larger converters. This change allows a single converter to blow at a time, better matching the process gas volume from the converters to the gas processing capacity of the acid plant;

- The better matching of the gas volumes from the converters with the processing capacity of the acid plant, in combination with new, improved primary and secondary hoods, reduces the volume of process gas spillage from the primary hood system to the secondary hood system during blowing operations. Additionally, the new tertiary ventilation system captures other converter aisle emissions, e.g., emissions from ladle movements of molten material along the aisle, for routing to the annulus of the main stack;

- Although not a Pb specific control, process gas captured by the secondary hood during blowing, which was previously routed to the secondary hood baghouse, is now rerouted to the acid plant, providing for substantial control of the sulfur dioxide that presently contributes the majority of the sulfur dioxide in the main stack emissions, additionally the slag return ventilation hoods will be re-routed to the secondary hood baghouse;

- A tertiary ventilation system was installed over the converter aisle. While this system does not reduce emissions, it does capture any converter aisle emissions not collected by the primary and secondary systems and route them to the main stack instead of allowing them to escape as fugitive emissions to the atmosphere at roof level;

- Improvements were made to the matte tapping, slag skimming ventilation system to reduce fugitives and to direct emissions to a new vent gas baghouse, which replaced the previous ESP. The new vent gas baghouse has a higher control efficiency than the current ESP and will further reduce particulate emissions.

More details concerning the CRP are provided in the ASARCO Converter Retrofit Permit application (Significant Permit Revision No. 60647). The enhancements listed above were incorporated into the 2017 SIP attainment demonstration. On December 16th, 2022 ASARCO submitted a Class I significant Permit Application to ADEQ, which proposed additional emission capture and control systems at the Hayden Smelter facility. For more information on these new controls see ADEQ's modeling TSD (Section 5.4.3) and supporting calculations found in Appendix B: ASARCO Smelter PTE Numeric Explanation. Appendix B provides a detailed equation-based breakdown of the modeled emission rates for the flash furnace, converter aisle, and anode furnace. These modeled emission rates are the foundation of the attainment demonstration and the PTE values found in this TSD

The following list summarizes the enhancements found in this 2022 permit application:

- Replacement of the existing preheater at the double contact acid plant with a redesigned unit;
- Addition of secondary hoods to the three existing anode furnaces, exhaust from which will be routed to a baghouse and then the main stack;
- Addition of secondary ventilation around the flash furnace uptake to capture fugitive emissions from the flash furnace, matte tapping and slag skimming areas and route them to the converter secondary hood baghouse;
- Addition of a hood to be used to capture fuming ladle emissions and route them to the converter secondary hood baghouse and its lime injection system.

In addition to the CRP controls, the 2017 SIP also included controls on material handling related sources of Pb. These material handling sources fall under ASARCO's "Fugitive Dust Plan". Specific controls that were included in the 2017 Fugitive Dust Plan are discussed below. These controls are to remain in place when ASARCO resumes operations, therefore, these controls were included in the latest attainment demonstration modeling.

- Reverts Crushing & Handling:
    - wind fence (designed to have a 75% control efficiency)
    - sprayers (maintain 10% surface moisture content)

- Concentrate Handling:
    - wind fence (designed to have a 75% control efficiency)
    - sprayers (maintain 10% surface moisture content)
    - daily rinsing of spillage/trackout areas
    - rumble grates

- Dewatering of Venturi Scrubber Slurry:
    - slurry to be sent to new thickener
    - resulting filter cake sent to two electric dryers
    - dried cake discharged directly into bags

- Lead-containing Road Dust:
    - Prompt clean-up of material that is tracked out from material storage areas onto paved roadways and daily sweeping of road surfaces.
    - chemical dust suppressant application intensity to meet a 90% control efficiency (PM_{10} emissions)

As part of the latest SIP revision, ASARCO has undertaken the installation of the Uptake Improvement Project, Fuming Ladle Capture Project, and the Anode Furnace Secondary Hood System Project. These additional projects have been designed in improve capture of smelter fugitives, and aid in the attainment of the Pb NAAQS.

As part of the consent decree, Asarco installed a temporary roofline fugitive monitoring system consisting of mini-vol samplers at several locations around the roof of the flash furnace building, at the ends of the converter aisle, and in the anode aisle. These mini-vol samplers gathered ambient particulate data that were periodically collected and analyzed for particulate and metals. Because the methodology is not an EPA-approved method, and the study was interrupted by the work stoppage, direct use of the data is not appropriate as the study method was never fully validated. Nevertheless, Asarco and its consultants have considered the partial data in designing additional controls to reduce instances of elevated emissions sporadically observed while the smelter was operating.

6.1.1 Flash Furnace Fugitive Emissions

Flash furnace fugitives include emissions that escape the primary system and fugitives not captured by the matte tapping and slag skimming systems, along with emissions from the dry feed bin. One of Asarco's proposed controls, the Uptake Improvement Project, involves the installation and ventilation of a partial enclosure around the INCO flash furnace uptake shaft.

The goal of this project is to improve the capture of fugitives from the flash furnace and emissions generated during matte tapping and slag skimming. These captured emissions will be ducted to the converter secondary hood baghouse, treated, and emitted from the main stack. The uptake improvement project is expected to result in a 3.3-3.5% reduction in particulate and lead fugitive emissions, compared to pre-Uptake Improvement Project emissions, and is expected to substantially reduce (30-50%) peak emissions.

The anticipated emission rate was calculated using emission factors and expected control efficiencies and then adjusted upward by multiplying by a 2.0 safety factor to reflect unknown future variability in feedstocks. For more details on how PTE emissions were calculated for this fugitive source see Appendix B of the TSD.

6.1.2 Converter Aisle Fugitive Emissions

Although Asarco's latest fugitive study wasn't completed, due to the 2019 smelter shutdown, one observation made was the migration of matte tapping and slag skimming emissions into the converter aisle and anode aisle/material transfer area. Asarco aims to address this by completing the Fuming Ladle Capture Project. This new control involves the construction of a hood and retaining walls on the smelting ladles. Emissions captured by the hood will be sent to the secondary hood baghouse, treated, and released from the main stack.

The new hoods will only operate for the brief periods when a fuming ladle is present in the enclosure. Asarco anticipates that the fuming ladles will only be vented for 15-minute periods occurring 0 to 5 times per day. As such, the secondary baghouse system can handle the added ventilation without an increase in system flow capacity.

The Fuming Ladle Capture Project is expected to result in a 15% reduction in fugitive lead emissions from the converter aisle. The estimate is based on emissions factor adjusted by the primary, secondary and tertiary control systems. The resulting value was then adjusted upward by a safety factor of 2.0 to reflect unknown future variability in feedstocks. For more details on how PTE emissions were calculated for this fugitive source see Appendix B of the TSD.

6.1.3 Anode Furnace Fugitive Emissions

The Anode Furnace Secondary Hood System Project will involve the construction of secondary hoods, much like those found on the converters, around the anode furnaces. These new hoods will be ducted to a new anode secondary hood baghouse, treated, and released to the main stack.

Asarco and GCT estimate that fugitive lead emissions in the anode aisle will reduce by approximately 70% based on the application of the secondary hood, which will lead to improved controls over charging operations. The emission rate was calculated based on emission factors reduced by the anode furnace baghouse capture and then the secondary hood baghouse capture. The anticipated emission rate was then adjusted upward by a 1.5 safety factor to reflect uncertainties in future feedstocks, but a lower level of adjustment was used in this case because of the greater confidence that the secondary hood baghouse will achieve at least the 70% reduction, if not more. This gave a value of 0.0257 lb/hr. The prior ADEQ model was not directly comparable so the modeled value was rounded up approximately 10% to 0.029 lb/hr to provide some additional conservatism.

For each project, Asarco and GCT also reviewed the results of the partially completed fugitive study conducted in 2018-2019 to ensure that the estimated fugitive emission rate used in the SIP modeling exceeded the observed rate during the study or would exceed the rate after considering the proposed controls. In all cases, the fugitive emissions rate used for modeling are higher than the anticipated actual rate under reasonably anticipated conditions. The estimated fugitive emission rates conservatively represent the expected conditions and hence are appropriate for modeling to ascertain upper bound conditions. For more details on how PTE emissions were calculated for this fugitive source see Appendix B of the TSD.

6.1.4 Smelter Stack & Fugitive Emissions Projection

ADEQ projected smelter stack and fugitive emissions based on Pb PTEs established for the SIP revision attainment demonstration, which can also be found in the facility's permit. Modeling the maximum allowable emissions provides an opportunity to determine ambient air quality under the highest emissions condition.

6.1.5 Leaded Road Dust Emissions Projection

ADEQ's approach to projecting road dust emissions to the attainment year involved the controls outlined in the consent decree's fugitive dust plan. Regarding unpaved road dust, the plan requires the source to create a chemical dust suppressant application schedule that will have a 90% control efficiency for PM_{10} emissions.

No control efficiencies were mandated for paved roads in the fugitive dust plan. The paved roads section states ASARCO must clean roads with sweepers or vacuum/wet broom vehicles no less frequently than daily. However, as part of the 2017 SIP revision, and the subsequent failure to attain determination, ASARCO is required to increase the frequency of sweeping on paved roads. This increase in sweeping has been reflected in the control efficiency used for projected paved road emissions.

In the previous SIP revision projected (2019) paved and unpaved leaded road dust emissions were estimated to be 0.016 and 0.027 tons per year, respectively. In 2019, the facility reported 0.089 tpy of lead from both paved and unpaved roads. Due to this discrepancy between the original estimates and the 2019 actuals, the calculation methodology was revised to include more conservative lead factors for road emissions. This revised methodology resulted in a total of 0.166 tpy of lead from both paved and unpaved roads.

6.1.6 Process Fugitives Emissions Projection

ADEQ projected process fugitive emissions to the attainment year in the same manner as unpaved road dust, discussed above. That is, new control efficiencies outlined in the fugitive dust plan were applied to base year calculations. Three of the four processes quantified in the EI (reverts crushing & handling, concentrate handling, and the dewatering of scrubber slurry) have prescribed controls; slag pouring was the only activity left uncontrolled. The only mention of slag pouring in the fugitive dust plan pertained to limiting where slag could be dumped (cooled in the open air).

For reverts crushing and concentrate handling, the source was required to design and install wind screens and a system of sprayers. In short, the wind screens must have a control efficiency of 75% and the sprayers must maintain surface moisture content at 10%. To project to the attainment year, ADEQ applied these changes to the emission factors used in the base year calculations.

Finally, the dewatering of scrubber slurry, as it occurred in the base year, will be drastically different in the 2026 attainment year. In the base year, this slurry was dewatered in open-air, 3-walled concrete bins; in the attainment year, the dewatering of scrubber slurry will be done as follows:

1. Scrubber blowdown will be sent to a stripping tower.
2. After stripping, and the addition of polymers, the slurry will be sent to a new thickener. In addition to scrubber blow down, the source will be sending vacuum truck station material to the thickener.
3. Underflow diaphragm and filter press feed pumps will send the mixture to a 53 ft^3 capacity filter press.
4. From the press, the material will be sent to a new dryer (which must operate under negative pressure) with a supersack filling station, where the cake will be bagged.

This process of creating filter cake from the scrubber blowdown will increase the percent weight of the slurry from 1.4% (scrubber blowdown) to 86% (at bag station).

Because the wet/dry bins will not be in operation in the attainment year, ADEQ did not project emissions from this source. Instead, ADEQ used a facility-provided thickener operation PTE to project the emissions from the dewatering of scrubber slurry.

6.2 Nonpoint and Mobile Nonroad Source Emission Projection Methodologies

ADEQ developed growth factors to project emissions to the 2026 attainment year. These projected emissions will inform planning decisions, including what RACM or RACT ADEQ may need to apply to other sources (besides the ASARCO Hayden smelter) that may contribute significantly to Pb emissions in the Hayden NAA. ADEQ has summarized the methodology for projecting emissions to the attainment year in the remainder of this section.

6.2.1 Nonpoint & Mobile Nonroad Source Emissions Projection

The approach ADEQ took to project emissions from both the nonpoint and mobile nonroad categories was based on population growth from 2017 to 2026 in the NAA. Because the base year EI quantified sources based on counties, the projections are based on population growth in the respective county. The calculations for developing these population growth factors are illustrated below.

Equation 6-1: Pinal County Population Growth Factor for Projecting Attainment Year Emissions

$$GF_P = \frac{P_{2026}}{P_{2017}} = \frac{2{,}697}{3{,}233} \approx \mathbf{0.834}$$

where:

- GF_P = Pinal Population Growth Factor
- P_{2026} = ADOA 2026 Population Projection for the Pinal County portion of the NAA
- P_{2017} = ADOA 2017 Population Estimate for the Pinal County portion of the NAA

Based on the calculation above, ADEQ applied the population growth factor of **0.834** to project emissions tied to population in the 2026 attainment year.

Equation 6-2: Gila County Population Growth Factor for Projecting Attainment Year Emissions

$$GF_P = \frac{P_{2026}}{P_{2017}} = \frac{982}{1{,}176} \approx \mathbf{0.834}$$

where:

- GF_P = Gila Population Growth Factor
- P_{2026} = ADOA 2026 Population Projection for the Gila County portion of the NAA
- P_{2017} = ADOA 2017 Population Estimate for the Gila County portion of the NAA

Based on the calculation above, ADEQ applied the population growth factor of **0.834** to project emissions tied to population in the 2026 attainment year.

7 2026 Projected Attainment Year Emission Inventory

The following series of tables contain ADEQ projections of maximum potential Pb emissions from all source categories within the Hayden Pb NAA for the year 2026. ADEQ made attainment year projections using the methodologies outlined in Section 6 of this document.

7.1 Attainment Year Projected Point Source Emission Inventory

As previously mentioned, the only point source found in the NAA is the ASARCO Smelter. ADEQ performed AERMOD dispersion modeling centered on the ASARCO Smelter to demonstrate attainment. The emissions found in this section reflect the modeled emissions used in the attainment model. These modeled emissions also make up the Smelter's permitted PTE. Appendix B of this TSD provides a step-by-step demonstration of the methodology used to develop the post-control emission rates for the Uptake Improvement Project, Fuming Ladle Capture Project, and the Anode Furnace Secondary Hood System Project. Additionally, more information on these projects see Section 5.4.3 of Appendix B to this SIP revision, *Hayden Pb Modeling Technical Support Document.*

Tables 7-1 through 7-4 contain the projected maximum potential emissions from the point source within the Hayden NAA for the attainment year. As a note, post 2017, the wet dry bins do not exist at the facility. This source has been replaced by the dryer bin feed system, which has a PTE of 0.00225 tons/yr.

Table 7-1: Projected Smelter Stack & Fugitive Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Smelter Stack & Fugitive Emissions		
Source	Description	2026 Facility Potential to Emit (tpy)
Dryer with Flash Furnace and Converter	Emission Point: Annulus Main Stack	2.99
Acid Plant	Emission Point: Acid Plant Inner Main Stack	
Anode Furnace Baghouse	Emission Point: Anode Baghouse Stack	
Flash Smelting	Emission Point: Flash Furnace Fugitives	0.99
Converter	Emission Point: Converter Fugitives	0.31
Anode Refining Furnace	Emission Point: Anode Furnace Fugitives	0.13
Smelter Stack & Fugitive Emissions Total		4.42

Table 7-2 Projected Smelter Scrubber Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Scrubbers		
Source	Description	2026 Facility Potential to Emit (tpy)
Concentrator	Crushing	0.00898
Concentrator	Transfer House	0.000748
Concentrator	Rail Unloading	0.000748
Concentrator	Fine Ore	0.00324
Scrubber Emissions Total		0.0137

Table 7-3: Projected Process Fugitive Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Process Fugitive Emissions		
Source	Description	2026 Facility Potential to Emit (tpy)
Dump Hopper	Unloading Materials to Ground Level Dump Hopper by a loader	0.000265
Feed to Dryers	Loading out from Bedding Area to Surf-Lev Hopper and Belt to Dryers	0.000528
Concentrate Storage Load In	Copper concentrate transfer from semi-trucks to storage pile	0.000192
Concentrate Storage Load Out	Concentrate Loading into railcars by a loader	0.000386
Concentrate Storage & Truck Dump	Transfer from truck	0.000114
Concentrate Storage & Truck Dump	Load out from pile	0.000114
Reverts South Load In	Transfer of reverts to outdoor storage via MACK truck	0.00344
Reverts South Load Out	Loading out reverts from storage piles into trucks	0.0275
Reverts North Load In	Loading Reverts to the Storage Area via Trucks	0.00344
Reverts North Load Out	Loading out the reverts into trucks by loader	0.00688

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory		
Process Fugitive Emissions		
Source	Description	2026 Facility Potential to Emit (tpy)
SmithCo	Smith Co. Crushing and Screening	0.0232
Thickener	Thickener Project	0.00133
Concentrator	Fine ore fugitives	0.00567
Concentrator	Rail unloading	0.0108
Concentrator	Transfer house	0.00170
Crusher	Crusher building fugitives	0.0179
Cold Dope Load In	Cold Dope Loading	0.00688
Cold Dope Load Out	Cold Dope Unloading	0.0138
Concentrator Screen	Concentrate Screen fugitives	0.000120
Slag Processing	Slag processing material handling	0.00736
Bedding	Bedding area emissions by wind erosion	0.000187
Concentrate Storage	Concentrate storage emission by wind erosion	0.00396
South Reverts	South reverts emissions by wind erosion	0.000241
North Reverts	North reverts emissions by wind erosion	0.000000737
Cold Dope	Cold dope storage emissions by wind erosion	0.00000452
North Tailings	North tailings emissions by wind erosion	0.0219
South Tailings	South tailings emissions by wind erosion	0.0219
Slag Pouring	Pouring of slag at slag dump	0.0512
Process Fugitive Emissions Total		0.231

Table 7-4: Projected Facility Road Emissions

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory	
Facility Road Emissions	
Source	2026 Facility Potential to Emit (tpy)
Paved Roads	0.076
Unpaved Roads	0.0901
Facility Road Emissions Total	0.166

Table 7-5: Projected Point Source Emissions Summary

2026 Projected Hayden Pb Nonattainment Point Source Emission Inventory	
Point Source Emissions	
Source	2026 Facility Potential to Emit (tpy)
Smelter Stack & Fugitive Emissions	4.42
Scrubbers	0.0137
Process Fugitive Emissions	0.231
Facility Road Emissions	0.166
Point Source Emissions Total	4.83

7.2 Attainment Year Projected Nonpoint Source Emission Inventory

ADEQ employed a population allocation method to all of the nonpoint sources within the NAA to determine their estimated future contribution to Pb emissions in the NAA. The projection method used gave approximately a 17% decrease in emissions to the attainment year. Table 7-6 represents ADEQ's estimates of projected emissions for nonpoint sources within the Hayden NAA in 2026.

Table 7-6: Projected Nonpoint Source Emissions

Nonpoint Source Emission Inventory		
Source	Description	2026 Projected Emissions (tpy)
Gas Stations	Storage and Transport-Petroleum and Petroleum Product Storage	0.000005
Industrial Processes - NEC	Miscellaneous Industrial Sources	0.001310
Miscellaneous Non-Industrial NEC	Miscellaneous Nonpoint Sources	0.000010
Nonpoint Source Emissions Total		0.001325

7.3 Attainment Year Projected Mobile Nonroad Emission Inventory

ADEQ employed population allocation methodologies to the mobile nonroad source category to determine the estimated future contribution to Pb emissions in the NAA. The projection method used gave approximately a 17% decrease in emissions to the attainment year.

Table 7-7: Projected Mobile Nonroad Emissions

Mobile Nonroad Source Emission Inventory		
Source	Description	2026 Projected Emissions (tpy)
Aircraft	Pinal County Portion of NAA	0.002763
Mobile Nonroad Emissions Total		0.002763

7.4 Summary of Attainment Year Projected Emission Inventory

From 2017 to 2026, the percent change in emissions contributed from each source is relatively stable, with roughly 96 to 97 percent of emissions occurring at the ASARCO copper smelter in the base and attainment years, respectively. All nonpoint and mobile nonroad source categories are expected to decrease 17%. In Table 7-8 the point source category (ASARCO smelter) shows an increase of approximately 15% in the attainment year. However, this increase is based on a comparison between actual emissions in the base year and what was modeled in the attainment demonstration.

As discussed in Section 5 of the modeling technical support document, modeled smelter roofline fugitive emissions included either a safety factor of 2 or 1.5 to account for future variability in feedstocks. These safety factors are in addition to the conservative assumptions built into the PTE calculations, which are the basis of the modeled emissions. Therefore, the comparison of actual and potential emissions should be done with reservation.

ADEQ feels with the changes brought on by the Update Improvement, Fuming Ladle Capture, and Anode Furnace Secondary Hood System projects should significantly improve the ambient air quality in the town of Hayden. Computer modeling in the attainment demonstration will evaluate the extent of this improvement. Table 7-8 below summarizes the emissions from each source category in the attainment year.

Table 7-8: Projected Hayden Pb NAA Emissions Summary

Projected Hayden Pb Nonattainment Emission Inventory Summary		
Source	2017 Emissions (tpy)	2026 Projected Emissions (tpy)
Point	4.1994	4.83
Nonpoint	0.001587	0.001325
Mobile Nonroad	0.003311	0.002763
Hayden Pb NAA Emissions Total	4.2	4.83

8 Closing Remarks

To recap, on January 31, 2022[15] EPA determined the Hayden NAA failed to attain by the applicable attainment date of October 3, 2019. ADEQ is developing a plan to implement the controls necessary to bring the area back into attainment with the NAAQS. ADEQ developed this TSD as a supplement to the SIP to inform stakeholders about the following:

- The local geography in the Hayden Pb NAA
- The meteorological conditions in the Hayden Pb NAA
- The ambient air quality issues in the Hayden Pb NAA
- The effect meteorology has on ambient air quality
- The major sources of Pb in the Hayden NAA
- ADEQ's projection of Pb emissions in the attainment year (2026)

ADEQ's analysis of the meteorology of the Hayden area found a general diurnal pattern. Specifically, winds in the NAA tend to come from the southeast at night and westerly winds prevail during the afternoon. However, due to the complex terrain, not all study monitors showed this particular trend. For example, the Globe Highway monitor, which is located in a river valley, is subjected to winds blowing from the northeast (bringing in ambient air from outside the town of Hayden) in the morning hours and winds from the smelter in the afternoon. In addition, monitors located on the west side of Hayden experience more random wind patterns, which again is a product of local topography.

The analyses within this TSD are focused on the ASARCO smelter due to this facility providing approximately 96.3% of lead emissions in the Hayden Pb NAA. ADEQ staff, informed by the analysis found in Section 3, found fugitive emissions resulting from the smelting process (Flash Furnace, Converter Aisle, and Anode furnace) likely have the largest impact on ambient air within the town of Hayden. Re-entrained dust from on-site material storage areas are theorized to impact ambient air as well, but at higher wind speeds, which are not common in the area.

The EI contained within the document found source categories in the NAA to be point (ASARCO Smelter), nonpoint, and mobile nonroad. The base year inventory totaled 4.372 tons of lead with approximately 96.3% of emissions coming from the point source category. This finding implies SIP revision efforts that focus on the ASARCO smelter will have the largest impact on ambient air quality in the NAA.

[15] EPA published this designation in 40 CFR Parts 52 as document 87 FR 4805 on January 31, 2022.

9 References

ADEQ staff referred to the following documents as guidance in the development of the Hayden Pb NAA Emission Inventory and this TSD.

US EPA. (September, 1992). *Protocol for Determining the Best Performing Model.* Office of Air Quality Planning and Standards. Research Triangle Park. NC.

US EPA. (February, 2000). *Meteorological Modeling Guidance for Regulatory Modeling Applications.* Office of Air Quality Planning and Standards. Research Triangle Park. NC.

US EPA. (March, 1983). *AP-42 Section 11.2 Fugitive Dust Sources.* Office of Air Quality Planning and Standards. Research Triangle Park. NC.

US EPA. (July, 2011). *2008 Lead (Pb) NAAQS Implementation Questions and Answers.* Office of Air Quality Planning and Standards. Research Triangle Park. NC.

US EPA. (August, 2012). *Addendum to the 2008 Lead NAAQS Implementation Questions and Answers.* Office of Air Quality Planning and Standards. Research Triangle Park. NC.

US EPA. (January, 1995). *AP-42 Section 12.3 Primary Copper Smelting.* Office of Air Quality Planning and Standards. Research Triangle Park

Appendix A: ADOA Population Estimation Methodology

Shapefiles:

- Hayden SO_2 nonattainment boundary shapefile
- Gila & Pinal County 2010 block/population shapefile

Population Data Source:

- ADOA Internal Population Report

Method:

The ADOA methodology determines population from an internal population report that contains census population figures from 1990 through 2010 as well as ADOA intercensal population estimates and projections.

1. ADOA uses ArcGIS Geoprocessing tools to calculate the population of the incorporated places and unincorporated areas (including CDP and Non-CDP areas) within the Hayden NAA. ADOA used the following method to calculate the total population inside of the Hayden NAA:
   a. Calculate the area of the census block using the calculate “areas” tool
   b. Merge the two shapefiles using the “union” tool
   c. Determine the proportion of each census block within the Hayden NAA using the “calculate areas” tool.
   d. Calculate the area weighted population for each census block
   e. Aggregate the population for each incorporated and unincorporated place within the Hayden NAA using the Dissolve Tool
2. In step 1, ADOA derived their population for all incorporated places (or their respective parts), Census Designated Places (CDP) and unincorporated non-CDP areas in the Hayden area from the 2010 Census. ADOA used the following steps to estimate population figures for all areas of each year from 1990-2018:
   a. Apply the Constant-Share ratio of the population for each year for Gila and Pinal Counties
   b. Apply the ratio to each year for the total population in the CDPs and unincorporated non-CDPs in Hayden NAA
   c. Multiply the population of the CDPs and unincorporated non-CDPs in the Hayden NAA by the 2010 Census population ratio for each year

Appendix B: ASARCO Smelter PTE Numeric Explanation

ASARCO LLC – Hayden Operations
Response to EPA questions about derivation of emissions and safety factors Hayden Lead Nonattainment Area SIP Revision
October 25, 2023

During a call between ASARCO, ADEQ and EPA Region IX representatives to discuss the Hayden Lead Nonattainment Area SIP revision, EPA representatives asked if ASARCO could provide a more detailed, equation-based, response for the derivation of the modeled emissions value. ASARCO responded that the initial numbers were derived from AP-42 and other emissions factors and that a safety factor was applied over the calculated value based on a weight of evidence approach considering process continuous emissions monitoring (CEMS) data, partially completed fugitive study data post-Converter Retrofit Project, and engineering judgment based upon control configuration and observation of the process prior the smelter work stoppage. EPA requested that this discussion be placed in writing and subsequently asked that the sources of emissions factors be added. This paper responds to that request.

1.0 <u>Flash Furnace Area</u>

Flash Furnace Building fugitives = Matte Tapping fugitives + Slag Skimming fugitives + Concentrate Dryer fugitives, all calculated as Total Suspended Particulate (TSP). This sum is multiplied by the Lead Speciation (decimal percent) for the Flash Furnace area and a safety factor applied.

Sources of emissions data as follows:

- 693,500 concentrate tons/year based on limit, Air Permit 60647, Condition XVI.B.1.
- 0.3 lb/ton concentrate pre-fugitive control system emission rate, EPA AP-42, Chapter 12.3, Table 12.3-11, Smelting Furnace, with consideration of footnote a as the Hayden smelter uses a flash furnace, the emissions of which are lower than the 0.4 lb/ton concentrate presented.
- 96.5% capture based on engineering estimates from Gas Cleaning Technologies, LLC (GCT) and further reductions achieved by the Uptake Improvement Project.
- 0.75 of slag skimming emissions assigned to initial slag tapping and skimming in flash furnace building due to higher energy when first tapped from the flash furnace and then skimmed; balance 0.25 of slag skimming emissions assigned to pouring slag at the slag pile based on observation and engineering judgment.
- 10 lb/ton concentrate drying, AP-42, Chapter 12.3, Table 12.3-3, Concentrate Dryer.
- 99% efficiency for concentrate dryer based on hard piping of dryers to product recovery baghouse.
- 96% efficiency for concentrate dryer fugitives based on engineering estimates from GCT, with no additional efficiency assigned for Uptake Improvement Project.

2.0 Matte Tapping Fugitives, TSP

693,500 tons concentrate * 0.3 lb TSP/ton concentrate * (1 – 0.965) capture * 1 ton/2000 lbs = 3.641 tpy

3.0 Slag Skimming Fugitives, TSP

693,500 tons concentrate * 0.75 part in building[16] * 0.3 lb TSP/ton concentrate * (1 – 0.965) capture * 1 ton/2000 lbs = 2.731 tpy

4.0 Concentrate Dryer Fugitives, TSP

693,500 tons concentrate * 10 lb/ton * (1 – 0.99) product recovery * (1 – 0.96) capture * 1 ton/2000 lbs = 1.387 tpy

5.0 Flash Furnace Area Fugitives, TSP

3.641 tpy + 2.731 tpy + 1.387 tpy = 7.759 tons TSP/year or 1.771 lb TSP/hour

6.0 Flash Furnace Area Fugitives, Lead

1.771 lb TSP/hour * 0.027 decimal percent = 0.0478 lb Pb/hour

7.0 Safety Factor Considerations

The Hayden smelter may accept concentrate from other sources in addition to ASARCO's Ray and Mission Mines. This "toll" concentrate may have higher lead concentrations. During the partially completed fugitive study fugitive emissions amounted to an average of 0.061 to 0.076 lb Pb/hr adjusting for production (prior to Uptake Improvement Project). An initial safety factor of 2x was applied to reflect feedstock and wind effects, giving 0.0956 lb Pb/hr. In the prior ADEQ modeling demonstration a rate of 0.234 lb Pb/hour was used. This consideration led to the decision to reduce the prior ADEQ modeled value by the 3.4% estimated reduction from the Uptake Improvement Project, giving a value of 0.226 lb/hr, to better reflect the potential magnitude of emissions from the combined flash furnace, matte tapping and slag skimming operations, if adversely affected by wind conditions reducing design efficiencies at one or more points. The proposed value, which translates as 0.0285 g/sec, is a conservative, protective, yet realistic, value for a maximum lb/hr emission rate.

8.0 Converter Aisle Fugitives

Converter Aisle Fugitives = (tons concentrate * 36 lb/ton * blowing fraction * primary hood capture * secondary hood capture * tertiary hood capture * 1 ton/2000 lbs) + (tons concentrate * 36 lb/ton * secondary operations fraction * secondary hood capture * tertiary hood capture * 1 ton/2000 lbs). This value is then adjusted for the lead speciation and a safety factor applied.

Sources of emissions data as follows:

- 693,500 tons concentrate/year from limit, Air Permit 60647, Condition XVI.B.1.
- 36 lb/ton concentrate emissions, EPA AP-42, Chapter 12.3, Table 12.3-3, Converters.
- 99% from blowing, GCT engineering estimate; balance of 1% assigned to secondary operations.
- 97% primary hood capture efficiency, GCT engineering estimate.
- 97% secondary hood capture efficiency, blowing, GCT engineering estimate.

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[16] The other 0.25 is accounted for in slag pouring at the slag pile.

- 95% secondary hood capture efficiency, non-blowing, GCT engineering estimate.
- 95% tertiary hood capture efficiency, GCT engineering estimate.

9.0 Converter Aisle Fugitives, TSP

693,500 tons concentrate * 36 lb/ton * 0.99 blowing fraction * (1 – 0.97) primary * (1 – 0.97) secondary * (1 – 0.95) tertiary * 1 ton/2000 lbs + 693,500 tons concentrate * 36 lb/ton * 0.01 secondary operation fraction * (1 – 0.95) secondary * (1 – 0.95) tertiary * 1 ton/2000 lbs = 0.868 tons TSP

10.0 Converter Aisle Fugitives, Lead

0.868 tons TSP * 0.0745 lead fraction = 0.0647 tons Pb or 0.0148 lb Pb/hr

11.0 Safety Factor Considerations

As noted above, the Hayden smelter may accept "toll" concentrate with higher lead concentrations. Initially, a 2x safety factor was assigned to account for this variable, giving a value of 0.0298 lb/hr. During the partially completed fugitive study fugitive emissions amounted to an average of 0.024 to 0.029 lb Pb/hr adjusting for production (prior to Fuming Ladle Control Project). In the prior ADEQ modeling demonstration a rate of 0.084 lb Pb/hour was used. Given uncertainty about concentrate inputs and wind interference and the greater certainty about the reduction likely to be achieved by the Fuming Ladle Control Project, the prior ADEQ modeled value was reduced by the 15.4% estimated project reduction, giving a value of 0.0712 lb/hr. The proposed value, which translates to 0.00895 g/sec, is a conservative, yet realistic, value for a maximum lb/hr emission rate.

12.0 Anode Fugitives

Anode fugitives = anode tons/day * 365 days/yr * 0.45 lb/ton anode * (1-0.85) primary hood capture * (1- 0.7) secondary hood capture * 1 ton/2000 pounds. This sum adjusted for lead and then safety factor applied.

Sources of emissions data:

- 693,500 concentrate tons/year based on limit, Air Permit 60647, Condition XVI.B.1, converted to anode tons based on 693,500/365 or 1900 tons/day multiplied by concentrate at 30<35% Cu gives 570-660 anode tons/day, so used upper end for conservatism.
- 0.45 lb/ton, EPA AP-42, Chapter 12.3, Table 12.3-11, Anode Refining Furnace, adjusted downward slightly from 0.5 lb/ton based on GCT engineering observations and judgment.
- 85% anode primary hood capture, GCT engineering estimate.
- 70% anode secondary hood capture, GCT engineering estimate. The

70% secondary hood capture efficiency is believed to be conservative. **Anode**

Fugitives, TSP

Anode fugitives = 660 anode tons/day * 365 days/yr * 0.45 lb/ton anode * (1 – 0.85) primary hood * (1 – 0.7) secondary hood * 1 ton/2000 pounds = 2.439 tons TSP

13.0 Anode Fugitives, Lead

2.439 tons/year * 0.0308 lead fraction = 0.075 tons Pb or 0.0172 lb Pb/hr

14.0 Safety Factor Considerations

As noted above, the Hayden smelter may accept “toll” concentrate with higher lead concentrations. Initially, a 1.5x safety factor was assigned to account for lead and atmospheric variability, giving a value of 0.0257 lb/hr. This safety factor is lower than the initial safety factor used for the two prior projects because Gas Cleaning Technologies, LLC, has greater confidence that the Anode Secondary Hood Project would achieve at least 70% control and should be less affected by lead variation in the concentrate because it is further along in the process. During the partially completed fugitive study fugitive emissions amounted to an average of 0.041 to 0.050 lb Pb/hr adjusting for production (prior to the Anode Secondary Hood Project).

The prior ADEQ modeling demonstration was considered but rejected because it did not consider the Anode Primary Baghouse and hence overestimated emissions substantially. Based on consideration of the 0.0257 lb/hr from emission factor and air pollution control, the 0.041 to 0.050 lb/hr after adjusting for production, seen during the fugitive study (post-primary baghouse installation but pre-secondary baghouse installation), and the anode aisle’s greater openness and susceptibility to wind compared to the converter aisle, the initial estimate was revised upward from 0.0257 to 0.0286 lb/hr, or approximately another 10%, as an added safety factor. The proposed value, which translates as 0.0036 g/sec, is a conservative, yet realistic, value for a maximum lb/hr emission rate.

ASARCO hopes that this explanation assists EPA and ADEQ in evaluating the proposed Hayden Lead Nonattainment Area SIP revision and its associated modeling. The values presented are intended to be conservative, demonstrating that the Hayden Nonattainment Area will attain the Lead NAAQS even if lead emissions are higher than anticipated. The proposed SIP review also demonstrates that the Hayden Nonattainment Area should achieve attainment expeditiously once the Uptake Improvement, Fuming Ladle Control and Anode Secondary Hood Projects are installed and optimized.

Please contact James Stewart, ASARCO’s Director of Environmental, Governmental and Community Affairs, or Eric Hiser, ASARCO’s air counsel, if you have any questions or concerns.

Appendix C: Atypical Events Supporting Information

November 9, 2023

Mr. Kamran Khan
Air Quality Division
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: Revised Supporting information for ASARCO Atypical Event on October 12, 2020

Dear Mr. Khan:

On September 7, 2023, ASARCO, the Arizona Department of Environmental Quality (ADEQ) and the U.S. Environmental Protection Agency (EPA) held a call to discuss several questions that EPA had pertaining to the Lead (Pb) State Implementation Plan (SIP) for the Hayden Nonattainment Area (NAA).

EPA supports exclusion of the October 12, 2020 Pb concentration at the Hillcrest monitor from the calculation of the proposed Pb background concentration (as described in Section 7.0 of the Modeling Technical Support Document[1]), provided that ADEQ provides sufficient documentation to demonstrate that this elevated concentration was due to an atypical event that is not expected to reoccur. To that end, EPA requested that ASARCO provide the information they typically ask for in an atypical event report in addition to what is already documented in the TSD. Later that day Mr. William Tsui of EPA emailed you a checklist for evidence supporting atypical events, which you subsequently forwarded to me.

On September 14, 2023, Blue Sky Modeling, LLC (BSM) on behalf of ASARCO submitted to you a letter providing supporting information for the atypical event on October 12, 2020.

On October 23, 2023, you forwarded to me EPA's comments on the September 14 submittal. This revised letter addresses EPA's comments.

Point No. 1: An introductory summary that describes the project and identifies the regulatory purpose of the air quality analysis.

EPA designated the Hayden area of Gila and Pinal Counties as a NAA for the 2008 Pb NAAQS effective as of October 3, 2014. On January 31, 2022 the EPA determined the Hayden NAA failed to attain by the applicable attainment date of October 3, 2019. As a result of this determination, ADEQ is preparing a new SIP revision, which includes an updated model attainment demonstration. Included in that model attainment demonstration is a Pb background concentration.

Point No. 2: The background concentration, calculated before removing any potential atypical events, and discussion describing why the default unmodified design value is unrepresentative.

[1] Appendix B: Modeling Technical Support Document (TSD): Hayden Pb State Implementation Plan Revision. ADEQ Air Quality Division, April 4, 2023. Draft

As described in Section 7.0 of the TSD, the Pb background concentration was derived from ambient air monitoring data that were generated from November 2019 through September 2022 (after ASARCO was temporarily shut down in October 2019). The maximum rolling 3-month Pb concentration during this period, with no atypical events removed, is 0.025 µg/m3.

This value is significantly skewed high because of a specific material handing activity that occurred during the shutdown. On October 12, 2020 there was a very high daily Pb concentration, roughly 15 times higher than most other daily Pb concentrations. On that day ASARCO loaded copper filter cake, a known lead containing material, from roughly 6:00 AM through 3:00 PM, to the southeast of the Hillcrest monitor. The loading of copper filter cake was an unusual occurrence, only taking place on this day since the strike. When it did occur on this day ASARCO was moving piles off site, and as this pile had been there since the strike the inside of it was dry, which led to an unusual amount of fugitive dust (the outside had been crusted over because of watering). The wind was blowing for much of that day from the southeast. Figure 1 below presents the wind rose for the 6:00 AM to 3:00 PM timeframe during which the copper filter cake loading took place; as can be seen, there were winds from the southeast that would have transported Pb from the copper filter cake loading to the Hillcrest monitor.

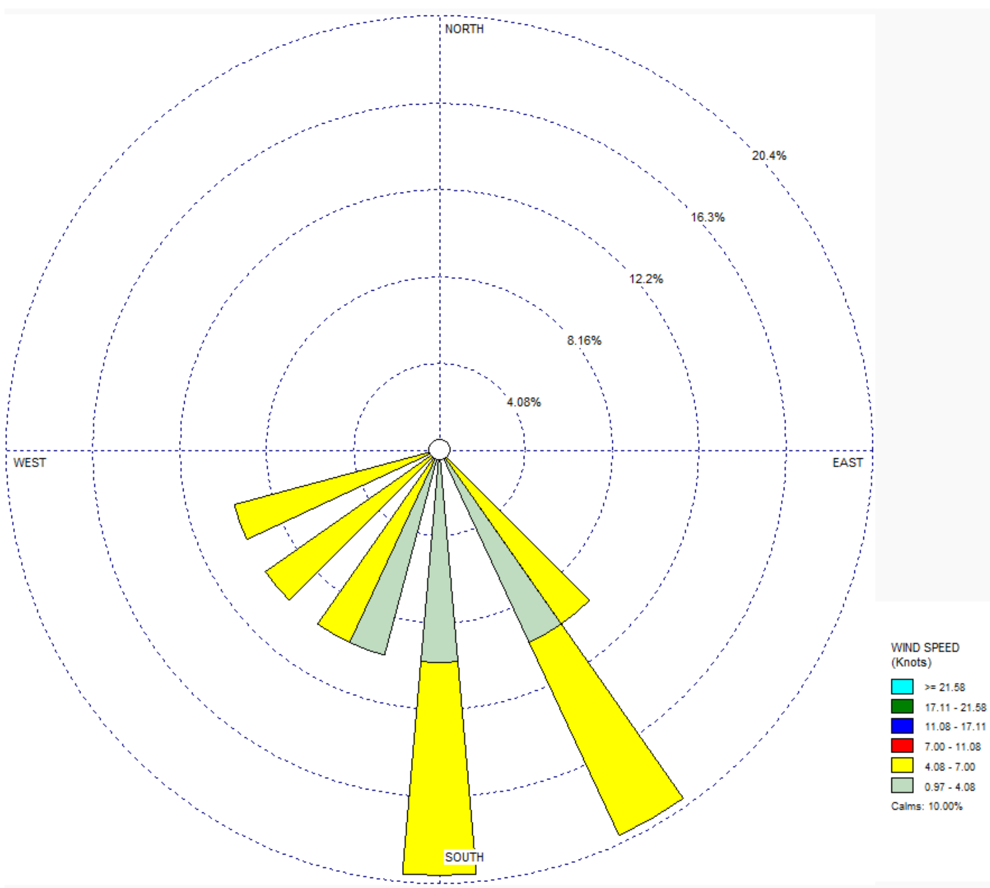

Figure 1
Hayden Jail Wind Rose
October 12, 2020
6:00 AM through 3:00 PM

Point No. 3: Identification of the dates, hours, monitors, and air pollutant concentrations to be removed from the background concentration or base-period design value.

Date: October 12, 2020
Hours: the 24-hr Pb concentration
Monitor: Hillcrest
Concentration to be removed: 0.076 $\mu g/m^3$

This specific concentration can be seen in Figure 2 below (which was originally provided in a March 2, 2023 letter from BSM to ADEQ[2]).

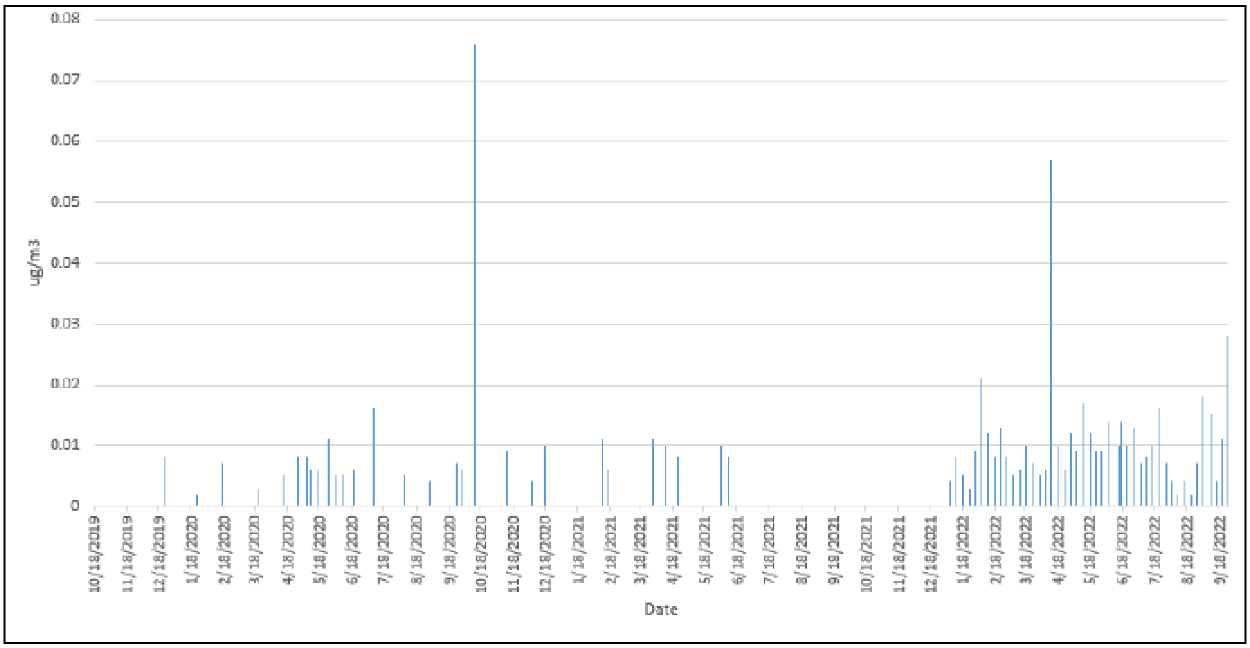

Figure 2
Daily Pb values used in the derivation of
Rolling 3-Month Averages used for
Hayden Pb SIP Background Concentration,
Before Removal of Atypical Event

Point No. 4: For each monitor and date proposed for removal, sufficient evidence the monitor was affected by an atypical event or event unlikely to occur again.

On October 12, 2020 ASARCO loaded copper filter cake, a known lead containing material, from roughly 6:00 AM through 3:00 PM, to the southeast of the Hillcrest monitor. The loading of copper filter cake was an unusual occurrence, only taking place at this time since the strike. When it did occur on this day ASARCO was moving piles off site, and as this pile had been there since the strike the inside of it was dry, which led to an unusual amount of fugitive dust (the outside had been crusted over because of watering).

[2] "ASARCO Response to EPA Pb SIP Modeling Comments" letter, William B. Jones (BSM) to Kamran Khan (ADEQ), March 2, 2023.

The activity that led to the pile and its moving no longer takes place; the material is now bagged in an enclosed structure.

Attached to this letter is an Outgoing Commodities report for October 12-13, 2020, which documents the removal of copper filter cake at this time.

Point No. 5: The modified background design concentration, calculated after the modification of the monitor record.

When the Hillcrest Pb concentration observed during the October 12, 2020 atypical event is removed from the calculation of the background concentration, the modified background concentration is 0.013 $\mu g/m^3$.

Thank you very much for your assistance. If you have any questions or need anything else, please contact me at bjones@blueskymodeling.com or at 410.499.9918.

Best regards,
William B. Jones
President

Weight entered manually

SCALE	TICKET	BOL	TRUCK #	CARRIER	FROM	COMMODITY	QUALITY	GROSS	TARE	NET	WEIGH IN DATE	WEIGH OUT DATE	SERVICE TIME (hh:mm)	OFFICER	DESTINATION	DRIVER	COMMENTS
Main Gate Hayden	BO2020-12080	A2751	951	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,280	27,100	52,180	10/12/2020 01:49	10/12/2020 02:23	00:34	HAYOPUSMAINGATE	Marana	MARK BALLARD	
Main Gate Hayden	BO2020-12081	A2752	250	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,400	29,040	50,360	10/12/2020 04:09	10/12/2020 04:56	00:47	HAYOPUSMAINGATE	Phoenix	BRUCE EGGERS	
Main Gate Hayden	BO2020-12082	A2753	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,140	25,940	53,200	10/12/2020 05:50	10/12/2020 06:37	00:47	HAYOPUSMAINGATE	Marana	DOMINIC SMITH	
Main Gate Hayden	BO2020-12084	BM191	224	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,800	30,000	47,800	10/12/2020 08:26	10/12/2020 08:54	00:28	HAYOPUSMAINGATE	GUAYMAS	MARCO FUENTES	CONTAINER # AZX-1180004 PLATE # AZ-82018-C
Main Gate Hayden	BO2020-12085	CFC20	211	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,600	27,860	50,740	10/12/2020 06:29	10/12/2020 08:47	02:18	HAYOPUSMAINGATE	GUAYMAS	JOHN DAY	PLATE # AZ-37505E TRAILER # 8255
Main Gate Hayden	BO2020-12088	CFC21	938	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,160	28,980	49,180	10/12/2020 07:00	10/12/2020 09:21	02:21	HAYOPUSMAINGATE	GUAYMAS	VINCE DURANT	PLATE # AZ-447735C TRAILER #8238
Main Gate Hayden	BO2020-12095	A2754	316	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,560	24,360	53,200	10/12/2020 08:55	10/12/2020 09:41	00:46	HAYOPUSMAINGATE	Marana	WILLIAM	
Main Gate Hayden	BO2020-12087	BM192	221	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,600	30,140	49,460	10/12/2020 07:41	10/12/2020 09:47	02:06	HAYOPUSMAINGATE	GUAYMAS	LUCIO MARTINEZ	CONTAINER # 1180008 PLATE # AZ-82458C
Main Gate Hayden	BO2020-12089	CFC22	948	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,640	28,520	48,120	10/12/2020 07:51	10/12/2020 10:25	02:34	HAYOPUSMAINGATE	GUAYMAS	JACOB BAKER	PLATE # AZ-72652H TRAILER # 8175
Main Gate Hayden	BO2020-12092	CFC23	250	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,480	26,520	50,960	10/12/2020 08:20	10/12/2020 10:48	02:28	HAYOPUSMAINGATE	GUAYMAS	AL HERMOSILLO	PLATE # AZ-72587 A TRAILER # 8178
Main Gate Hayden	BO2020-12102	A2755	1029	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,420	24,820	53,600	10/12/2020 10:16	10/12/2020 10:59	00:43	HAYOPUSMAINGATE	Marana	LEE	
Main Gate Hayden	BO2020-12093	CFC24	232	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,400	28,880	49,520	10/12/2020 08:25	10/12/2020 11:14	02:49	HAYOPUSMAINGATE	GUAYMAS	TYLER ECHOLLS	PLATE # AZ-44716C TRAILER # 8238
Main Gate Hayden	BO2020-12091	BM193	218	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	78,780	30,080	48,700	10/12/2020 07:58	10/12/2020 11:36	03:38	HAYOPUSMAINGATE	GUAYMAS	TOBIAS TRUJILLO	CONTAINER # 1180015 PLATE # AZ-82462C
Main Gate Hayden	BO2020-12106	A2756	315	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	76,900	23,780	53,120	10/12/2020 11:04	10/12/2020 11:41	00:37	HAYOPUSMAINGATE	Marana	FIDEL	
Main Gate Hayden	BO2020-12107	A2757	421	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,740	29,420	49,320	10/12/2020 11:23	10/12/2020 12:04	00:41	HAYOPUSMAINGATE	Casa Grande	JEREMY	
Main Gate Hayden	BO2020-12097	BM194	947	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,320	31,140	46,180	10/12/2020 09:28	10/12/2020 12:08	02:40	HAYOPUSMAINGATE	GUAYMAS	PAT MITCHELL	CONTAINER # AZX- 1180007 PLATE # AZ-22088-C
Main Gate Hayden	BO2020-12108	A2758	1032	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	25,140	52,560	10/12/2020 11:27	10/12/2020 12:30	01:03	HAYOPUSMAINGATE	Marana	JOHN	
Main Gate Hayden	BO2020-12109	A2759	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,280	25,020	53,260	10/12/2020 11:31	10/12/2020 12:33	01:02	HAYOPUSMAINGATE	Marana	DOMINIC	
Main Gate Hayden	BO2020-12098	CFC25	252	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	75,560	26,480	49,080	10/12/2020 09:17	10/12/2020 12:38	03:21	HAYOPUSMAINGATE	GUAYMAS	RON MATTHYS	PLATE # AZ-72691H TRAILER # 8240
Main Gate Hayden	BO2020-12110	A2760	293	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,880	24,820	53,860	10/12/2020 11:55	10/12/2020 12:46	00:51	HAYOPUSMAINGATE	Marana	GABE	
Main Gate Hayden	BO2020-12099	CFC26	248	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,720	30,200	47,520	10/12/2020 09:53	10/12/2020 13:19	03:26	HAYOPUSMAINGATE	GUAYMAS	MARIO CASTILLO	PLATE # AZ-T 34611 TRAILER # 8206
Main Gate Hayden	BO2020-12101	CFC27	991	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,380	29,580	46,800	10/12/2020 10:15	10/12/2020 13:43	03:28	HAYOPUSMAINGATE	GUAYMAS	LAZARO SANCHEZ	PLATE # AZ-01510F TRAILER # 8205
Main Gate Hayden	BO2020-12116	BM195	247	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	70,900	29,460	41,440	10/12/2020 14:33	10/12/2020 15:05	00:32	HAYOPUSMAINGATE	GUAYMAS	JOHN BARNES	CONTAINER # AZX-1180018 PLATE # AZ-78311C
Main Gate Hayden	BO2020-12117	A2761	318	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,400	23,600	53,800	10/12/2020 14:41	10/12/2020 15:25	00:44	HAYOPUSMAINGATE	Marana	WILLIAM	
Main Gate Hayden	BO2020-12123	A2762	250	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,520	29,840	49,780	10/12/2020 18:16	10/12/2020 19:15	00:59	HAYOPUSMAINGATE	Tonopah	SCOTT MEADOR	
Main Gate Hayden	BO2020-12124	A2763	951	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,260	26,440	52,820	10/13/2020 01:46	10/13/2020 02:22	00:36	HAYOPUSMAINGATE	Marana	MARC BALLARD	
Main Gate Hayden	BO2020-12125	A2764	948	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,100	27,660	50,440	10/13/2020 01:52	10/13/2020 02:35	00:43	HAYOPUSMAINGATE	Marana	DAVID RANDALLE	
Main Gate Hayden	BO2020-12126	A2765	251	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,440	29,000	50,440	10/13/2020 04:44	10/13/2020 05:33	00:49	HAYOPUSMAINGATE	Gilbert	BRUCE EGGERS	
Main Gate Hayden	BO2020-12128	A2766	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,780	25,820	53,960	10/13/2020 05:48	10/13/2020 06:42	00:54	HAYOPUSMAINGATE	Marana	DOMINIC	298
Main Gate Hayden	BO2020-12132	A2767	77	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,320	28,580	49,740	10/13/2020 06:46	10/13/2020 07:38	00:52	HAYOPUSMAINGATE	Saint Johns, AZ.	BRAD	
Main Gate Hayden	BO2020-12131	BM196	224	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,240	29,440	47,800	10/13/2020 06:36	10/13/2020 08:04	01:28	HAYOPUSMAINGATE	GUAYMAS	MARCO FUENTES	container # azx- 1180012 plate # mx-91-uf-4v
Main Gate Hayden	BO2020-12130	CFC28	211	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,000	30,080	47,920	10/13/2020 06:25	10/13/2020 08:18	01:53	HAYOPUSMAINGATE	GUAYMAS	JOHN DAY	plate # az-t34809 trailer # 8204
Main Gate Hayden	BO2020-12134	CFC29	250	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,160	25,940	50,220	10/13/2020 07:02	10/13/2020 08:22	01:20	HAYOPUSMAINGATE	GUAYMAS	AL HERMOSILLO	plate # az-y97152 trailer # 8226
Main Gate Hayden	BO2020-12140	A2758	948	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,720	27,340	51,380	10/13/2020 07:50	10/13/2020 08:28	00:38	HAYOPUSMAINGATE	Marana	DAVID	
Main Gate Hayden	BO2020-12133	BM197	218	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	76,660	30,220	46,440	10/13/2020 06:55	10/13/2020 08:37	01:42	HAYOPUSMAINGATE	GUAYMAS	TOBIS TRUJILLO	container # azx-1180002 plate # mx-28b5m
Main Gate Hayden	BO2020-12139	CFC30	948	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,620	30,520	47,100	10/13/2020 07:42	10/13/2020 08:45	01:03	HAYOPUSMAINGATE	GUAYMAS	JACOB BAKER	plate # az-27845d trailer # 8225
Main Gate Hayden	BO2020-12136	BM198	221	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	74,900	30,160	44,740	10/13/2020 07:10	10/13/2020 08:56	01:46	HAYOPUSMAINGATE	GUAYMAS	LUCIO MARTINEZ	container # azx-1180003 plate # az-13280d
Main Gate Hayden	BO2020-12137	BM199	929	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,040	32,160	46,880	10/13/2020 07:17	10/13/2020 09:14	01:57	HAYOPUSMAINGATE	GUAYMAS	JUAN VALVERDE	container # azx-1180024 plate # az-78243c
Main Gate Hayden	BO2020-12143	CFC31	232	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	79,120	29,240	49,880	10/13/2020 08:41	10/13/2020 09:52	01:11	HAYOPUSMAINGATE	GUAYMAS	TYLER ECHOLLS	plate # az-y97212 trailer # 8228
Main Gate Hayden	BO2020-12148	A2769	870	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	25,480	52,220	10/13/2020 09:25	10/13/2020 10:01	00:36	HAYOPUSMAINGATE	Marana	AUDIE	
Main Gate Hayden	BO2020-12144	CFC32	248	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,960	26,820	50,140	10/13/2020 08:50	10/13/2020 10:14	01:24	HAYOPUSMAINGATE	GUAYMAS	MARIO CASTILLO	plate # az-72893a trailer # 8173
Main Gate Hayden	BO2020-12150	A2770	1022	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,520	24,020	54,500	10/13/2020 09:34	10/13/2020 10:18	00:44	HAYOPUSMAINGATE	Marana	BEN	
Main Gate Hayden	BO2020-12147	CFC33	210	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,580	29,200	49,380	10/13/2020 09:21	10/13/2020 11:05	01:44	HAYOPUSMAINGATE	GUAYMAS	MIKE OSIER	plate# az-y97153 trailer # 8227
Main Gate Hayden	BO2020-12149	CFC34	938	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,360	31,540	45,820	10/13/2020 09:28	10/13/2020 11:16	01:48	HAYOPUSMAINGATE	GUAYMAS	VINCE DURANT	plate # az-y81903 trailer # 8208
Main Gate Hayden	BO2020-12157	A2771	315	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,500	23,660	55,840	10/13/2020 10:53	10/13/2020 11:30	00:37	HAYOPUSMAINGATE	Marana	ANDRES	
Main Gate Hayden	BO2020-12151	BM200	947	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,580	31,760	47,820	10/13/2020 09:36	10/13/2020 11:43	02:07	HAYOPUSMAINGATE	GUAYMAS	PATRICK MITCHELL	container # azx-1180001 plate # mx-65-ty-8g
Main Gate Hayden	BO2020-12161	A2772	293	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	76,880	24,600	52,280	10/13/2020 11:27	10/13/2020 12:01	00:34	HAYOPUSMAINGATE	Marana	GABE	
Main Gate Hayden	BO2020-12152	BM201	247	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	75,040	29,260	46,880	10/13/2020 09:44	10/13/2020 12:07	02:23	HAYOPUSMAINGATE	GUAYMAS	JOHN BARNES	container # azx-1180006 plate # mx-92u6fv
Main Gate Hayden	BO2020-12162	A2773	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,880	24,580	54,300	10/13/2020 11:34	10/13/2020 12:17	00:43	HAYOPUSMAINGATE	Marana	DOMINIC	
Main Gate Hayden	BO2020-12156	BM202	215	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	73,560	29,420	44,140	10/13/2020 10:43	10/13/2020 12:26	01:45	HAYOPUSMAINGATE	GUAYMAS	SAL MONREAL	container # azx-1180011 plate # az-82475 c
Main Gate Hayden	BO2020-12165	A2774	318	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,000	23,760	54,240	10/13/2020 11:57	10/13/2020 12:37	00:40	HAYOPUSMAINGATE	Marana	FIDEL	
Main Gate Hayden	BO2020-12155	CFC35	991	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,300	27,380	49,920	10/13/2020 10:39	10/13/2020 12:54	02:15	HAYOPUSMAINGATE	GUAYMAS	LAZARO SANCHEZ	plate # az-253726 trailer # 8187

Weight entered manually

SCALE	TICKET	BOL	TRUCK #	CARRIER	FROM	COMMODITY	QUALITY	GROSS	TARE	NET	WEIGH IN DATE	WEIGH OUT DATE	SERVICE TIME (hh:mm)	OFFICER	DESTINATION	DRIVER	COMMENTS
Main Gate Hayden	BO2020-12159	CFC36	219	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	75,540	26,580	48,960	10/13/2020 11:00	10/13/2020 13:18	02:18	HAYOPUSMAINGATE	GUAYMAS	MIKE FORCE	plate # az-72694a trailer #6174
Main Gate Hayden	BO2020-12167	A2775	1032	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	24,540	53,160	10/13/2020 12:23	10/13/2020 13:22	00:59	HAYOPUSMAINGATE	Marana	JOHN	
Main Gate Hayden	BO2020-12166	CFC37	252	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,240	25,960	50,280	10/13/2020 12:11	10/13/2020 13:27	01:16	HAYOPUSMAINGATE	GUAYMAS	RON MATTHYS	PLATE # AZ-01638F TRAILER # 8254
Main Gate Hayden	BO2020-12174	A2776	245	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,180	26,940	51,240	10/13/2020 16:10	10/13/2020 16:56	00:46	HAYOPUSMAINGATE	Joseph City	DAN	
											AVERAGE TIME		01:27				

COMMODITY	CLIENT	RECORDS	NET
MMI HAYDEN SULFURIC ACID PLANT - SULPHURIC ACID			
	Casa Grande	1	49,320
	Gilbert	1	50,440
	Joseph City	1	51,240
	Phoenix	1	50,360
	Saint Johns, AZ.	1	49,740
	Tonopah	1	49,780
		6	300,880
HAYDEN SULPHURIC ACID PLANT - SULPHURIC ACID			
	Marana	20	1,063,500
		20	1,063,500
HAYDEN SMELTER - BIN MIXES			
	GUAYMAS	12	558,080
		12	558,080
HAYDEN SMELTER - COPPER FILTER CAKE			
	GUAYMAS	18	881,540
		18	881,540
		56	**2,804,000**

Appendix B:

Modeling Technical Support Document (TSD): Hayden Pb State Implementation Plan Revision

Air Quality Division
December 05, 2023

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1.0 Introduction

The United States Environmental Protection Agency (EPA) established a new more stringent National Ambient Air Quality Standard (NAAQS) for lead of 0.15 microgram per cubic meter ($\mu g/m^3$) in total suspended particles as a 3-month rolling average, on November 12, 2008.[1] EPA designated the Hayden area of Gila and Pinal Counties as a nonattainment area (NAA) for the 2008 Pb NAAQS effective as of October 3, 2014. On January 31, 2022[2] the EPA determined the Hayden NAA failed to attain by the applicable attainment date of October 3, 2019. As a result of this determination, the Arizona Department of Environmental Quality (ADEQ) is preparing a new SIP revision, which will include an updated model attainment demonstration. An American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) attainment demonstration is a core piece of this SIP submittal.

As described in this modeling Technical Support Document (TSD), the modeling was performed in accordance with the EPA's Guideline on Air Quality Models (GAQM) (40 CFR 51, Appendix W) (U.S. EPA, 2005). Additionally, where needed, ADEQ employed additional clarification regarding modeling from "2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers" (U.S. EPA, 2011). ADEQ closely followed EPA's modeling guidance in performing dispersion modeling for this SIP.

This TSD, presents the modeling methodologies that ADEQ followed in completing the ambient air quality analysis of the Hayden planning area. The TSD is organized as follows:

- Section 2 provides an overview of the general regional characteristics of the Hayden Pb NAA, including topography, land use, and climate;
- Section 3 provides a discussion on the determination of the modeling domain, sources to explicitly model and the receptor grid;
- Section 4 provides a discussion on the model selection;
- Section 5 provides detailed source inputs, including source configuration, source emissions, source release parameters, Good Engineering Practice (GEP) stack height, urban/rural determination, and contingency measure modeling;
- Section 6 provides a discussion on the selection and processing of meteorological data;
- Section 7 provides a discussion on the determination of background concentrations;
- Section 8 provides a discussion on modeling results and emission limits.

In addition to the above sections, ADEQ is also providing Appendix I, the modeling report created by Asarco's modeling contractor. This modeling reports describes much of the material covered in this TSD, but also includes the following appendices:

- Appendix A: Volume Source Supporting Information, Non-Roads
- Appendix B: Volume Source Supporting Information, Roads
- Appendix C: Background Concentration Supporting Information

[1] 73 Fed. Reg. 66964 (November 12, 2008)
[2] EPA published this designation in 40 CFR Parts 52 as document 87 FR 4805 on January 31, 2022.

2.0 Overview of Hayden Nonattainment Area (NAA) for Pb

The Hayden Pb NAA is located in Southeastern Arizona and encompasses roughly 275 square miles. Directly east of the NAA is the San Carlos Reservation, no major sources of lead are found in said reservation, therefore transport from the reservation into the NAA was not considered. The major source of lead in the NAA is the Asarco's Primary Copper Smelter located adjacent to the Town of Hayden. The smelter's location is depicted in Figure 2-1 below.

2.1 Evaluation of NAAQS Exceedances

The following section addresses the exceedances that occurred after the submission of the 2017 Hayden Pb SIP revision. Specifically, exceedances at the Hillcrest and Globe Highway monitors from 2018 to when the smelter shutdown due to the work stoppage in 2019. The Table 2-1 provides the 24-hr Pb concentration for both monitors on a given exceedance day, the maximum hourly wind speed at the Camera Hill meteorological (MET) station, and the 24-hr average wind speed at the Globe Highway monitor.

For the Hillcrest monitor, the elevated readings shown in the table were, with minor exceptions, attributable to process fugitive emissions. This is based on a root cause analysis that Asarco performed and reported to EPA pursuant to Appendix B, 31.B.iii of the Consent Decree. The report that Asarco filed with EPA attributed the high concentrations to fugitive dust during high wind events, including events that coincided with non-routine material handling.

The best management practices for fugitive dust control, which have been migrated from the decree into Hayden Operations' Title V permit and into the concurrently effective Pb NAA SIP (A.A.C. R18-2-B1301.01) including their corrective action components, as well as the additional dust control measures proposed in Asarco's December 16 petition (page 8 of the petition), will ensure that fugitive dust emissions at Hayden Operations are not drivers of exceedances of the 3-month rolling average Pb NAAQS.

In addition to the Hillcrest monitor, Table 2-1 contains the 2018 – 2019 exceedance days at the Globe Highway monitor. Section 3.2.3 of ADEQ's Emissions Inventory TSD discusses previous analyses performed to identify potential sources impacting the Globe Highway monitor. In short, the lead particulate ratio analysis performed for the 2017 SIP, along with the observed mountain-valley diurnal wind patterns, which cause the pooling of air in low-lying areas, suggests smelter fugitives likely play a part in elevated Globe Highway concentrations. The Globe Highway wind speed data in Table 2-1 supports this conclusion, in that, exceedance days align with low wind speeds recorded at the Globe Highway monitor. For reference, the annual average wind speed at the Globe Highway monitor in 2018 was 5.6 miles per hour (mph).

The three new smelting process related controls discussed throughout this TSD are expected to substantially reduce process fugitive emissions from the Hayden smelter. These reductions have been quantified and modeled according to the latest EPA guidelines and preferred model. The results of this modeling, presented in Section 8, show the area will attain the 2008 Pb NAAQS.

Table 2-1: Hillcrest and Globe Highway Exceedances

Date	24-hr Pb (µg/m3) by Monitor		Max Hourly Wind (mph) Speed at Camera Hill	24-hr Average Wind (mph) Speed at Globe Highway
	Hillcrest	Globe Highway		
1/2/2018	0.351	N/A	15.3	5.6
1/8/2018	0.213	N/A	12	6.1
1/20/2018	N/A	0.176	21.6	2.0
1/29/2018	1.003	N/A	26.6	11.2
2/1/2018	0.294	0.251	14.6	5.0
2/7/2018	0.479	N/A	20.4	7.2
2/19/2018	N/A	0.298	18.7	8.7
3/3/2018	0.204	0.357	23.1	4.3
3/9/2018	N/A	0.438	15.8	3.9
4/20/2018	N/A	0.274	16.5	3.1
5/8/2018	N/A	0.168	16.7	3.2
5/26/2018	N/A	0.247	23.7	3.3
7/1/2018	N/A	0.162	15.9	2.5
7/7/2018	0.321	N/A	19.4	5.1
7/19/2018	N/A	0.251	16.3	2.8
7/25/2018	0.156	N/A	25.3	3.0
10/17/2018	0.505	N/A	26.3	9.9
10/20/2018	0.336	N/A	27.2	8.8
11/10/2018	0.191	N/A	25.9	8.5
1/21/2019	N/A	0.253	25.6	3.4
3/16/2019	0.323	N/A	26.4	11.5
3/28/2019	N/A	0.166	15.9	3.0
4/15/2019	N/A	0.17	18.6	2.7
5/27/2019	N/A	0.32	20.2	2.8
6/14/2019	N/A	0.17	19.2	5.2
6/20/2019	N/A	0.175	16.2	4.3
7/2/2019	0.155	0.222	19.2	3.4
7/14/2019	N/A	0.276	17.3	2.5
7/20/2019	N/A	0.272	16.7	2.6
7/26/2019	N/A	0.185	16.9	2.4
8/25/2019	N/A	0.179	17.9	3.1
9/6/2019	N/A	0.351	16.2	2.1
9/24/2019	0.317	N/A	16.2	4.3
10/12/2019	0.305	N/A	26.4	7.8

2.2 Population

The Hayden Pb NAA has been codified in 40 CFR 81.303 and is comprised of the portions of Gila County and Pinal County bound by the townships and ranges listed in Table 2-1 and represented geographically in Figure 2-1. Population estimates for the entire Hayden Pb NAA as well as the respective proportions of Gila and Pinal Counties are also presented in Table 2-1. The Hayden NAA encompasses the Towns of Hayden, Winkelman and Kearny, for which population data has been included in Table 2-2.

Table 2-2: Geographic Location and Population

Hayden Pb NAA[3,4]			
Land Area		275 square miles	
2017 Population		4,409	
2026 Projected Population		3,679	
Gila County Portion		**Pinal County Portion**	
Land Area	58 square miles	Land Area	217 square miles
2017 Population	1,176	2017 Population	3,233
2026 Projected Population	982	2026 Projected Population	2,697
Township, Range		**Township, Range**	
4S, 14E		4S, 14E	
4S, 15E		4S, 15E	
4S, 16E		4S, 16E	
5S, 15E		5S, 14E	
5S, 16E		5S, 15E	
-		5S, 16E	
-		6S, 14E	
-		6S, 15E	
-		6S, 16E	

Table 2-3: Towns within Hayden PB NAA

Location	2017 Population[5]
Town of Hayden	632
Town of Winkelman	347
Town of Kearny	2,100

[3] ADOA calculated the land area of Gila County and Pinal County based on 2010 department of Census TIGER/Line shapefiles.

[4] AOEO population figures for both Gila County and Pinal County were used to develop population projections. AOEO's population estimation methodologies are presented in Appendix A.

[5] Based on AOEO estimates.

2.3 Land use

The Hayden NAA area encompasses portions of two counties: Gila and Pinal (see Figure 2-2). The Gila County portion of the NAA is approximately 58 square miles[6] while the Pinal County portion is approximately 217 square miles[7]. The majority of the land within the NAA is owned and managed by the either the Bureau of Land Management (39.1%) or the Arizona State Land Department (35.5%). The remainder of the land within the NAA is comprised of privately held land along with a small area of land located to the east of Winkelman, which the Bureau of Reclamation manages. A breakdown of the land owners in the Hayden Pb NAA are presented in Table 2-3 and Figure 2-2.

Table 2-4: Land Use Area

Hayden Pb NAA[8]		
Land Owner	**Area (square miles)**	**Percentage**
Bureau of Land Mgmt.	106.816	39.1%
State Trust Land	96.876	35.5%
Private Land	68.932	25.2%
Bureau of Reclamation	0.499	0.2%

A discussion of industrial sources within the Hayden Pb NAA are provided in Section 3.1 of this TSD. Further discussion of land use, as it pertains to dispersion modeling and meteorological processing inputs, is provided in Sections 5 and 6.

2.4 Topography

Asarco operations in Hayden, Arizona are located on the southwestern flank of the Dripping Spring Mountains, a range rising rapidly just to the north and east of Asarco. Bisected by numerous northeast-southwest oriented arroyos, this terrain in the immediate vicinity of the Asarco Hayden Operations is rugged and variable in elevation. To the south of Asarco the terrain is smoother, dominated by the northwest-southeast aligned valley of the Gila and San Pedro Rivers. The Tortilla Mountains, which form the western border of the Gila River Valley, are located several miles to the west of Asarco. The topography of the local area, along with the location of Asarco's Hayden Operations, is depicted in Figure 2-1. As a note, the ambient air boundary (AAB) shown in Figure 2-1 reflects the AAB used in the attainment demonstration modeling. As discussed later in this document, the contingency measure modeling utilized an AAB with an expanded southern fence line. That AAB is shown in Figure 2-2.

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[6] ADOA calculated the land area of the Miami NA based on 2010 department of Census TIGER/Line shapefiles.
[7] ADOA calculated the land area of the Hayden NA based on 2010 department of Census TIGER/Line shapefiles.
[8] Land use information for both Gila County and the Hayden NA was garnered from the Arizona Land Resource Information System (ALRIS) GIS tool managed by the Arizona State Land Department.

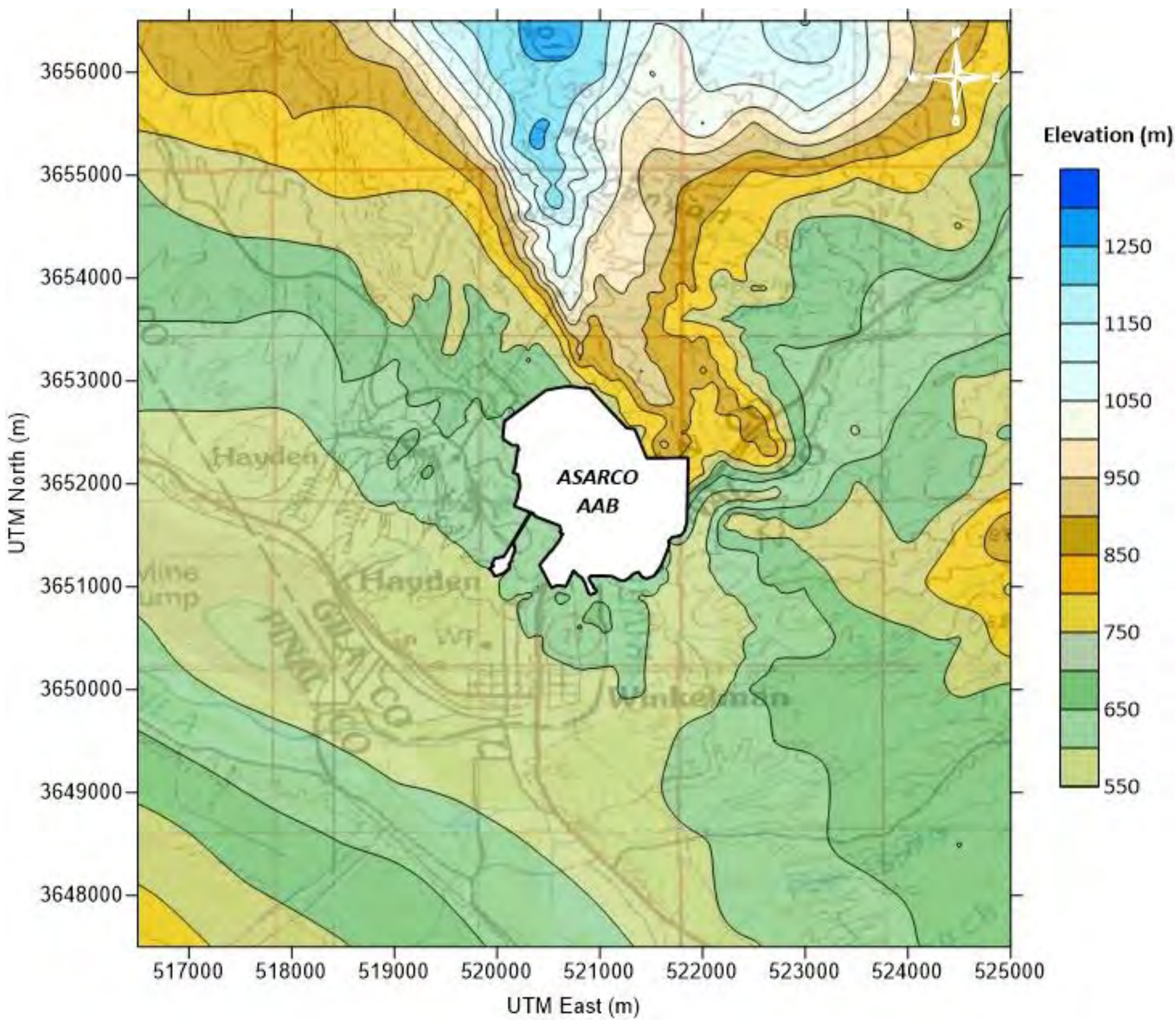
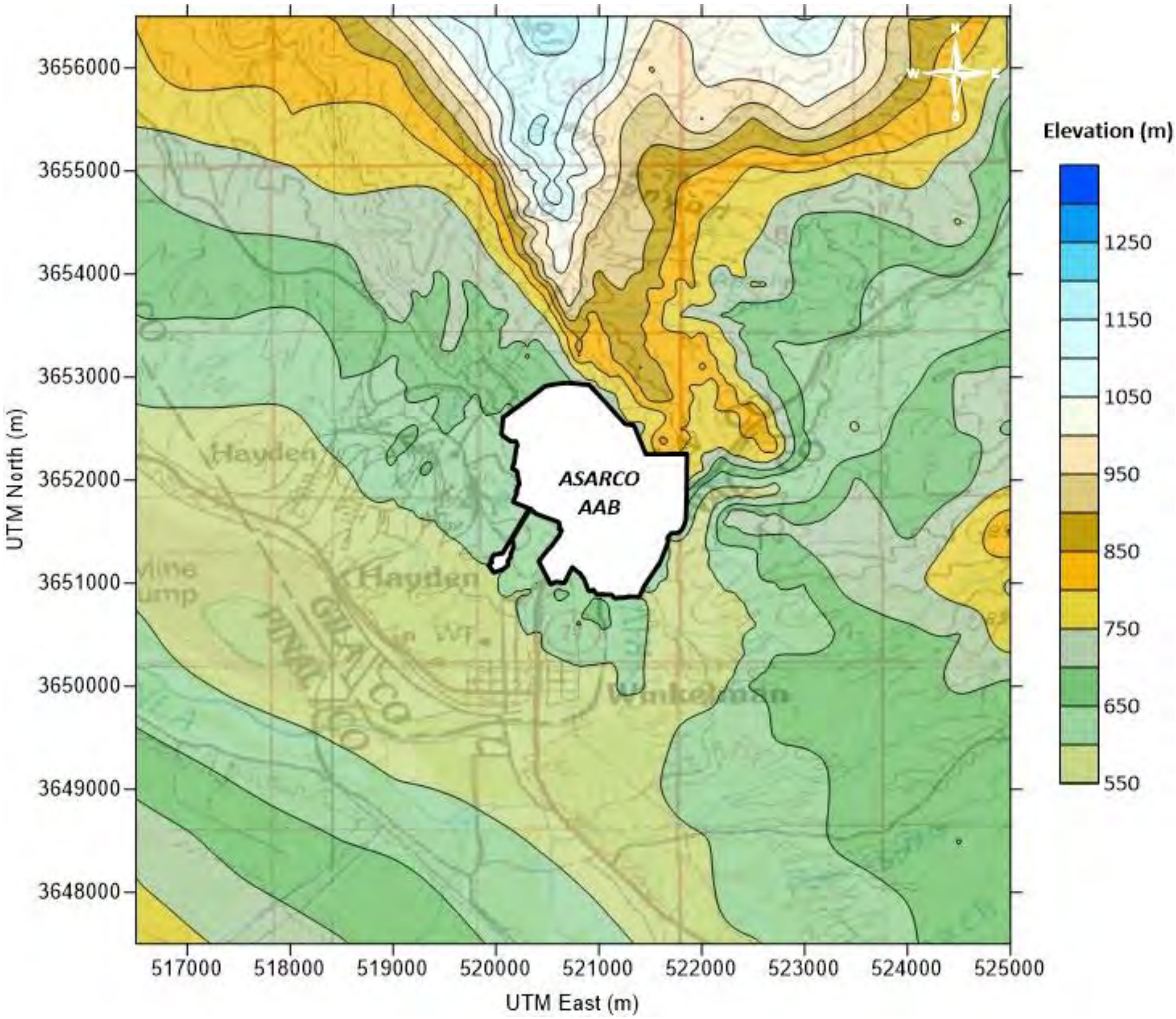


Figure 2-1: Topography of Area Surrounding Asarco with Attainment Demonstration AAB

Figure 2-2: Topography of Area Surrounding Asarco with Contingency Measure AAB



2.5 Climate

Both desert terrain and mountain ranges are found across the southern Gila County and eastern Pinal County landscape. Elevations range from near 1,800 feet to more than 4,400 feet above sea level in the NAA with the Town of Hayden situated at an elevation near 2,050 feet. This unique environment experiences both warm desert and cool alpine climates. The climate of the area is arid, with annual average precipitation of about 14 inches. Temperatures range from an average low in the winter of 31°F to an average high of 99°F in the summer. Wind directions in the area generally conform to the river valley orientations, with westerly and southeasterly winds predominating in Hayden.

Synoptic scale air flows and local topographically driven surface winds influence the speed and direction of air pollution transport throughout the Hayden area. Local wind patterns in the Gila River Airshed are greatly influenced by the complex local topography. Hayden is located at the junction of two rivers, the Gila and the San Pedro. Situated in a low-lying part of a valley with mountains reaching over 4,000 feet to the north, east and southwest, Hayden is subject to a distinct mountain-valley diurnal wind pattern. Under stable atmospheric conditions, nighttime winds are typically from the southeast with speeds less than 10 miles per hour (4.47 meters per second). These conditions can cause air pooling in low-lying areas at night, allowing for pollutants to settle in these areas. The up-slope air flows and convection that occurs during the day increases dispersion and flow out of the Hayden area. Under normal daytime conditions, surface winds in the Hayden area range from west-southwesterly to west-northwesterly as the atmosphere becomes less stable. This pattern is repeated throughout the complex terrain found in the Hayden area.

During the wintertime, relatively strong inversions (where cold air becomes trapped at the surface by warmer air aloft) create extremely stable atmospheric conditions. Depending on the strength of the inversion and amount of daytime surface heating, the inversion may break by the early afternoon, permitting the air to mix vertically. Sometimes, however, the inversion may not break at all. Under these conditions, vertical and horizontal movement of the air is very limited, causing pollutants in the air to accumulate up to several days with little dispersion.

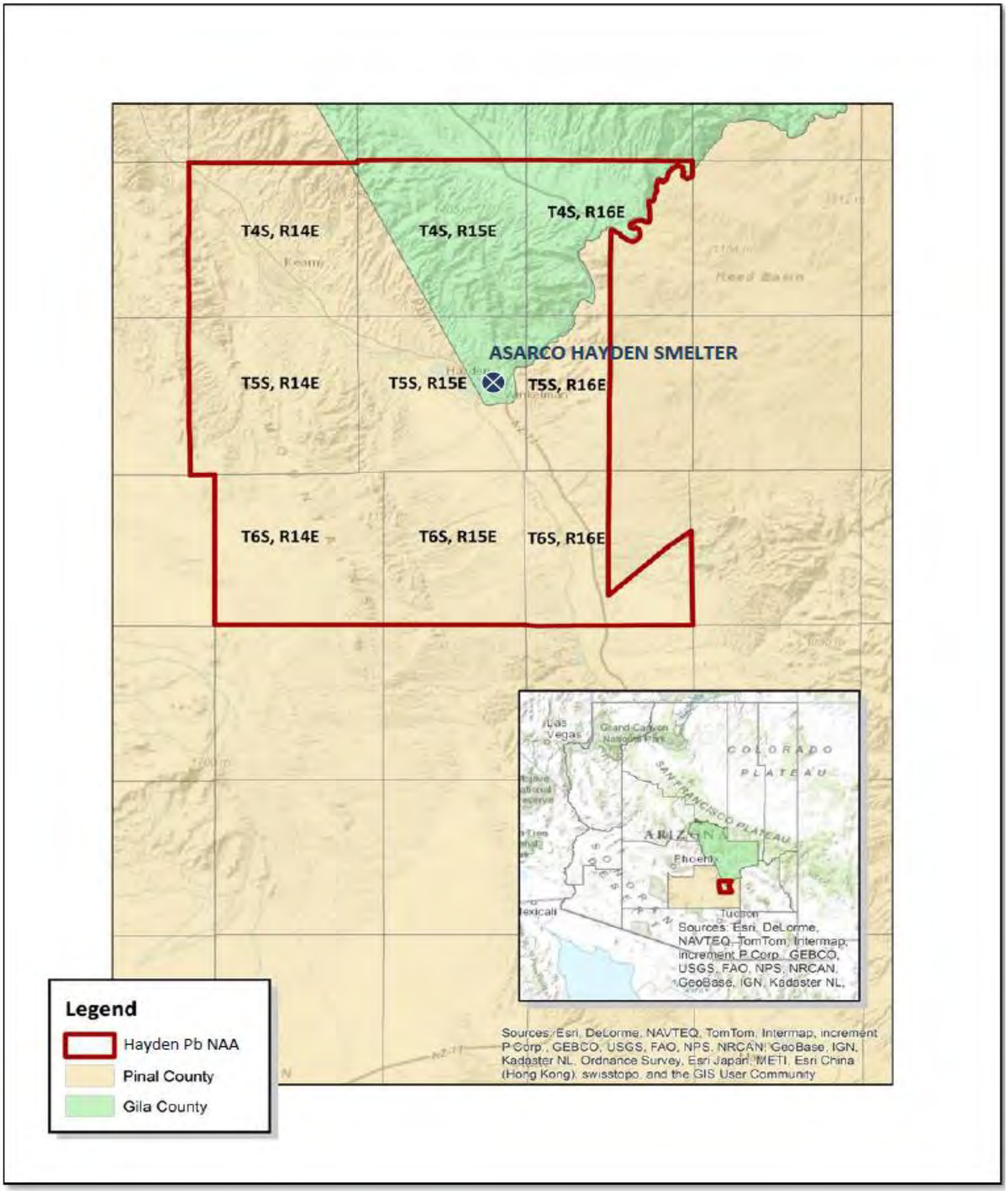


Figure 2-3: Map of the Hayden Nonattainment Area Including Townships and Ranges

3.0 Modeling Domain

The first step of the SIP modeling exercise is to determine the size of the modeling domain, which depends on the number of sources to explicitly model and size of the receptor network in order to account for the areas of impact (U.S. EPA, 2014a). The modeling domain should at a minimum encompass the nonattainment area and include the sources thought most likely to cause or contribute to NAAQS violations in and around the nonattainment area. In the modeling exercise, all modeled receptors should exhibit modeled attainment of the NAAQS.

3.1 Emission Sources

ADEQ's Emissions Inventory (EI) for the Hayden Pb NAA includes point and area sources. In said inventory the point source category contributes 99% of the Pb emissions in the NAA. Moreover, the only facility in this category is the Asarco Hayden Copper Smelter. Due to this inventory make up, ADEQ has focused its contributing sources analysis on the aforementioned facility. For more information on the NAA EI see ADEQ's EI TSD.

At the Asarco facility, ADEQ has determined the following processes/emissions points to be the contributors of Pb emissions:

- Main stack emissions
- Fugitive emissions from the smelting process
- Slag dumping
- Re-entrained leaded silts/material

3.2 Ambient Air Boundary and Receptor Grid

The land owned by Asarco contiguous to and including Asarco's Hayden Operations covers an area in excess of 15 square miles. This area extends along and on either side of the Gila River Valley approximately 4-1/2 miles to the west of the plant and extends into the Dripping Spring Mountains to the north and northwest. In addition, much of the area is inaccessible to the general public, either because it is fenced or because of the steep and rugged nature of the terrain. Consequently, much of Asarco's property is not considered ambient air. The area encompassing the actual processes and industrial activities associated with the Asarco Hayden Operations is considerably smaller and is located immediately to the north and east of the Town of Hayden.

Asarco followed guidance in Section 3.4.3 of ADEQ's Air Dispersion Modeling Guidelines (ADMG) about how to identify, for permitting modeling purposes, the Ambient Air Boundary (AAB), outside of which modeling receptors are to be placed. This perimeter consists of fencing and steep/rugged terrain.

The AAB used for the attainment demonstration is the same as that used for the SO_2 SIP modeling, with one exception: the AAB used for the Pb attainment demonstration encompasses an additional narrow area extending down to the crusher (Figure 3-1), near the rail loading, which is a source of fugitive dust that may contain Pb. The SO_2 modeling over-conservatively treated this area as ambient air, even though it is a secure part of Asarco's property and operations at the facility. Additionally, the attainment demonstration AAB does not encompass the railcar unloading area that is located across Highway 177, even though that area too is a secure part of Asarco's property and operations. In this respect, the Pb SIP modeling is as over-conservative as the SO_2 SIP modeling, which also treated that area as ambient air.

The modeling conducted for the contingency measure analysis is slightly different than the attainment demonstration AAB. As part of the contingency measure, Asarco will be expanding the fencing along the southern portion of the facility (Figure 3-2). A comparison of the southern portion of the attainment demonstration and contingency measure AABs, can be seen in Section 5.2 of this TSD (Figures 5-2 and 5-3).

Additionally, In January 2017, Asarco informed ADEQ that they had purchased land to the east of the smelter, which was previously excluded from the AAB. ADEQ has included this land to Asarco's AABs and updated the modeling information.

ADEQ personnel performed an on-site tour of the AAB used for the Hayden SO_2 and Pb nonattainment plans. During this tour ADEQ personnel traveled and documented the portions of the AAB that were reasonably accessible. In general, upon visiting the site and inspecting the AAB, ADEQ concurs with the AAB assessment provided by Asarco[9] and agrees that the boundary represents a practical ability to preclude public access. More details and photographs of the survey are provided in Appendix H of this TSD.

As part of the latest modeling effort, ADEQ has consulted with Asarco regarding any changes to the boundary since the 2017 site tour. Other than the expanded fencing previously discussed, no changes have been made to fencing or terrain. Therefore, the previous determination that the boundary represents a practical ability to preclude public access still applies.

The modeling domain covers approximately 33 kilometers by 34 kilometers, centered on the Asarco Smelter facility. The modeling domain covers portions of Gila and Pinal Counties and encompasses the entire Hayden NAA. Figure 3-1 presents the attainment demonstration receptors superimposed on a map of the Hayden NAA.

The Pb SIP modeling receptor grid consists of 2,932 receptors, spaced as follows:

- Receptors along AAB at a spacing of 25 m
- Receptors between AAB 500 m and ~1500 m at a spacing of 100 m (including in area of elevated terrain to the north)
- Receptors between ~1500 m and ~5500 m at a spacing of 500 m
- Receptors between ~5500 m and Hayden Pb NAA boundary at a spacing of 1000 m
- Receptors along the Hayden Pb NAA boundary at a spacing of 2500 m

EPA's AERMAP software tool (version 18081) was used to estimate receptor elevations and hill heights. Four 1/3 arc-second USGS GeoTiff files were used as inputs to AERMAP. The datum for this AERMAP processing was 1983 North American Datum (NAD83).

[9] See Appendix A Asarco's Updated Ambient Air Boundary

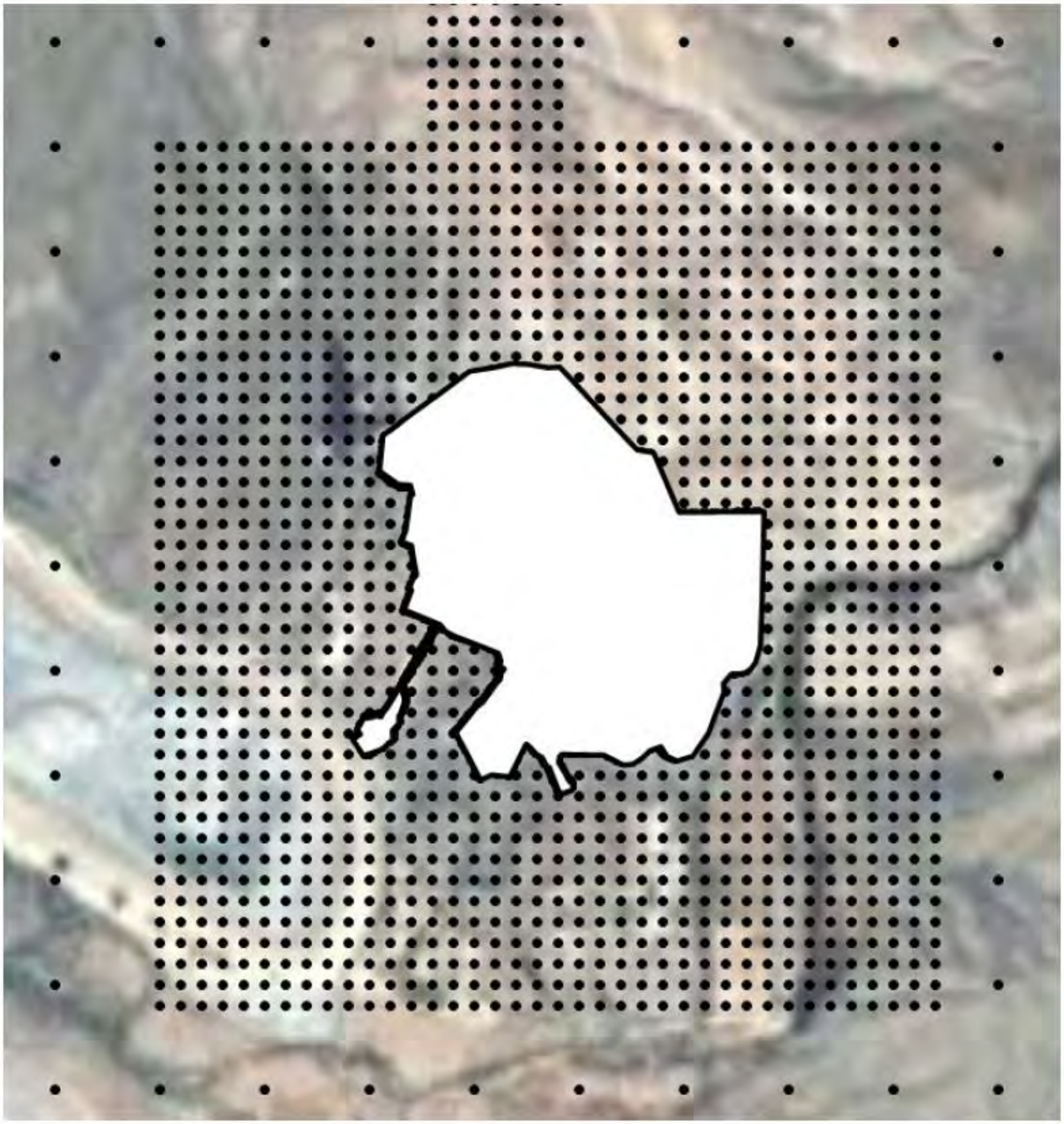


Figure 3-1: Attainment Demonstration Ambient Air Boundary

Figure 3-2: Contingency Measure Ambient Air Boundary

4.0 Model Selection

As outlined in the EPA's Guideline on Air Quality Models (Appendix W to 40 CFR Part 51), AERMOD is the recommended model to demonstrate attainment under the 2008 Pb NAAQS. As stated in Section 4.2.2.1 of Appendix W, for a wide range of regulatory applications in all types of terrain, and for aerodynamic building downwash, the recommended model is AERMOD. Additionally, AERMOD is the recommended sequential model in EPA's GAQM (40 CFR 51, Appendix W) (U.S. EPA, 2005) for near-field analysis.

4.1 AERMOD

ADEQ used AERMOD version 22112 for the attainment demonstration described in this TSD.

There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET (version 22112), a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP (version 18081), a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data. Other non-regulatory components of this system include: AERSURFACE (Version 20060), a surface characteristics preprocessor, and BPIPPRIM, a multi-building dimensions program incorporating the Good Engineering Practice technical procedures for PRIME applications (U.S. EPA, 2004a).

The regulatory default option was used. This option commands AERMOD to:

- Use the elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Use stack tip downwash (building downwash automatically overrides);
- Use the calms processing routines;
- Use buoyancy-induced dispersion;
- Use the missing meteorological data processing routines.

4.1.1 Hybrid Approach

In the Hayden SO_2 SIP, Camera Hill MET data was used because it best represented MET conditions seen at the rooflines, which have the highest impact on ambient SO_2 concentrations. However, for the Hayden Pb SIP a large number of sources exist near ground level, with a significant elevation difference with Camera Hill. Using the Camera Hill MET data to model these emission sources may not be representative of the actual Pb concentrations in the modeling area. Additionally, the very complex terrain in the Hayden area causes the monitoring stations to experience different wind speeds and wind directions for a given time period. Considering all these issues, the previously approved hybrid approach was utilized to model Asarco's Pb emissions. In this approach two different MET data sets were used to run AERMOD. Camera Hill MET data were used to model the emissions from the main stack and roofline fugitives, and Hayden Old Jail (HOJ) MET data were used to model the emissions from near ground sources such as material storage and handling and road dust emissions.

4.1.1.1 Performance Evaluation of the Hybrid Approach

To demonstrate that the hybrid approach, which uses MET data from two different on-site stations, performs better than modeling all the sources using the MET data from one station, ADEQ conducted a performance evaluation to compare predicted ambient concentrations measured at the five monitoring sites listed in Table 4-1 and shown in Figure 4-1. As a note, Figure 4-1 contains the outdated AAB used for the previous SIP revision.

Table 4-1: Coordinates for Air Monitoring Sites

Monitor*	UTM Easting (m)	UTM Northing (m)
ST-02	521341.1	3650761.4
ST-05	521912.9	3651593
ST-14	520634.1	3651590.2
ST-23	520333.9	3651710.4
ST-26	520205.4	3651997.3

* Regulatory monitors are co-located with ST-05 (SLAMS monitor Globe Highway) and ST-23 (SLAMS monitor Hillcrest)

The following approaches were evaluated:

- Modeling all the emission sources in AERMOD with Camera Hill on-site MET data
- Modeling all the emission sources in AERMOD with HOJ on-site MET data
- Use AERMOD to model the main stack and rooflines with Camera Hill MET data and model the rest of the emission sources with HOJ MET data. Because AERMOD cannot handle multiple MET data sources at the same time, two runs were completed, and the results combined in post-processing.

The results showed that the hybrid approach offered a margin of safety at the highest violating SLAMS monitor termed Hillcrest (or ST-23). A detailed discussion on the model performance evaluation methodology and results including quantile-quantile plots is included in a technical memorandum provided in Appendix B.

Figure 4-1: Geographical Representation of Ambient Air Monitors

4.1.2 LEADPOST

The National Ambient Air Quality Standards (NAAQS) for lead is defined as 0.15 µg/m^3 for rolling 3-month averaging time. Therefore, the modeled design value is calculated as the rolling 3-month average concentration at each receptor. AERMOD does not calculate the design value, so post-processing is required. The EPA post-processor, LEADPOST, can be used to calculate the design values.

LEADPOST is a FORTRAN program designed to read monthly concentration output from AERMOD or an alternative model and calculate rolling 3-month averages by receptor and source group. This program was used to calculate the maximum rolling 3-month average concentration for each receptor and overall maximum concentration (across all receptors and source groups).[10]

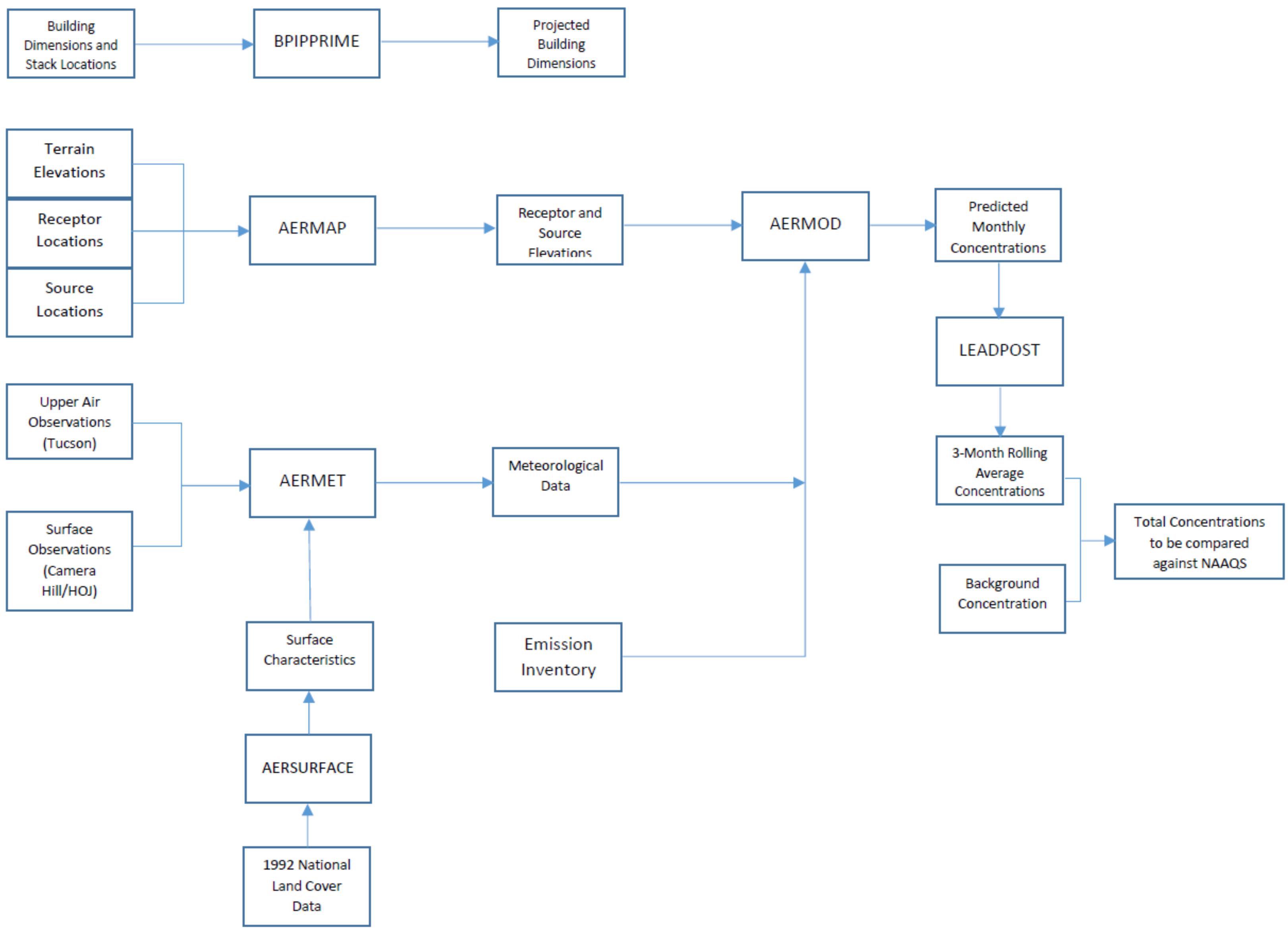
In the hybrid approach, AERMOD was run separately using each of the MET data sets and their associated emission sources. Post-processing files containing highest monthly concentrations were generated for each run. Post-processing files were then processed to combine the concentrations predicted at each

[10] EPA's User instructions for LEADPOST (Version 11237) program.

receptor. The combined post-processing file was then used as an input to LEADPOST to calculate the maximum rolling 3-month average concentration.

A flowchart of the general approach to this modeling analysis is presented in Figure 4-2.

Figure 4-2: Flowchart of Proposed Modeling System



5.0 Source Inputs

This section discusses source characterization to develop appropriate source inputs for dispersion modeling with AERMOD. Section 5.1 provides an overview of Asarco's facility operations and Pb controls, Section 5.2 provides details on source configuration, source types and source release parameters, Section 5.3 discusses Good Engineering Practice (GEP) stack heights, and Section 5.4 provides details on urban/rural determination of the sources.

5.1 Asarco Smelter Operations and Pb Controls

The copper smelting facility in Hayden, AZ, operated by Asarco, consists of a flash furnace, three Peirce-Smith converters, three anode furnaces, an acid plant and other support equipment. A plot plan of the facility as proposed is provided in Figure 5-1.

ADEQ classifies the Hayden Smelter as a major source pursuant to A.A.C. R18-2-101.61. The potential emission rates of the following pollutants are greater than major source thresholds: (i) particulate matter with an aerodynamic diameter less than 10 microns, (ii) sulfur dioxide, and (iii) nitrogen oxides.

For the previous SIP revision, Asarco submitted a Class I Significant Permit Application to ADEQ, proposing upgrades to enhance emission capture and control systems at its Hayden Smelter facility (hereafter referred to as the "Converter Retrofit Project"). The following list summarizes the enhancements Asarco proposed for the Converter Retrofit Project (CRP):

- The five existing converters were replaced with three larger converters. This change allows a single converter to blow at a time, better matching the process gas volume from the converters to the gas processing capacity of the acid plant;
- The better matching of the gas volumes from the converters with the processing capacity of the acid plant, in combination with new, improved primary and secondary hoods, reduces the volume of process gas spillage from the primary hood system to the secondary hood system during blowing operations. Additionally, the new tertiary ventilation system captures other converter aisle emissions, e.g., emissions from ladle movements of molten material along the aisle, for routing to the annulus of the main stack;
- Although not a Pb specific control, process gas captured by the secondary hood during blowing, which was previously routed to the secondary hood baghouse, is now rerouted to the acid plant, providing for substantial control of the sulfur dioxide that presently contributes the majority of the sulfur dioxide in the main stack emissions, additionally the slag return ventilation hoods will be re-routed to the secondary hood baghouse;
- A tertiary ventilation system was installed over the converter aisle. This system captures any converter aisle emissions not collected by the primary and secondary systems and routes them to the main stack instead of allowing them to escape as fugitive emissions to the atmosphere at roof level;
- Improvements were made to the matte tapping, slag skimming ventilation system to reduce fugitives and to direct emissions to a new vent gas baghouse, which replaced the previous electrostatic precipitator (ESP). The new vent gas baghouse has a higher control efficiency than the current ESP and will further reduce particulate emissions.

More details concerning the CRP are provided in the Asarco Converter Retrofit Permit application (Significant Permit Revision No. 60647). The enhancements listed above were incorporated into the 2017 SIP attainment demonstration. On December 16th, 2022 Asarco submitted a Class I significant Permit Application to ADEQ, which proposed additional emission capture and control systems at the Hayden Smelter facility. The following list summarizes the enhancements found in this 2022 permit application:

- Replacement of the existing preheater at the double contact acid plant with a redesigned unit;
- Addition of secondary hoods to the three existing anode furnaces, exhaust from which will be routed to a baghouse and then the main stack;
- Addition of secondary ventilation around the flash furnace uptake to capture fugitive emissions from the flash furnace, matte tapping and slag skimming areas and route them to the converter secondary hood baghouse;
- Addition of a hood to be used to capture fuming ladle emissions and route them to the converter secondary hood baghouse and its lime injection system.

The additional controls found in the 2022 permit application are foundational to the latest attainment demonstration.

5.2 Contingency Measure

5.2.1 Background

Under CAA section 172(c)(9), Pb nonattainment area plans must include contingency measures to be implemented if the area fails to meet reasonable further progress (RFP) requirements or fails to attain the NAAQS by the applicable statutory attainment date. Key requirements associated with contingency measures for Pb nonattainment areas are:

- Contingency measures must be fully adopted rules or control measures that are ready to be implemented quickly without significant further action by the state or Administrator.
- The SIP should contain trigger mechanisms for the contingency measures.
- The SIP should contain a schedule for implementation of the contingency measures once triggered.
- The SIP must also indicate that the selected contingency measures are not relied upon to demonstrate RFP and are not part of the overall control strategy used to demonstrate attainment.
- Contingency measures should provide SIP-creditable emission reductions generally equivalent to one year's worth of RFP.

5.2.2 Required Reduction

As noted above, a contingency measure, or group of measures, must reduce emissions equal to or greater than the annual average reduction required to meet RFP goals. Annual average RFP is calculated by subtracting attainment year emissions from base year emissions and then dividing that amount by the number of years between the attainment and base years. The basic formula is:

Annual average RFP = (Attainment level emissions – base year emissions) ÷ the number of years between the base year and attainment year

EPA guidance recommends using the year of designation as the base year and the attainment year for calculating the amount of emissions reduction necessary for contingency measures. Although the Hayden area was designated nonattainment in 2014, EPA used ambient air monitoring data from 2012 to make the designation. Therefore, in the 2017 SIP, ADEQ used 2012 as the base year in the calculation to coincide with the monitoring data EPA used for designation and 2019 as the required attainment year.

As a result of EPA's January 31, 2022 determination that the area failed to attain the 2008 Pb standards by the October 3, 2019 attainment date, ADEQ is required to develop a new SIP revision including revised demonstrations for RFP necessary to show attainment of the Pb NAAQS by the new attainment date of January 31, 2027.

EPA guidance explains that, "traditionally the amount of reductions required for contingency measures has been measured in terms of tpy (tons per year) reductions at a source. However, where a single source is responsible for nonattainment, it may be possible to identify the amount of reductions required by reference to reductions in ambient air concentrations [monitored and modeled concentrations] ... EPA would need to evaluate the approvability of such an approach on a case-by-case basis based on the sources within the nonattainment area, the modeling used, and available control measures." Since one source contributes the majority of Pb emissions in the Hayden NAA, ADEQ estimated contingency measure reductions using ambient air concentrations.

The same formula for calculating emissions reductions in tpy applies to concentrations. For the Hayden NAA, ADEQ calculated annual average RFP using the following equation:

Annual Average RFP = (2026 modeled concentration – 2017 highest monitored rolling 3-month concentration) / 9 years

Because the necessary reduction is being measured in ambient air concentrations, ADEQ selected 2017 as the base year. This supports the requirement for relevant data as 2017 contains the most excursions above the level of the Pb NAAQS in recent years. Additionally, 2017 was the last year of normal operations at the Asarco Hayden Smelter. During years 2018-2021 there were several shutdowns resulting in decreased or complete stoppage of production.

The highest monitored rolling 3-month concentration for 2017 was used, considering that in one year, there are actually 12 rolling three-month averages (one for each month). Using the highest recorded rolling 3-month concentration provides a more conservative approach rather than averaging the concentrations.

The annual average RFP is calculated below:

-0.016 µg/m3 (Annual Average RFP) = (0.134 µg/m3 (2026 modeled concentration) – 0.28 µg/m3 (highest rolling 3-month monitored concentration in 2017 highest monitored concentration)) / 9 years

Therefore, contingency measures for the Hayden nonattainment area must reduce ambient Pb concentrations by -0.016 µg/m3 when triggered.

5.2.3 Selected Measures

The contingency measure selected consists of wind fencing on the north side of the filter plant and along the south side of the main haul road. The new wind fencing is indicated in red in Figure 5-1 below. The wind fencing provides control on possible windblown or reentrained dust from filter plant material handling and primary haul road emissions, including possible lead-bearing dust, that may be found in these areas. Wind fencing has been found to be an effective control at other areas of the Hayden smelter. In addition, Asarco is required to expand the southern perimeter fence further south toward the chlorinator facility. This expansion lessens the likelihood of inadvertent exposure of the general public to possible lead-contaminated dusts reentrained from the southern haul road.

To model the revised emissions for the addition of the wind fencing and expansion of the perimeter fencing as shown in Figure 5-1, Asarco revised the attainment model emission inventory to add 75% control of windblown or reentrained dust for the wind fence along only those segments of roadway immediately adjacent to the proposed wind fences and revised the southern ambient air boundary to reflect the new fencing boundary. The 75% control factor was developed during the EPA consent decree negotiations and appears consistent with observed performance of wind fences at other locations in the Hayden smelter at reducing wind velocities and associated reentrainment of dust particles. Appendix M of this TSD provides a wind fence effectiveness case study that was drawn from during the development of the 75% control factor.

The NAAQS design value from the attainment modeling is 0.134 µg/m^3. The NAAQS design value after implementation of the proposed contingency measures is 0.106 µg/m^3. The difference between the two concentrations is 0.028 µg/m^3, which is more than the required reduction needed for contingency purposes (which is 0.016 µg/m^3). Therefore, the addition of the wind and perimeter fencing achieves the required reduction needed to protect RFP and attainment.

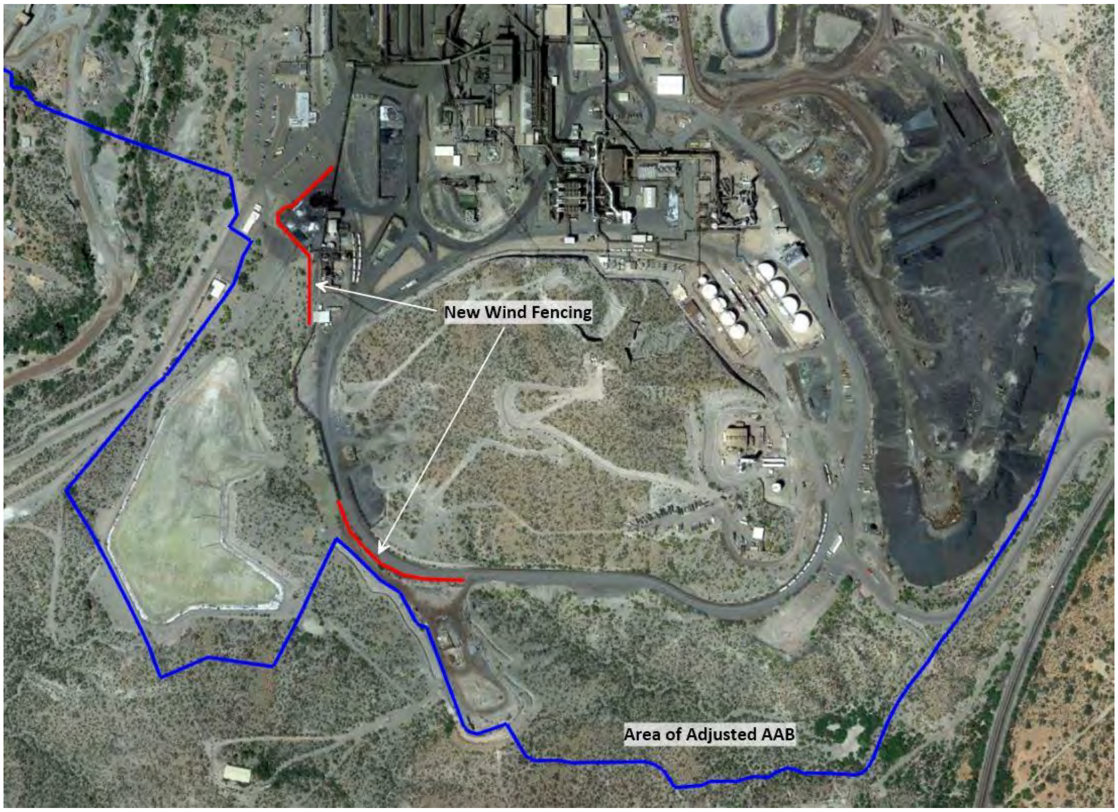


Figure 5-1: Contingency Measure Wind Fencing

In addition to the wind fences shown in Figure 5-1, Asarco has proposed a precautionary expansion of the southern perimeter fencing to reduce the likelihood of exposure in this area. This additional fencing is represented in Figure 5-1, near the “Area of Adjusted AAB” label. A more detailed view of how this additional fencing impacts the attainment model, and the AAB, can be seen in Figures 5-2 and 5-3 on the following page.

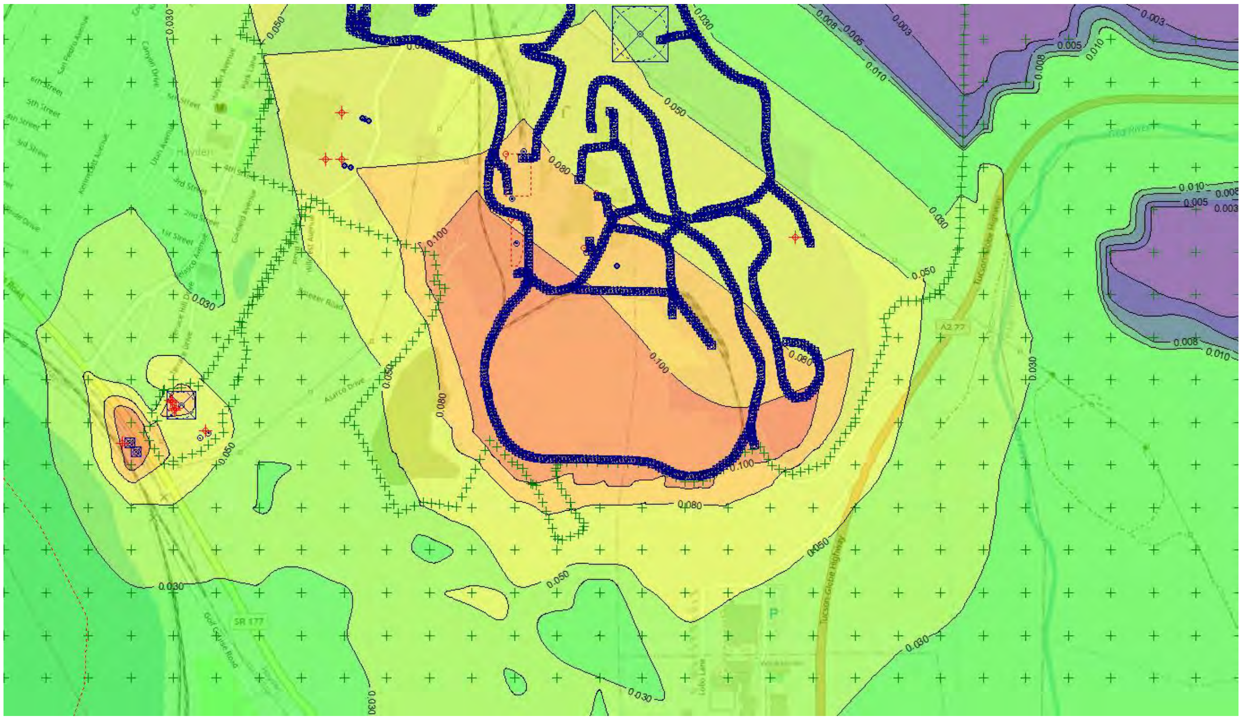


Figure 5-2: Southern AAB Pre-Expanded Fencing

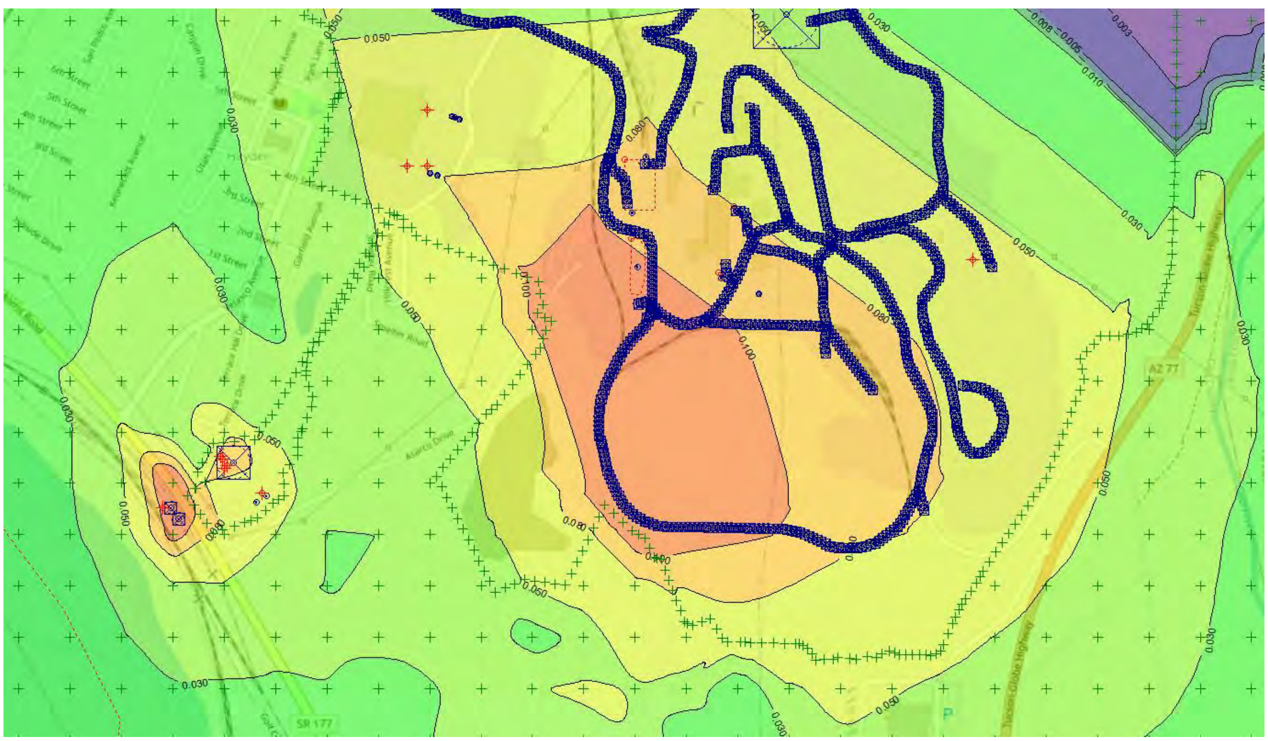


Figure 5-3: Southern AAB Post-Expanded Fencing

The contingency measure is triggered upon the occurrence of any of the following:

- A monitored value exceeding 0.15 µg/m^3 at the Hillcrest or Globe Highway monitors not caused by an "exceptional event" defined under EPA or ADEQ policy that occurs after installation and optimization of the controls required in the latest permit revision; or

- Failure to meet attainment of the NAAQS by the statutory attainment date. Violating the permit effective dates for installation of controls would subject Asarco to penalties. The contingency measure must be implemented within 60 days of notification by EPA Region 9 of such failure. These triggers, 60-day timeframe, as well as the actual contingency measure, are incorporated into the significant permit revision which serves as the regulatory text for this implementation plan revision, consistent with EPA guidance, which states that contingency measures should take effect "without further action by the state or the Administrator." EPA interprets this requirement to mean that no further rulemaking by the state, or EPA, would be needed to implement the contingency measures. By having the contingency measures already in the permit, there is no further action needed to implement the fencing project. ADEQ will ensure that the measures are fully implemented within the relevant timeframes.

The fencing project is also a practical contingency measure, as Asarco is already operating other wind fences, which have been shown to be effective, as part of the 2017 SIP and consent decree. The location of the fencing is specifically targeted at areas where Asarco expects that reentrainment may occur and for which control would be important to achieve attainment.

5.3 Fugitive Dust Plan

In addition to the CRP controls, the 2017 SIP also included controls on material handling related sources of Pb. These material handling sources fall under Asarco's "Fugitive Dust Plan". Specific controls that were included in the 2017 Fugitive Dust Plan are discussed below. These controls are to remain in place when Asarco resumes operations, therefore, these controls were included in the latest attainment demonstration modeling.

- Reverts Crushing & Handling:
  - wind fence (designed to have a 75% control efficiency[11])
  - sprayers (maintain 10% surface moisture content)

- Concentrate Handling:
  - wind fence (designed to have a 75% control efficiency)
  - sprayers (maintain 10% surface moisture content)
  - daily rinsing of spillage/trackout areas
  - rumble grates

- Dewatering of Venturi Scrubber Slurry:
  - slurry to be sent to new thickener
  - resulting filter cake sent to two electric dryers

[11] See Appendix M for more information on the derivation of the 75% control efficiency.

- dried cake discharged directly into bags

- Lead-containing Road Dust:
  - Prompt clean up of material that is tracked out from material storage areas onto paved roadways and daily sweeping of road surfaces.
  - chemical dust suppressant application intensity to meet a 90% control efficiency (PM_{10} emissions)

5.4 Source Configuration, Types and Release Parameters

Lead emissions will be released to the atmosphere from the following sources at Asarco's Hayden Operations: the main smelter stack, the anode furnace roof line vents, the converter aisle roof line vents, the flash furnace roof line vents, the outdoor slag pouring, materials storage and handling, paved roads, unpaved roads, crushing and screening facility, and Wet Gas Cleaning project. With the exception of road emissions, the locations of these Pb sources, are depicted in Figure 5-4. Figures 5-5 and 5-6 show the location of sources modeled using the Camera Hill and HOJ, respectively.

The sources modeled with the Camera Hill meteorological data include the Main Stack and the process fugitives (i.e., the Anode Furnace fugitives, the Flash Furnace fugitives, and the Converter Aisle fugitives). The sources modeled with the Hayden Jail meteorological data include the following:

- Slag Pouring
- Scrubbers associated with Concentrator Crushing
- Various material handling sources and storage piles
- Fugitive dust from road traffic
- Tailings ponds (not shown in Figure 5-4)

Figure 5-4: Modeled Emission Sources for Attainment Year

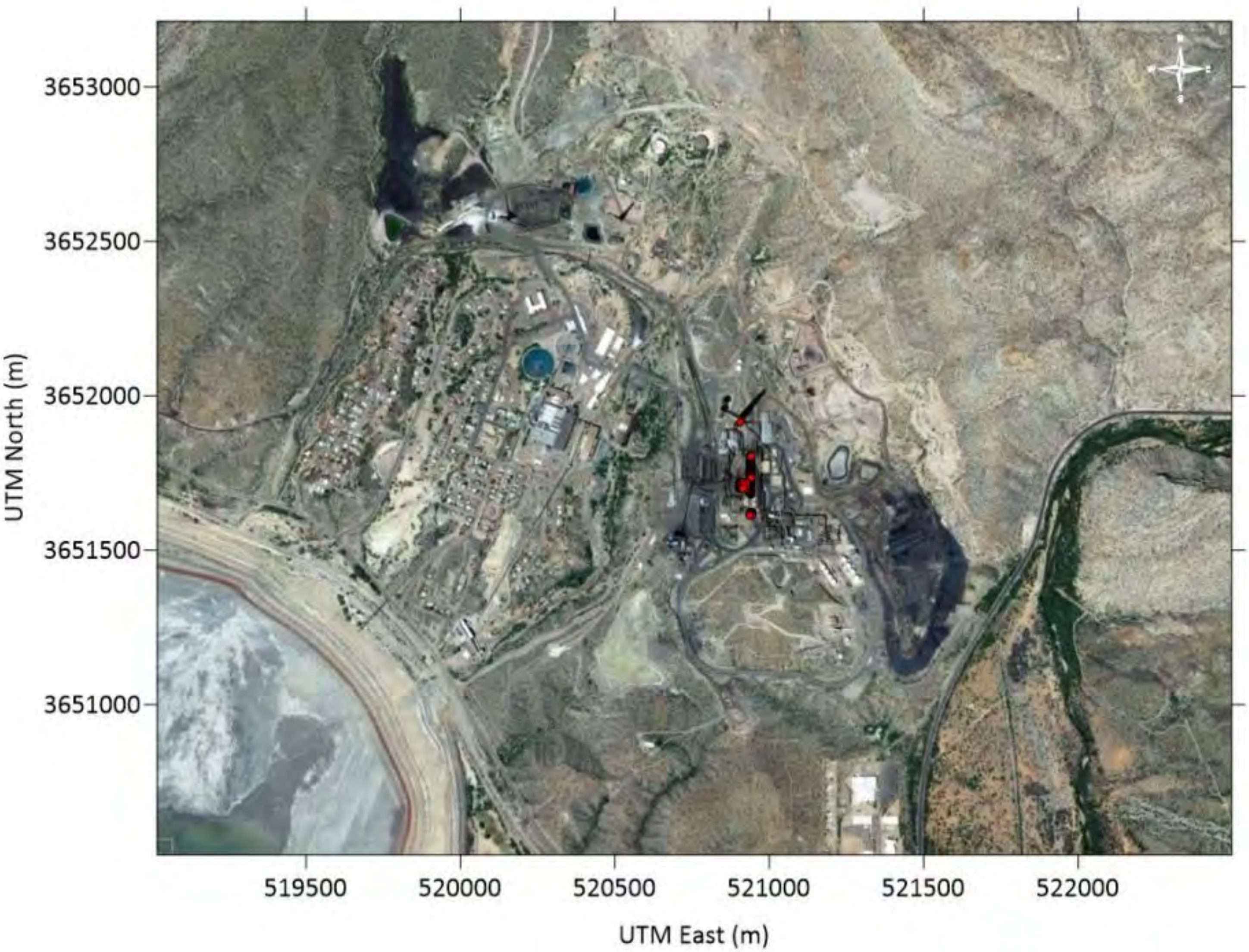


Figure 5-5: Modeled Emission Sources, Camera Hill

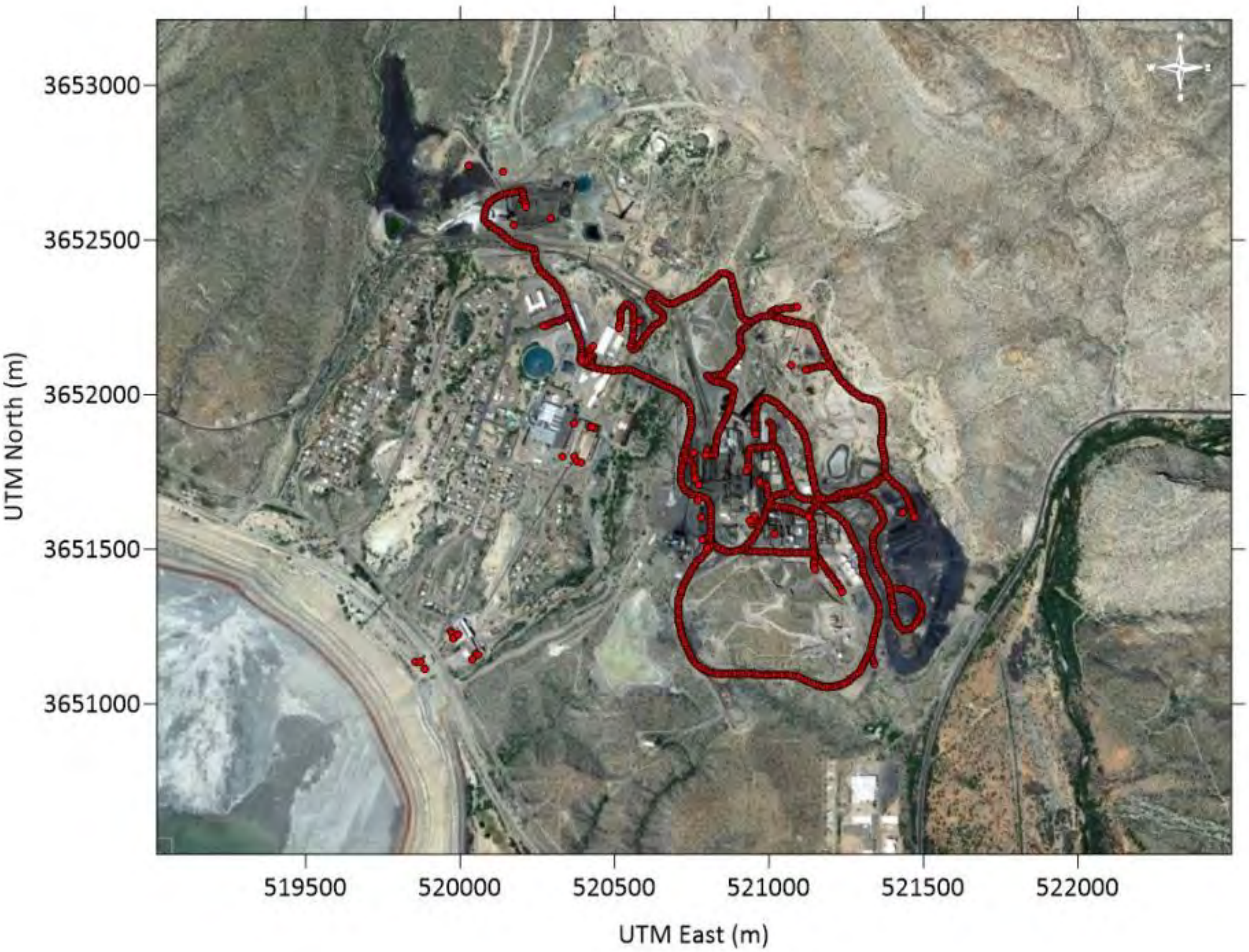


Figure 5-6: Modeled Emission Sources, Hayden Old Jail

5.4.1 Stacks (Point Sources)

5.4.1.1 Main Stack

The main smelter stack, which is comprised of an inner stack and an outer annulus, exhausts almost all emissions from the smelting processes at Hayden. The attainment model has the main stack emitting at the limit found in R18-2-B1301.C (Table 5-3). Asarco's engineering contractor Gas Cleaning Technologies (GCT) has determined the additional lead captured from the new controls, which will be routed to the main stack, does not affect the ability of the main stack to meet the current limit.

To properly account for the main stack plume rise in the dispersion modeling, a combined exhaust stream was defined for the stack's two emissions streams. The calculation of this combined stream's parameters, presented in Appendix D, is based on conservation of the total stack flow rate and release area, and calculation of an equivalent exhaust temperature, stack diameter, and exit velocity.

5.4.1.2 Good Engineering Practice (GEP) Stack Height

There are two definitions of Good Engineering Practice (GEP) stack height: (i) formula GEP stack height and (ii) regulatory GEP stack height. EPA requires sources to evaluate building downwash effects when a stack is less than formula GEP stack height. Regulatory GEP stack height is either 65 meters or formula GEP stack height, whichever is greater. The EPA does not allow sources to take credit for ambient air concentrations that result from stacks that are higher than regulatory GEP stack height unless they meet the formula stack height criteria.

As discussed in ADEQ's March 2017 "Arizona State Implementation Plan Revision: Hayden Sulfur Dioxide Nonattainment Area for the 2010 SO_2 NAAQS", the GEP height for Asarco's main stack was assessed in a fluid modeling study jointly conducted by North American Weather Consultants and Colorado State University, with that study concluding that the stack's 1,000-foot height meets GEP stack height requirements. EPA subsequently approved Arizona's SIP determination of GEP stack height. No structures have since been constructed at Asarco that would affect this determination.

At EPA's request in mid-2022, ADEQ re-assessed the GEP stack height determination with respect to current GEP regulations. This re-assessment confirmed that the original GEP stack height determination is consistent with the 1985 regulations and that the 1,000-foot stack remains an appropriate GEP determination. Therefore, Asarco's main stack was modeled at its true height of 1,000 feet. A white paper summarizing the re-assessment conducted for the 2017 SIP, which ADEQ believes applies to the current SIP revision, is provided in Appendix C of ADEQ's Hayden SO2 Modeling TSD.

The GEP demonstration under the SO2 SIP fulfills this requirement if included in the Pb SIP and put out for public notice and comment. The Clean Air Act states that "good engineering practice means … the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the vicinity of the source …." 42 U.S.C. § 7423(c); 40 CFR 51.100(ii)(3) (similar). Under both the Clean Air Act and EPA's implementing regulations, once the stack height is demonstrated as "good engineering practice" for "any" air pollutant, that stack height is used for all pollutants. Therefore, no additional demonstration is required because the demonstration for the current SO2 limit is in place.

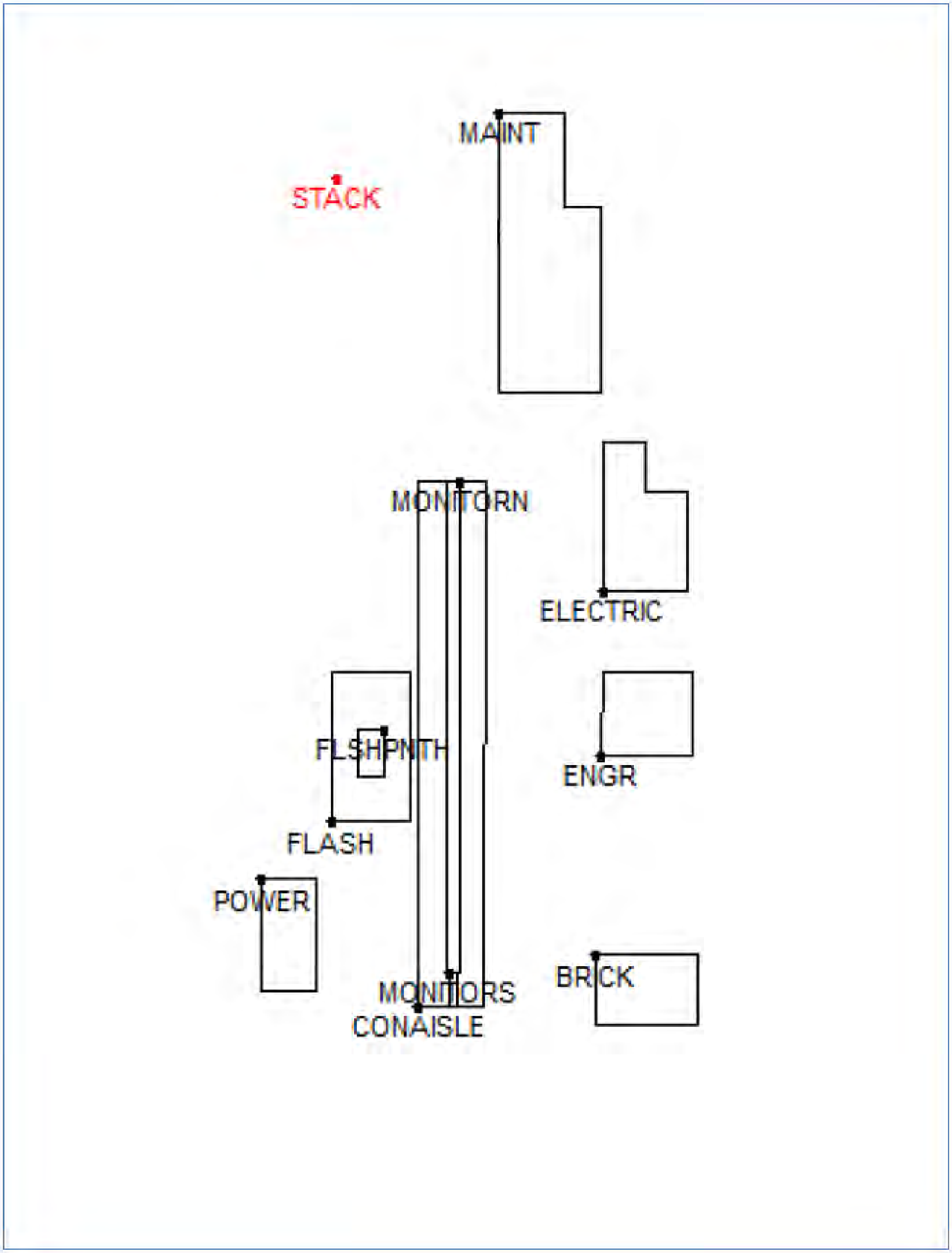


Figure 5-7: Simplified Facility Layouts

5.4.1.3 Slag Pouring

Pb can be released to the atmosphere as molten slag is poured on the ground outdoors. PTE emissions were modeled for this source.

Due to the high temperature of the molten slag at the point of pouring (about 2000^{0}F), the gas rises rapidly into the air. Recognizing that such heat results in a rising buoyant plume, regulatory agencies have approved methods for calculating equivalent stack parameters for the purposes of the dispersion modeling of slag pouring gases. In particular, the Texas Air Control Board, a predecessor agency to the Texas Commission on Environmental Quality, approved such an approach, involving the use of equivalent exhaust parameters, to account for plume rise in the modeling of slag pouring at Asarco's El Paso Smelter in 1992 and 2006 air quality permit reviews. Similarly, the ADEQ has described in Section 3.3.6 of its ADMG the calculation and use of equivalent release parameters for modeling flares, a category of non-standard sources with heat release that cannot be treated in a straightforward way in dispersion models.

Following a methodology with similarities to the one ADEQ applies to flares, Asarco has calculated, for use in the modeling, an effective upward velocity for emissions arising from the pouring of the slag. This calculation, based on the physical properties of the slag and the nature and dimensions of the pour, is presented in Appendix D.

5.4.2 Point Source Release Parameters

Table 5-3 presents the stack and exhaust parameters modeled for the stacks associated with the proposed changes. Asarco identified coordinates for the stacks by mapping the site plan to rectified aerial photographs of the site. ADEQ and Asarco projected UTM coordinates of each stack to UTM Zone 12. These coordinates are based on the NAD83. The modeled emission rate for the Main Stack was 0.683 lb/hr, the allowable emission rate under R-18-2- B1301(C). The modeled emission rate for the Slag Pouring was 0.012 lb/hr, taken from the Title V renewal application, reproduced in Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022.

Table 5-1: Stack and Exhaust Parameters- Proposed (Post-CRP)

Stack	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Stack Height (m)	Exit Diameter (m)	Exit Velocity (m/s)	Exhaust Temp. (ºK)	Pb PTE Emissions (lb/hr)
Main Stack	520929	3651932	650.75	304.8	8.9	10.7	346.5	0.683
Slag Pouring	521458	3651636	626.9	0	13.3	1.5	1333	0.012

5.4.3 Roofline Vents (Roofline Fugitives)

5.4.3.1 Roofline Vents Configuration

ADEQ and Asarco identified coordinates for the roofline vents by mapping the site plan to rectified aerial photographs of the site and adjusting the building footprint to site Computer Assisted Drafting (CAD) drawings. ADEQ and Asarco projected the Universal Transverse Mercator (UTM) coordinates of each vent to UTM Zone 12, 1983 North American Datum (NAD83). Figure 5-5 shows each vent location on the simplified plot plan and the representative volume sources used in AERMOD.

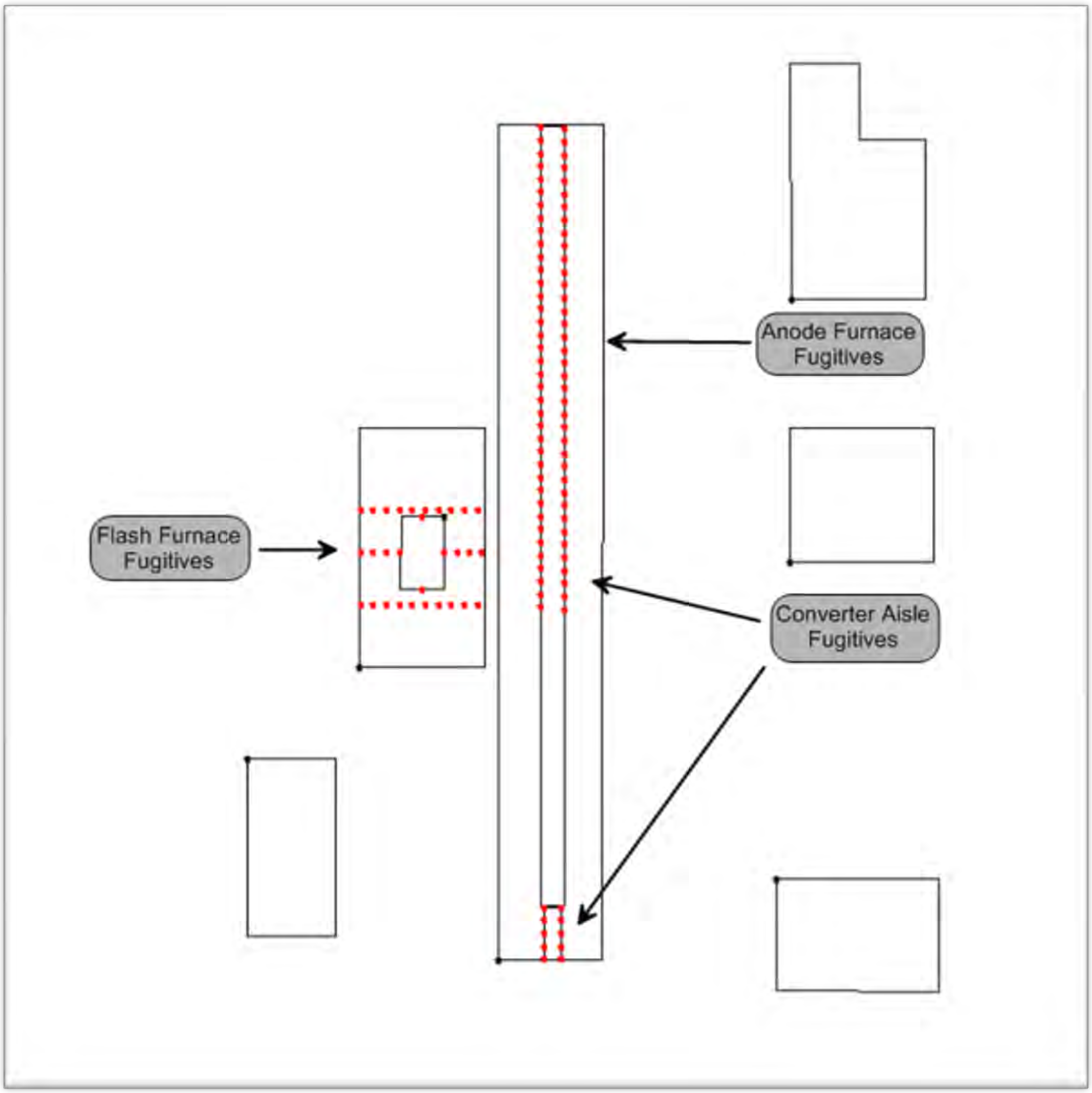


Figure 5-8: Ridge Vents Modeled Volume Sources

As part of the consent decree, Asarco installed a temporary roofline fugitive monitoring system consisting of mini-vol samplers at several locations around the roof of the flash furnace building, at the ends of the converter aisle, and in the anode aisle. These mini-vol samplers gathered ambient particulate data that were periodically collected and analyzed for particulate and metals. Because the methodology is not an EPA-approved method, and the study was interrupted by the work stoppage, direct use of the data is not appropriate as the study method was never fully validated. Nevertheless, Asarco and its consultants have considered the partial data in designing additional controls to reduce instances of elevated emissions sporadically observed while the smelter was operating.

5.4.3.2 Flash Furnace Fugitive Emissions

Flash furnace fugitives include emissions that escape the primary system and fugitives not captured by the matte tapping and slag skimming systems, along with emissions from the dry feed bin. One of Asarco's proposed controls, the Uptake Improvement Project, involves the installation and ventilation of a partial enclosure around the INCO flash furnace uptake shaft.

The goal of this project is to improve the capture of fugitives from the flash furnace and emissions generated during matte tapping and slag skimming. These captured emissions will be ducted to the converter secondary hood baghouse, treated, and emitted from the main stack. The uptake improvement project is expected to result in a 3.3-3.5% reduction in particulate and lead fugitive emissions, compared to pre-Uptake Improvement Project emissions, and is expected to substantially reduce (30-50%) peak emissions.

The anticipated emission rate was calculated using emission factors and expected control efficiencies and then adjusted upward by multiplying by a 2.0 safety factor to reflect unknown future variability in feedstocks. This gave a value of 0.1 lb/hr. For modeling, Asarco reduced the value in the prior ADEQ modeling by -3.4% based on GCT estimate, which gave an equivalent of 0.225 lb/hr. Blue Sky Modeling then used this higher value for modeling purposes for added conservatism.

5.4.3.3 Converter Aisle Fugitive Emissions

Although Asarco's latest fugitive study wasn't completed, due to the 2019 smelter shutdown, one observation made was the migration of matte tapping and slag skimming emissions into the converter aisle and anode aisle/material transfer area. Asarco aims to address this by completing the Fuming Ladle Capture Project. This new control involves the construction of a hood and retaining walls on the smelting ladles. Emissions captured by the hood will be sent to the secondary hood baghouse, treated, and released from the main stack.

The new hoods will only operate for the brief periods when a fuming ladle is present in the enclosure. Asarco anticipates that the fuming ladles will only be vented for 15-minute periods occurring 0 to 5 times per day. As such, the secondary baghouse system can handle the added ventilation without an increase in system flow capacity.

The Fuming Ladle Capture Project is expected to result in a 15% reduction in fugitive lead emissions from the converter aisle. The estimate is based on emissions factor adjusted by the primary, secondary and tertiary control systems. The resulting value was then adjusted upward by a safety factor of 2.0 to reflect unknown future variability in feedstocks. This gave a value of 0.04 lb/hr. For modeling Asarco reduced the value in the prior ADEQ modeling by approximately 15%, which gave an equivalent of 0.0711 lb/hr. This higher value was then used for modeling purposes for added conservatism.

5.4.3.4 Anode Furnace Fugitive Emissions

The Anode Furnace Secondary Hood System Project will involve the construction of secondary hoods, much like those found on the converters, around the anode furnaces. These new hoods will be ducted to a new anode secondary hood baghouse, treated, and released to the main stack.

Asarco and GCT estimate that fugitive lead emissions in the anode aisle will reduce by approximately 70% based on the application of the secondary hood, which will lead to improved controls over charging operations. The emission rate was calculated based on emission factors reduced by the anode furnace baghouse capture and then the secondary hood baghouse capture. The anticipated emission rate was then adjusted upward by a 1.5 safety factor to reflect uncertainties in future feedstocks, but a lower level of adjustment was used in this case because of the greater confidence that the secondary hood baghouse will achieve at least the 70% reduction, if not more. This gave a value of 0.0257 lb/hr. The prior ADEQ model was not directly comparable so the modeled value was rounded up approximately 10% to 0.029 lb/hr to provide some additional conservatism.

For each project, Asarco and GCT also reviewed the results of the partially completed fugitive study conducted in 2018-2019 to ensure that the estimated fugitive emission rate used in the SIP modeling exceeded the observed rate during the study or would exceed the rate after considering the proposed controls. In all cases, the fugitive emissions rate used for modeling are higher than the anticipated actual rate under reasonably anticipated conditions. The estimated fugitive emission rates conservatively represent the expected conditions and hence are appropriate for modeling to ascertain upper bound conditions.

Table 5-3 on the following page lists vent-specific parameters for the roofline vents. These sources were modeled as volumes sources, as recommended in the AERMOD Users Guide[12], which states, "(t)he AERMOD VOLUME source algorithms are used to model releases from a variety of industrial sources such as building roof monitors…".

[12] User's Guide for the AMS/EPA Regulatory Model (AERMOD), EPA-454/B-22-007. June 2022.

Table 5-2: Ridge Vent (Roof Line) Parameters- Proposed (Post CRP)

Source ID	Description	Base Elev. (m)	Release Height (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)	Emission Rate per Source (g/s)
CES* CWS* CEN* CWN*	Converter Aisle: East South, West South, East North, West North	634.11	31.4/25.4[e]	0.7[a]	11.34/10.63[f]	1.02E-04
AFW* AFE*	Anode Furnace: West, East	640.08	31.35[e]	0.7[a]	11.34[f]	3.75E-05
FFS* FMW* FME* FFN*	Flash Furnace: South, Middle West, Middle East, North	635.86	43.67	0.7[a]	19.85[b]	5.82E-04
FFPH*	Flash Furnace: Penthouse	635.86	43.59	7.44[c]	20.7[d]	5.82E-04

a. Line source represented by adjacent volume sources; length of side 1.5 m
b. Elevated source on or adjacent to building; building height 42.67 m
c. Line source represented by adjacent volume sources; length of side 16 m
d. Elevated source on or adjacent to building; building height 44.5 m
e. Release height of 25.5 m for southern portion of Converter Aisle, 31.35 m for northern portion of Converter Aisle (including above Anode Furnace)
f. Elevated source on or adjacent to building; southern portion of Converter Aisle building height 22.86 m, northern portion of Converter Aisle (including above Anode Furnace) building height 24.38 m

5.4.4 Fugitive Dust Emissions

Fugitive dust Pb emissions are due to processes and activities related to materials storage and handling and road dust emissions. The main modeled fugitive dust emissions are based on the Fugitive Dust Plan and are described in this section.

5.4.4.1 Materials Storage and Handling

Concentrate Storage Area

Concentrate from Asarco's other mining operations, or purchased concentrate, is unloaded onto the concentrate storage concrete pad (constructed as part of the 2017 SIP). Loaders then transfer the material from the storage area to the rail car loading dock all of which will occur on a concreted area. The concentrate is then sent to the bedding plant by railcars. Additionally, as part of the 2017 SIP revision, this entire area is surrounded by a wind fence to reduce any fugitive emissions from wind erosion. The modeled Pb emissions for this process include:

- Dust emissions resulting from wind erosion
- Dust emissions from transferring copper concentrate from semi-trucks to storage piles
- Dust emissions from the load out of copper concentrate from storage area to rail cars

Bedding Plant Area

The bedding plant area is where the flash furnace feed mix is prepared. Copper concentrate, silica flux and by-products are transferred from truck or rail to an unloading dump hopper. The material is then transferred by belt to the bedding area into one of four bins where the flash furnace feed mix is prepared. The top of the dump hopper is at ground level and the rest of the hopper and conveyor belts are below ground in a concreted tunnel. A front-end loader then dumps the material into a hopper that feeds the belt lines to the dryers. As a result of the 2017 SIP, this area is now surrounded by a wind fence to reduce any fugitive emissions from wind erosion. The Pb emissions for this process that are included in the modeling are as follows:

- Dust emissions resulting from wind erosion
- Dust emissions from the unloading of copper concentrate and by-products from truck or rail to unloading dump hopper
- Dust emissions from transferring the materials from the hopper to the #2 belt that goes to dryers

Reverts Pile -South Storage

The reverts pile south is a storage area for fine revert materials. This area is also surrounded by a wind fence to reduce any fugitive emissions from wind erosion. The modeled Pb emissions for this process include:

- Dust emissions from wind erosion
- Dust emissions from the transfer of reverts to outdoor storage via MACK truck
- Dust emissions from the load out of reverts in outdoor storage

Reverts Pile- North Storage

The reverts pile north is a storage area for coarse revert materials. The latest version of the model has been changed to reflect the fact that two piles exist in the north storage area. This source is also surrounded by a wind fence to reduce any fugitive emissions from wind erosion. The modeled Pb emissions for this process include:

- Dust emissions from wind erosion
- Dust emissions from the transfer of reverts to outdoor storage
- Dust emissions from the load out of reverts in outdoor storage

To model the fugitive dust emissions from storage piles due to wind erosion, the storage piles were modeled as polygon area source (defined as AREAPOLY) in AERMOD. Table 5-4 presents the modeling parameters for these sources.

Cold Dope Storage Pile

An additional update to the latest version of the attainment model includes what Asarco has termed the "cold dope" storage area. This is a new source relative to the 2017 SIP, which has similar characteristics as the North reverts pile, except with a wind break and no wind fence. The modeled Pb emissions for this process include:

- Dust emissions from wind erosion
- Dust emissions from the transfer of reverts to outdoor storage
- Dust emissions from the load out of reverts in outdoor storage

Table 5-4 in Appendix I provides the modeled volume source characteristics for the above sources. The table contains the individual volume source ID's in the model, a short description of the volume source, and the following parameters:

- Base elevation
- Release height
- Initial horizontal dimension
- Initial Vertical Dimension
- Emission rate

5.4.4.2 Road Dust

Paved Roads

Lead emissions generated by road traffic was modeled using 1,112 volume sources. The layout of the volume sources can be seen in Figure 5-3. The emissions from the activities listed below were used to calculate fugitive road dust emissions:

- Hauling concentrate
- Flux delivery to crusher
- Flux to storage
- Flux to bedding area
- H_2SO_4 related traffic
- Slag to crusher
- Slag crusher to lumber spur
- Miscellaneous truck deliveries
- General traffic and warehouse
- Scrap handling forklift
- Water/sweeper
- Miscellaneous use forklift
- Storage pile loader
- Miscellaneous use loader
- Hauling blister copper
- Slag hauler

- Flux, delivery to crusher

Modeled emissions were derived using the methodology found in Appendix J of this TSD. The roadway paths modeled included 22 paved segments and 10 unpaved segments. Some of the segments only had one type of truck driving on them while some had multiple. The emission rate for each individual volume source was the sum of the source-specific emission rates for all types of truck driving at the location of that specific volume source.

Full details concerning the derivation of volume source characteristics and modeled emission rates are provided in the Asarco roads summary found in Appendix I.

5.4.4.3 Storage Piles

Fugitive emissions generated by storage areas/piles were represented as AreaPoly sources in the HOJ run. Table 5-4 presents the modeled AreaPoly source characteristics.

Table 5-3: Modeled AreaPoly Source Characteristics

Source ID	Description	Base Elev. (m)	Release Height (m)	Number Vertices	Emission Rate (g/s)
BEDDING	Bedding Area Emission by Wind Erosion; Smelter, HP-5h; Wind erosion only	647.33	6.096	6	5.37E-06
CONCSTORAGE	Concentrate Storage Area; Smelter HP-6h; Wind erosion only	655.36	3.048	9	1.14E-04
SOUTHREVERT	Revert Pile Fines-South Storage; Smelter, HP-21h; Wind erosion only	645.09	2.134	6	6.93E-06
NORTHREVERT	Revert Coarse Storage-North; Smelter, HP-22h; Wind erosion only	633.98	1.295	4	2.12E-08
COLDDOPE	Cold Dope pile wind erosion; Smelter, HP-70h; Wind erosion only	634.19	3.048	4	1.30E-07
NORTHTAILIN	North Tailing, F26	585.84	0.5	31	2.66E-04 [a,b]
SOUTHTAILIN	South Tailing, F26	607.67	0.5	17	2.66E-04 [a,b]

a. Modeled g/s emission rate derived from tpy emission rate from Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022

b. Emissions split evenly amongst two TAILIN sources

5.5 Urban/Rural Determination

Dispersion coefficients for air quality modeling are selected based on the land use classification technique suggested by Auer (Auer, 1978), which is EPA's preferred method. The classification determination involves assessing land use by Auer's categories within a 3-kilometer radius of the proposed site. A source should select urban dispersion coefficients if greater than 50 percent of the area consists of urban land use types; otherwise, rural coefficients apply.

Following Section 3.7 of the ADEQ Modeling Guidelines, the land use of the area using the land-use procedure set forth in EPA's "Guideline on Air Quality Models" (GAQM). This approach requires determining the amount of specific types of land use categories within a 3-km radius circle centered on the source; if the total land use (as defined by Auer) is classified as 50% or more "urban" then the area is designated as urban; otherwise it is designated as rural.

Land use (taken from the U.S. Geological Survey (USGS) National Land Cover Data (NLCD) 2016 archives) was examined for the 3-km radius circle, and totals of each land use category were calculated. These land use categories were then correlated to the categories as established by Auer, and the amount of urban and rural land use within 3 km of Asarco was calculated. The area near Asarco that was examined is depicted in Figure 5-6, while the results of the analysis are presented in Table 5-5.

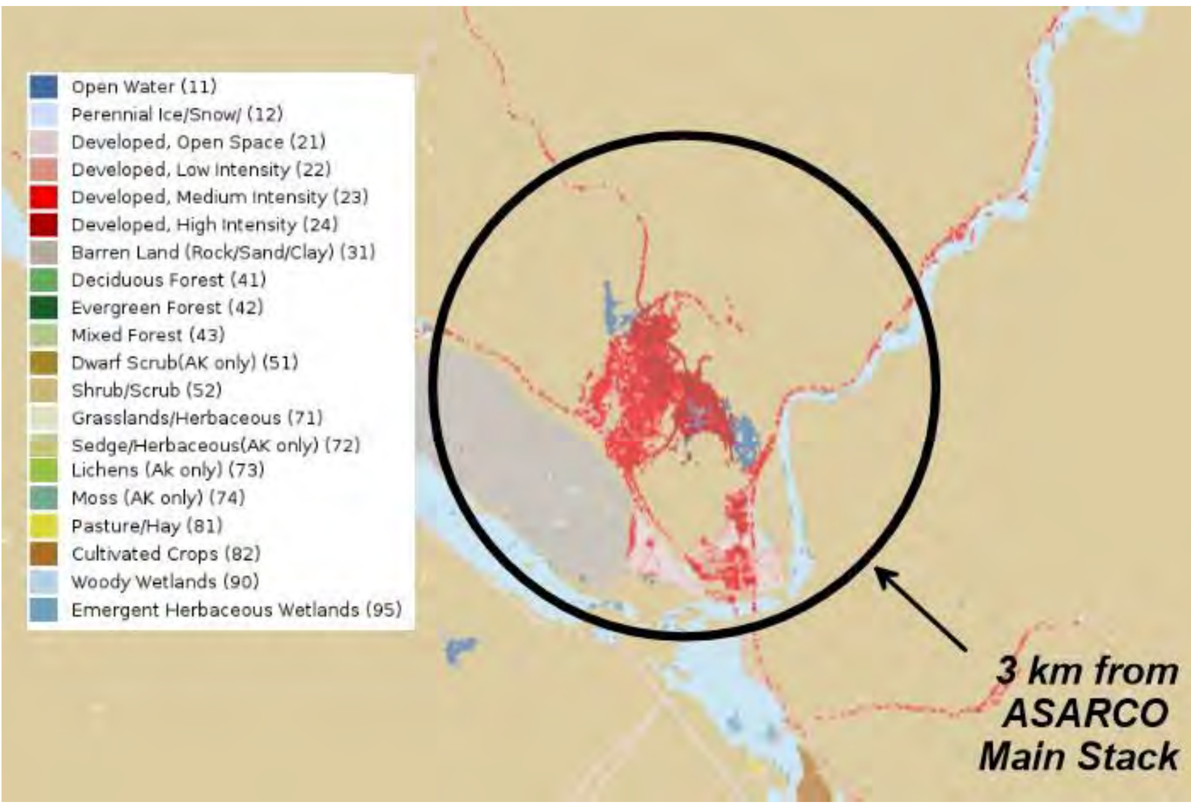


Figure 5-9: Land Use near Asarco Smelter

Table 5-4: Land Use Analysis within 3 km of Asarco Smelter

2016 NLCD Land Use Category	Percent of Area within 3 km of Asarco's Facility	Rural/Urban
Open Water	0.0%	Rural
Perennial Ice/Snow	1.0%	Rural
Developed, Open Space	0.0%	Rural
Developed, Low Intensity	2.2%	Urban
Developed, Medium Intensity	3.3%	Urban
Developed, High Intensity	4.7%	Urban
Barren Land (Rock/Sand/Clay)	2.6%	Rural
Unconsolidated Shore	9.9%	Rural
Deciduous Forest	0.0%	Rural
Evergreen Forest	0.0%	Rural
Mixed Forest	0.0%	Rural
Dwarf Scrub	0.0%	Rural
Shrub/Scrub	0.0%	Rural
Grasslands/Herbaceous	67.6%	Rural
Sedge/Herbaceous	0.0%	Rural
Lichens	0.0%	Rural
Moss	0.0%	Rural
Pasture/Hay	0.0%	Rural
Cultivated Crops	0.0%	Rural
Woody Wetlands	0.0%	Rural
Palustrine Forested Wetland	8.2%	Rural
Palustrine Scrub/Shrub Wetland	0.0%	Rural
Estuarine Forested Wetland	0.0%	Rural
Estuarine Scrub/Shrub Wetland	0.0%	Rural
Emergent Herbaceous Wetland	0.0%	Rural
Palustrine Emergent Wetland (Pe	0.4%	Rural
Estuarine Emergent Wetland	0.0%	Rural
Palustrine Aquatic Bed	0.0%	Rural
Estuarine Aquatic Bed	0.0%	Rural

For the purposes of the Auer Method, the following 2016 NLCD land use categories were assumed to be "urban":

- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity

As shown in Table 5-4, these three land use categories comprise 10.2% of the land use within 3 km of Asarco's facility; accordingly, the sum of the "rural" categories is 89.8%. Therefore, the area within 3 km of Asarco's facility is defined as "rural" and identified as such in the AERMOD input.

Pertinent input/output files for the AERSURFACE analysis used in the urban/rural determination are being forwarded to ADEQ concurrent with the submission of this report.

6.0 Meteorological Data

6.1 AERMET

EPA's AERMET tool (version 22112) was used to process meteorological data for use with AERMOD. AERMET merges National Weather Service (NWS) surface observations with NWS upper air observations and performs calculations of meteorological parameters required by AERMOD. Surface observations from on-site instruments can optionally be included. The latter can be useful because the data are more relevant to the site being modeled and in cases where on-site data are collected at multiple elevations above ground, AERMET can construct a more accurate vertical profile of meteorological data. In addition to the meteorological observations, AERMET further requires the inclusion of the characteristics of land use surfaces that Asarco calculated using EPA's AERSURFACE tool.

6.1.1 Surface Observations

EPA recommends that AERMOD be run with a minimum of 5 years of NWS data or 1 year of on-site meteorological data. As described in Section 4, a hybrid modeling approach was used for this project. The meteorological data used in the sequential modeling consists of on-site hourly surface observations collected by Asarco from a 10-meter tower located approximately 0.35 kilometers south of the smelter building, on Camera Hill and also on-site hourly surface observations collected by ADEQ's HOJ 10-meter station located approximately 1.06 kilometers west of the Asarco concentrator and smelter complexes.

The Camera Hill met data were used to model the Pb emissions from the main stack and fugitive rooflines and HOJ met data were used to model the emissions from lower elevation sources such as material storage and handling sources, paved roads, unpaved roads, etc.

The meteorological data used in the modeling cover the entire 2020 calendar year, with the raw on-site data provided by Asarco and ADEQ. The year 2020 was selected due being the most recent year of complete data at the time of the modeling. During 2021 the solar radiation sensor at the Camera Hill station failed an audit and was replaced, leading to less than the minimum 90% data completeness requirement for regulatory modeling purposes.

The Camera Hill monitoring station is equipped with the following instrumentation:

- Wind speed, wind direction, standard deviation of horizontal wind, and ambient temperature at 10 meters;
- Ambient temperature at 2 meters;
- Atmospheric pressure;
- Relative humidity;
- Solar radiation; and
- Precipitation.

The Camera Hill monitoring station is operated pursuant to the requirements of the consent decree in the matter of United States of America v. Asarco LLC, No. CV-15-02206-PHX. Appendix B 31-32 of the consent decree and §§ 5.1-5.2 of the fugitive dust plan, that EPA approved pursuant to the decree, make the Camera Hill monitoring station's operation subject to the applicable quality assurance requirements of:

- 40 C.F.R. Part 58 Appendix A;

- EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Measurements, Version 2.0;

The Quality Assurance Project Plan that was initially developed by EPA under the administrative settlement agreement and order on consent in the matter of the Asarco Hayden Plant Site, Docket No. CERCLA 2008-13 (AOC).

The HOJ station is equipped with the following instrumentation:

- Wind speed and wind direction at 10 meters;
- Ambient temperature and relative humidity at 2.1 meters.

The installation for both stations meets the requirements of ADEQ and EPA's recommendations available at the time of installation. Instrument performance is audited on a regular basis in accordance with ADEQ and EPA requirements.

Table 6-1 lists the geographic locations of the met stations. Figure 6-1 shows the location of the on-site met stations relative to the proposed project. As a note, Figure 6-1 shows the AAB pre-expanded fencing, as discussed in Section 5.2.3.

Table 6-1: Geographical Location of the on-site Meteorological Stations

Station	UTM, m		Base Elevation, m
	East	North	
Camera Hill	521018.35	3651420.28	699.5
HOJ	519947.57	3651995.64	623.0

Figure 6-1: Onsite Meteorological Stations

6.1.2 Upper Air Observations

Upper air data were taken from the Tucson International Airport (WBAN 23160) in Tucson, Arizona.

6.1.3 AERSURFACE

EPA's AERSURFACE tool (version 20060) was used to calculate the surface roughness length, albedo and Bowen ratio inputs required by AERMET. EPA developed AERSURFACE to identify these parameters within a defined radius from a specified point. In this case, the UTM coordinates of the on-site meteorological stations to AERSURFACE along with a 1-kilometer radius per EPA guidance. The modeling used land cover, tree canopy, and impervious surface information for the year 2016 as inputs to AERSURFACE. The parameters for twelve compass sectors of 30° each and by month were calculated. In original Met data processing for Hayden Pb SIP, the user-defined seasonal categories were assigned as follows per ADEQ guidance:

- Late autumn after frost and harvest, or winter with no snow: December, January, February, March;
- Winter with continuous snow on the ground: none;
- Transitional spring (partial green coverage, short annuals): April, May, June;
- Midsummer with lush vegetation: July, August, September; and
- Autumn with un-harvested cropland: October, November.

6.1.4 Processed Data Completeness

Section 5.3.2 of "Meteorological Monitoring Guidance for Regulatory Modeling Applications" states that to be acceptable for use in regulatory dispersion modeling a meteorological dataset must be 90% complete on a quarterly basis. The 90% requirement applies to wind direction, wind speed, and temperature. The data completeness for each monitor (HOJ and Camera Hill) are presented in Table 6-2 and 6-3. As seen in the tables, both monitors meet data completeness requirements for the year 2020.

Table 6-2: Camera Hill Data Completeness

Year	Quarter	Percentage of Missing Data by Variable				
		Wind Direction	Wind Speed	Temperature (2 m)	Temperature (10 m)	Sigma Theta
2020	1	0.1%	0.1%	0.1%	0.1%	0.1%
	2	0.0%	0.0%	0.0%	0.0%	0.0%
	3	0.1%	0.1%	0.1%	0.1%	0.1%
	4	0.0%	0.0%	0.0%	0.0%	0.0%

Table 6-3: HOJ Data Completeness

Year	Quarter	Percentage of Missing Data by Variable		
		Wind Direction	Wind Speed	Temperature (2.1 m)
2020	1	0.0%	0.0%	0.0%
	2	0.0%	0.0%	0.0%
	3	0.9%	0.0%	0.0%
	4	0.0%	0.0%	0.0%

7.0 Background Air Quality

The smelter has been temporarily shut down since October 2019. Therefore, the background ambient air concentration of Pb used in the modeling analysis is derived from ambient air monitoring data that were generated from November 2019 through September 2022.

Ambient air monitoring data were generated by two state and local air monitoring stations in the Hayden Pb NAA—the one at Globe Highway to the east of the slag dump along Highway 77 and the one at Hillcrest in the town of Hayden. During November 2019 through September 2022, the data from the Hillcrest monitor had higher concentrations of Pb than the data from the Globe Highway monitor. Therefore, to be conservative, the modeling analysis used a background concentration of Pb that has been calculated using the data from the Hillcrest monitor.

The location of the Hillcrest monitor is shown in Figure 7-1. The monitor is nearly surrounded by Asarco's facility and is typically in the pathway of wind blowing from sources of fugitive dust within the facility—including dust occasionally generated by road traffic and residual material management operations at the facility—from practically all points of the compass. Nonetheless, pursuant to § 8.3.2(c)(i) of Appendix W of 40 CFR Part 51, the monitoring data used to calculate the background concentration of Pb excluded data generated when wind was blowing from a 90-degree arc relative to the monitor; specifically, when wind was blowing from 16 to 106 degrees relative to the monitor, as shown in Figure 7-1.

The 90-degree arc was established by the relative orientation of Asarco and the Hillcrest monitor. As shown in Figure 7-1, in general when the wind blows from the northeast there will be impacts at the Hillcrest monitor from Asarco. In reality, because of the orientation/proximity of Hillcrest to Asarco, impacts from Asarco at the Hillcrest monitor are felt over a wider angle than the 90 degrees allowed for in § 8.3.2(c)(i) of 40 CFR Part 51, Appendix W (likely an additional roughly 50 degrees to the north/northwest and approximately 20 degrees to the southeast); however, for the sake of conservatism a larger angle to exclude monitor values is not being applied.

Asarco went on strike on October 16, 2019; however, there are still activities going on at Asarco that generate Pb emissions, including vehicle traffic (which generates fugitive Pb emissions from roads), material transfers, and wind-blown emissions from various piles. Because these emissions would be coming from Asarco, Asarco believes it is appropriate to exclude monitor values when the wind was blowing from Asarco to the Hillcrest monitor even during the post-strike period.

HOJ MET data were used to identify days for exclusion from the background concentration at Hillcrest because there are no meteorological data available for the Hillcrest monitor. For the purposes of the determination of excluding monitor values at Hillcrest, data from HOJ are representative as the monitor is only several blocks (approximately 1600 ft) from the Hillcrest monitor.

MET data were examined and each day with at least one hour of wind blowing from within this sector (see Figure 7-1) was identified. If a Pb monitor value was from one of those days, it was excluded from the calculation of the background concentration.

This procedure resulted in 39 3-month rolling averages from November 2019 through September 2022. (There were four 3-month rolling periods in 2021 that had no eligible Pb monitor values to calculate a 3-month rolling average.)

Figure 7-1: Hillcrest Exclusion Radials

Figure 7-2 below shows each of the Rolling 3-Month Pb averages calculated from the Hillcrest monitor, along with the maximum Rolling 3-Month Pb concentration and the average Rolling 3-Month Pb concentration. As seen in the figure, several of the rolling averages are substantially higher than the average calculated during this shutdown period.

These elevated averages are due to material handing activity that occurred during the shutdown. On October 12, 2020 there was a very high daily Pb concentration, roughly 15 times higher than most other daily Pb concentrations. On that day Asarco loaded copper filter cake, a known lead containing material, from roughly 6:00 AM through 3:00 PM, to the southeast of the Hillcrest monitor. The loading of copper filter cake was an unusual occurrence, only taking place on this day since the strike. When it did occur on this day Asarco was moving piles off site, and as this pile had been there since the strike the inside of it was dry, which led to an unusual amount of fugitive dust (the outside had been crusted over because of watering). The wind was blowing for much of that day from the southeast, which would have transported fugitive Pb emissions toward the Hillcrest monitor as shown in Figure 7-3. Appendix K of this TSD provides the atypical events report for this October 12th event.

Note that the location of the Copper Filter Cake loading is only a few degrees outside of the 90-degree sector that Asarco used in its derivation of the Pb background concentration. This illustrates the point that because the Hillcrest monitor is so close to Asarco that, even when using the 90-degree sector as allowed for under §8.3.2(c)(i) of 40 CFR 51, Appendix W, the calculated background concentration will still include some impacts from Asarco and therefore conservatively "double-count" some of Asarco's emissions.

In order to calculate a more representative background concentration the October 12, 2020 concentration was omitted from the calculation. The resulting maximum 3-month rolling average to be used as the background concentration is 0.013 µg/m^3.

Figure 7-2: Rolling 3-Month Pb Averages & Maximum

Figure 7-3: Location of Copper Filter Cake Loading 10/12/20

8.0 Air Quality Modeling Results and Emission Limits

This section provides a discussion on the air quality modeling results and emission limits for Hayden Pb SIP revision.

8.1 Attainment Demonstration

As described in Section 5 of this TSD, Pb emission reductions will be achieved through the implementation of the:

- Uptake Improvement Project
- Fuming Ladle Capture Project
- Anode Furnace Secondary Hood Project.

Dispersion modeling using AERMOD with hybrid MET data was used to demonstrate that the completion of these projects will result in attainment of the 2008 Pb NAAQS. The results of this modeling are presented in Table 8-1. As the table shows, attainment with the 3-month rolling average Pb NAAQS can be demonstrated.

It should be noted that the emissions used in the model were a combination of what the source requested for a permit limit (main stack) and conservative calculation methodologies. These calculation methodologies included:

- Adjustment of AP-42 and other historic emissions inventory factors to account for CEMS data results and results from the partially completed fugitive study,
- Use of worst-case estimated lead concentrations,
- Use of design flows and throughputs at 8760 hours of operation, addition of 2x safety factor for estimated fugitive emissions in the flash furnace are and converter aisle and a 1.5x safety factor in the anode aisle,
- The relative emissions reductions were taken from prior SIP modeling inputs, rather than the calculated vales, which result in a more conservative approach.

For more information on these calculation methodologies please see Appendix J of this TSD.

Table 8-1: Maximum 3-month Averaged Concentration

Highest 3-Month Concentration (µg/m^3)	Background Concentration (µg/m^3)	Total Concentration (µg/m^3)	NAAQS (µg/m^3)
0.134	0.013	0.147	0.15

As shown above, the controlling Pb concentration is below the Pb NAAQS of 0.15 µg/m^3. It is predicted to occur along the southern side of the Asarco AAB, to the south of Camera Hill. Figure 8-1 on the following page shows how modeled Pb concentrations decrease rapidly with distance from Asarco. Additionally, Figures 8-2 to 8-11 provide contour plots for each modeled source type. These figures show the highest three-month average concentration at each receptor over the entire modeling period. Modeled sources with predicted concentrations greater than 10% of the NAAQS include call-out boxes to illustrate more clearly predicted concentrations. As a note, in Figures 8-2 through 8-11, portions of the nonattainment area that don't contain a contour color had a modeled concentration of zero.

Collectively these plots illustrate that no single source is responsible for the majority of the predicted Pb impacts near ASARCO, with most sources contributing less than 10% to total predicted Pb concentrations. The Flash Furnace and Roofline sources produce concentrations between 10% and 20% of the NAAQS to the immediate west of ASARCO, while the road sources produce very localized concentrations between 10% and 20% of the NAAQS. The two tailings ponds are responsible for isolated areas of 10% and 20% of the NAAQS within the tailings ponds themselves.

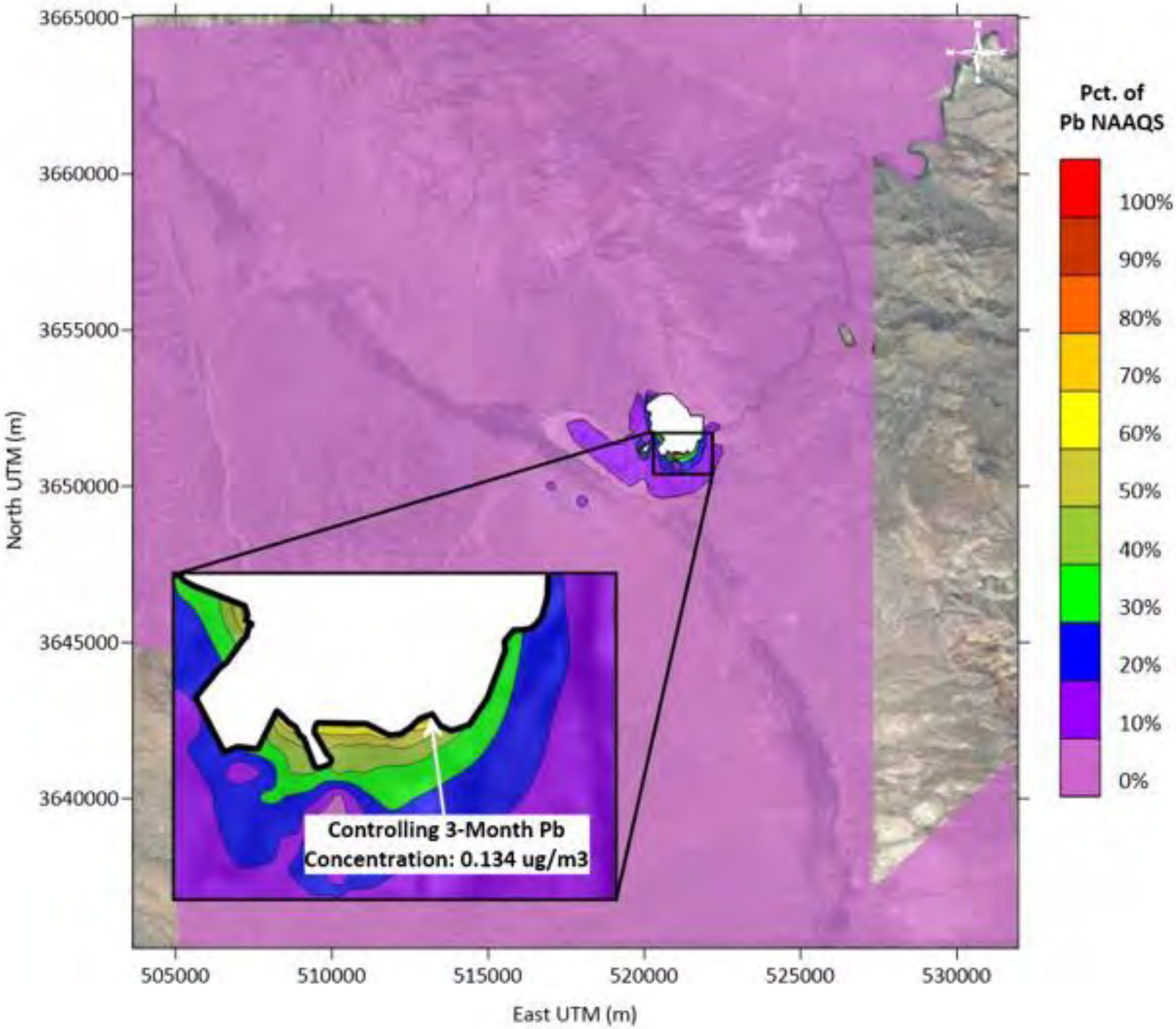


Figure 8-1: Highest 3-Month Pb Concentration

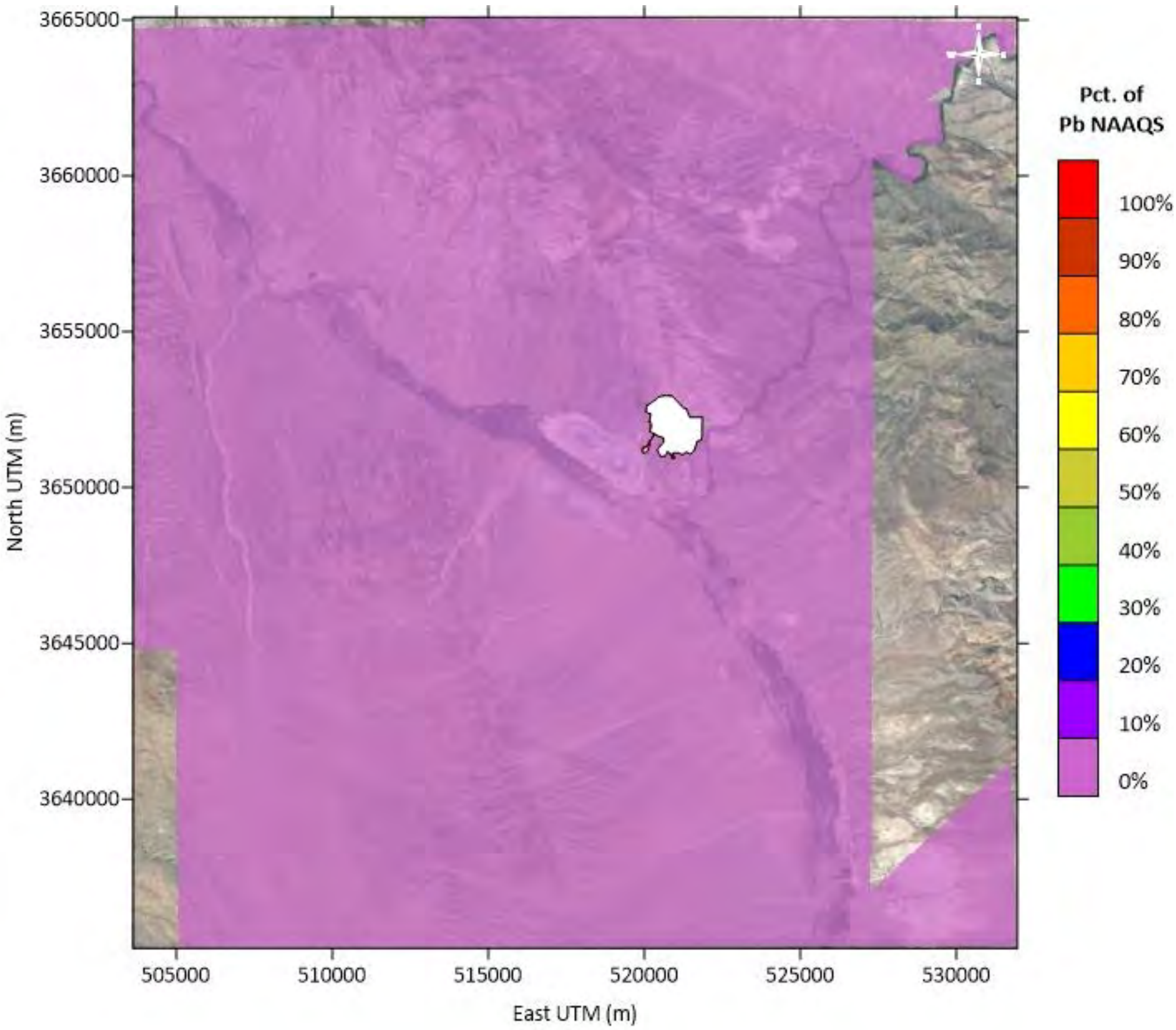


Figure 8-2: 3-Month Pb Concentrations

Camera Hill Meteorological Data

Main Stack Only

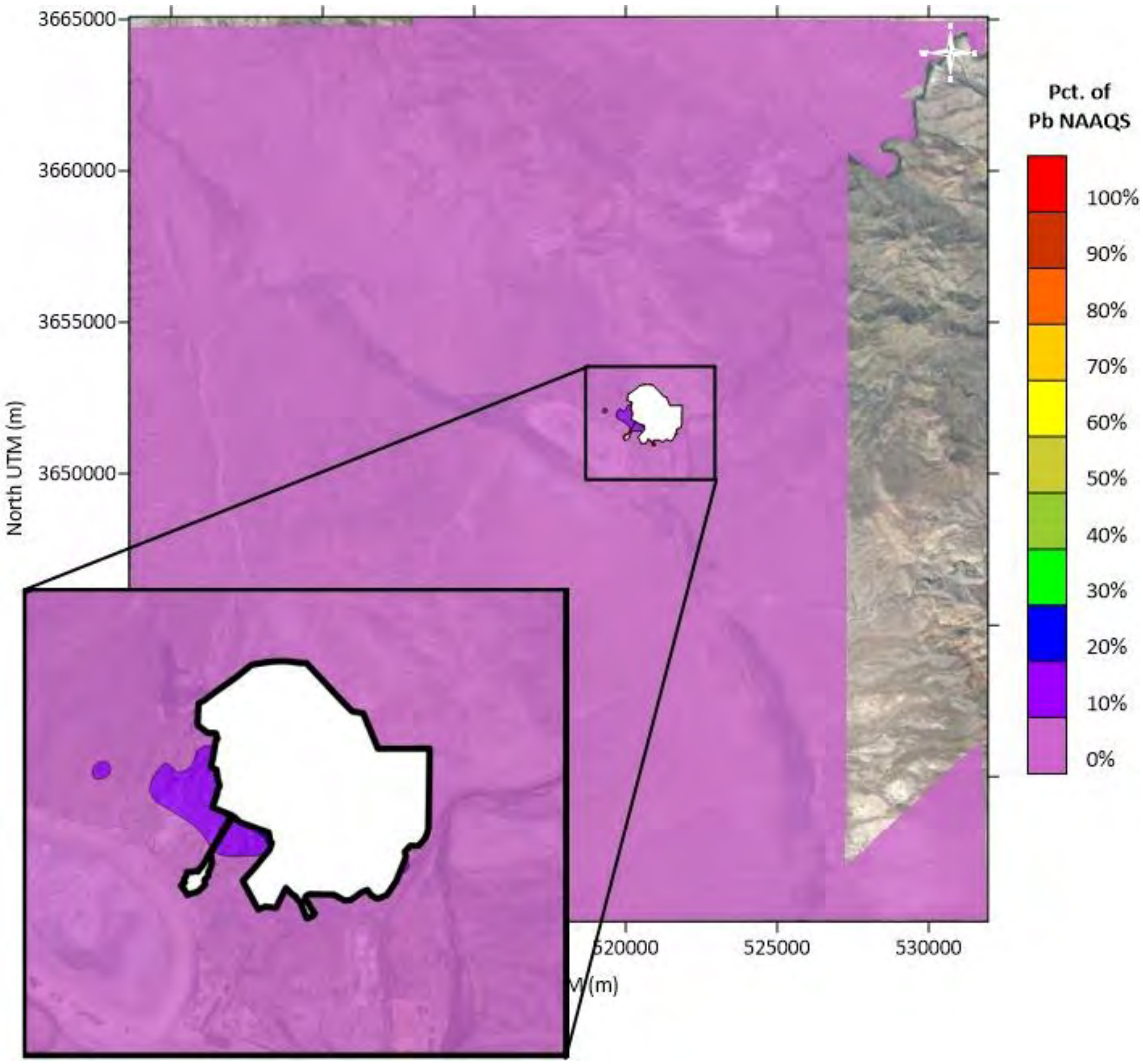


Figure 8-3: 3-Month Pb Concentrations

Camera Hill Meteorological Data

Flash Furnace Only

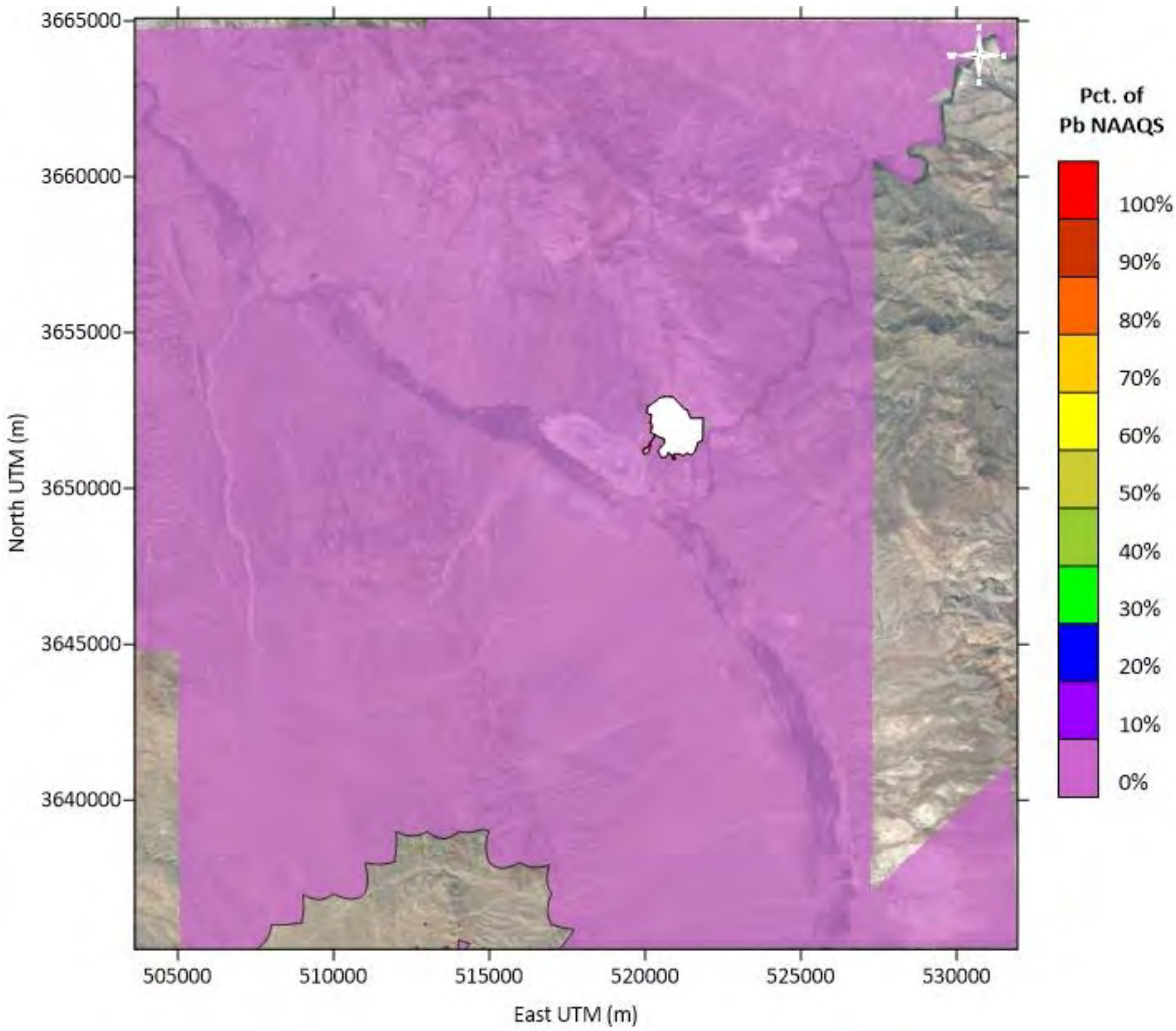


Figure 8-4: 3-Month Pb Concentrations

Camera Hill Meteorological Data

Converter Aisle Only

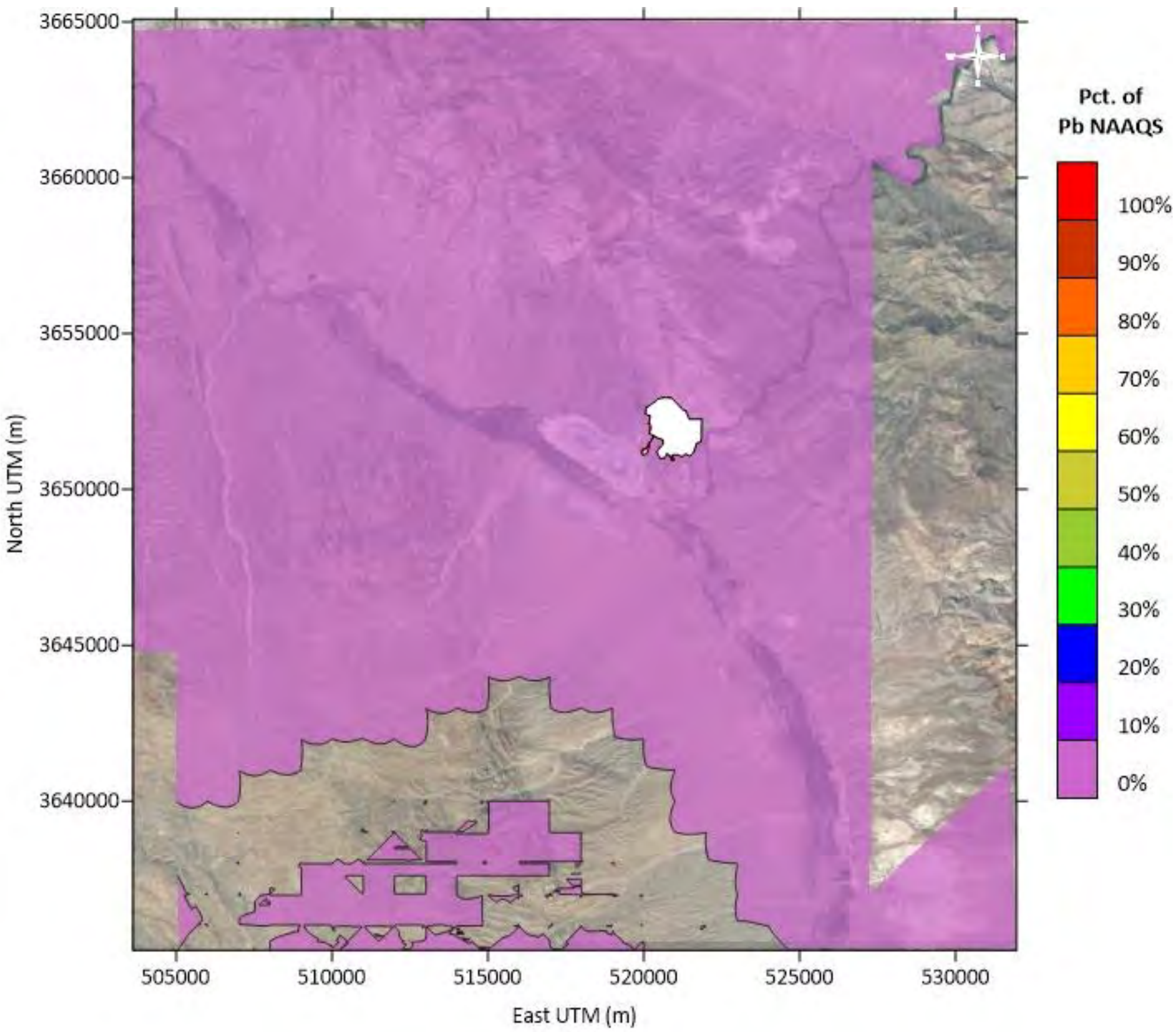


Figure 8-5: 3-Month Pb Concentrations

Camera Hill Meteorological Data

Anode Furnace Only

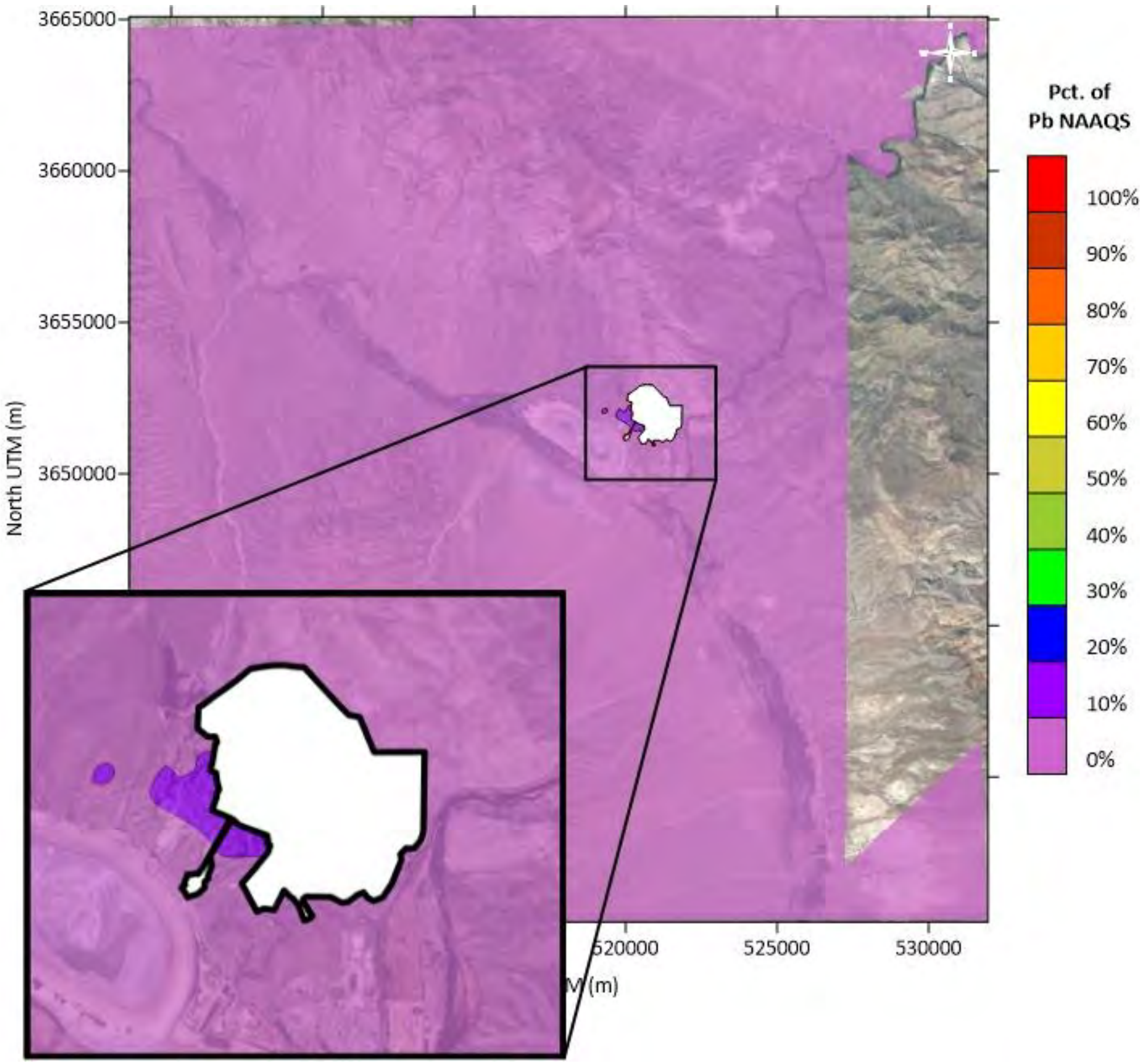


Figure 8-6: 3-Month Pb Concentrations

Camera Hill Meteorological Data

Roofline Sources Only

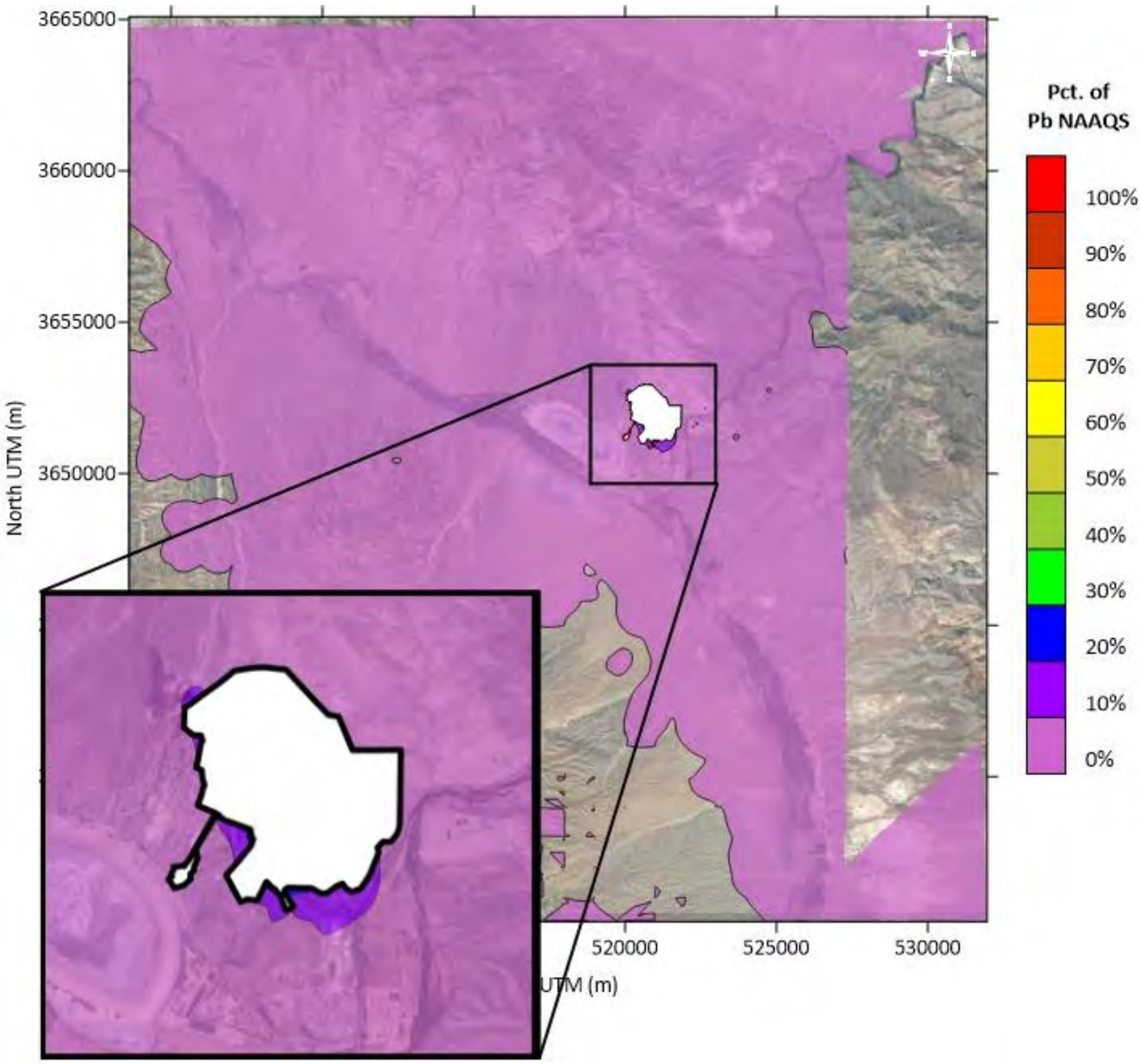


Figure 8-7: 3-Month Pb Concentrations

Hayden Old Jail Meteorological Data

Paved Roads Only

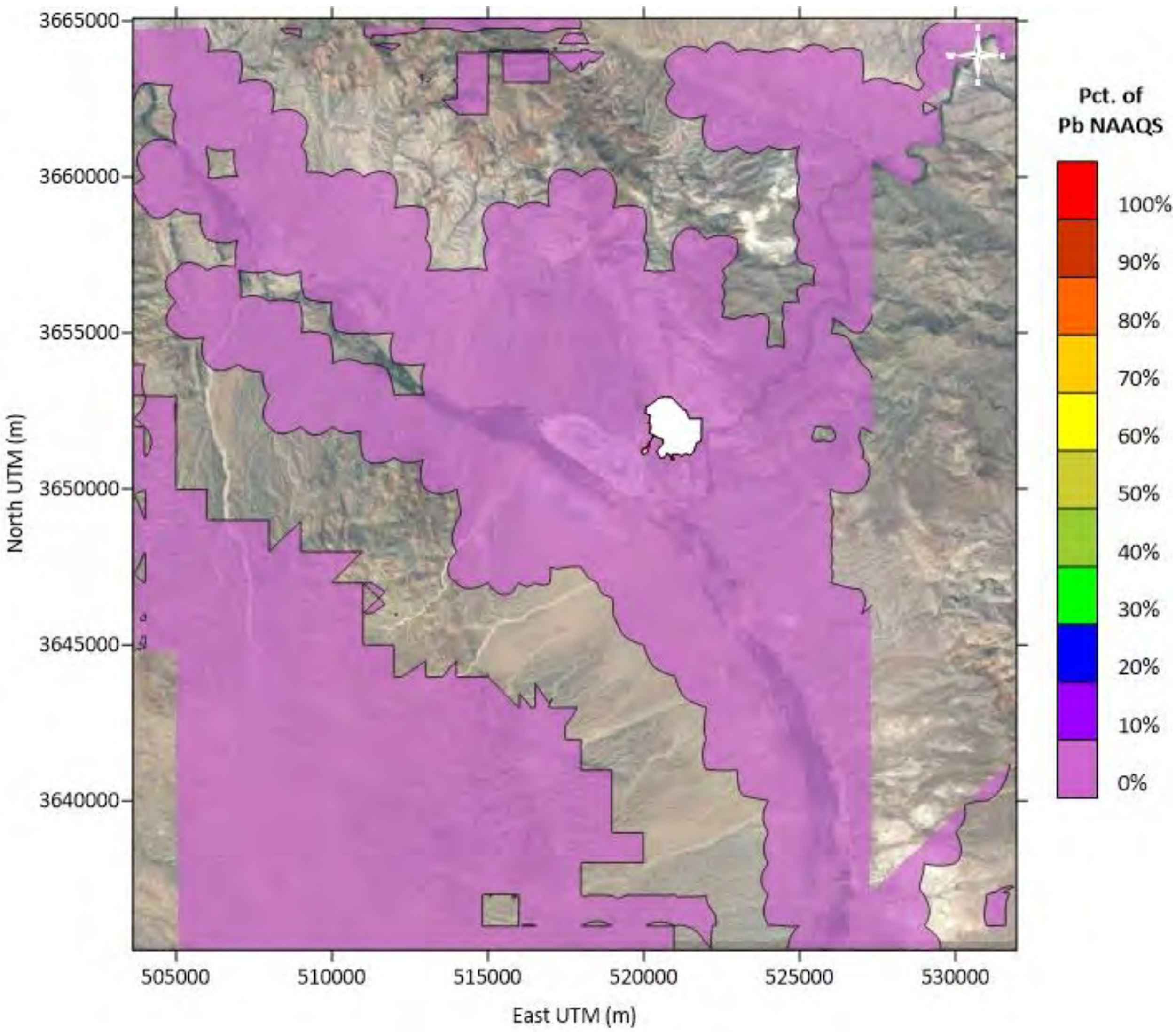


Figure 8-8: 3-Month Pb Concentrations

Hayden Old Jail Meteorological Data

Scrubbers Only

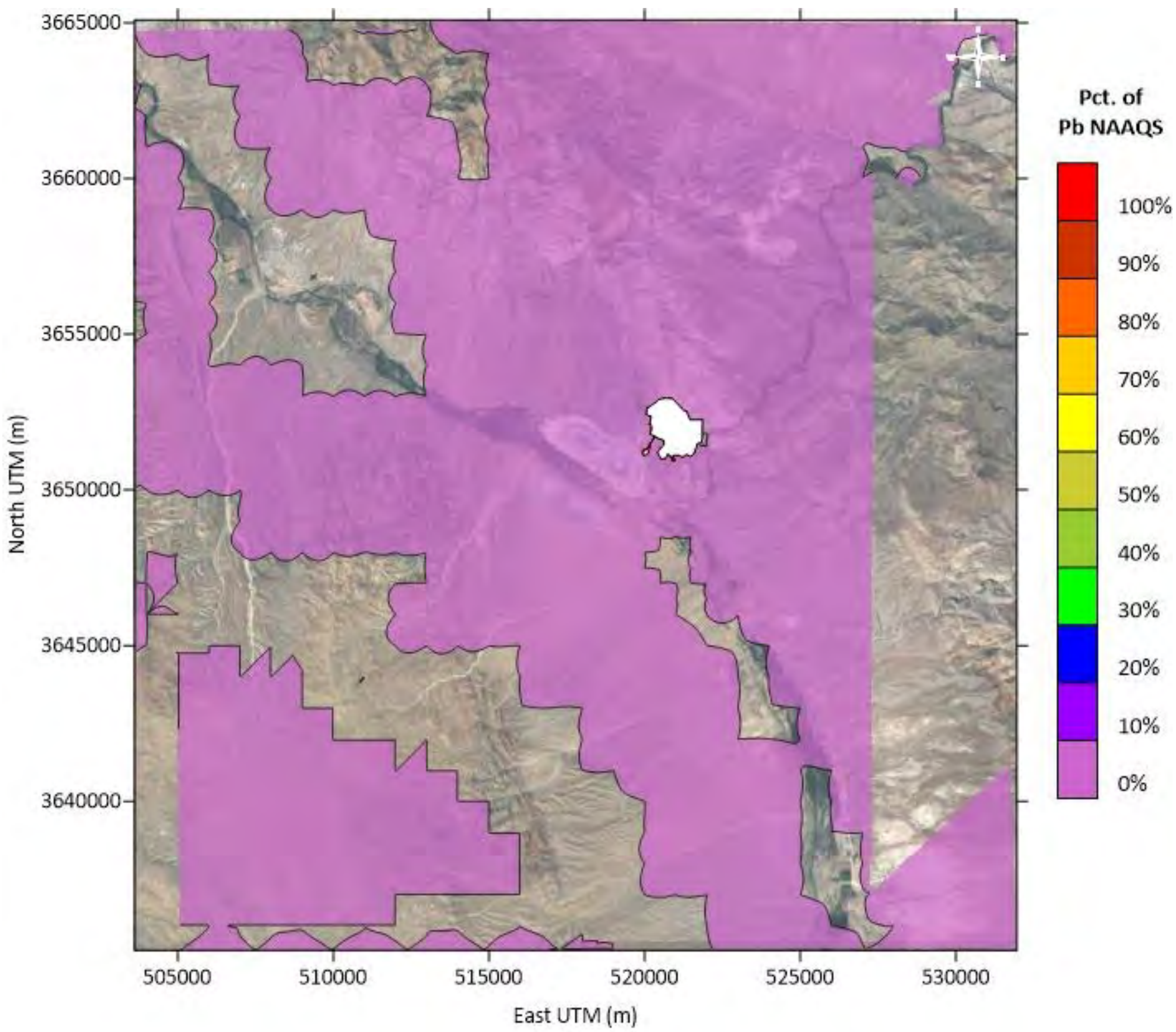


Figure 8-9: 3-Month Pb Concentrations

Hayden Old Jail Meteorological Data

Slag Dumping Only

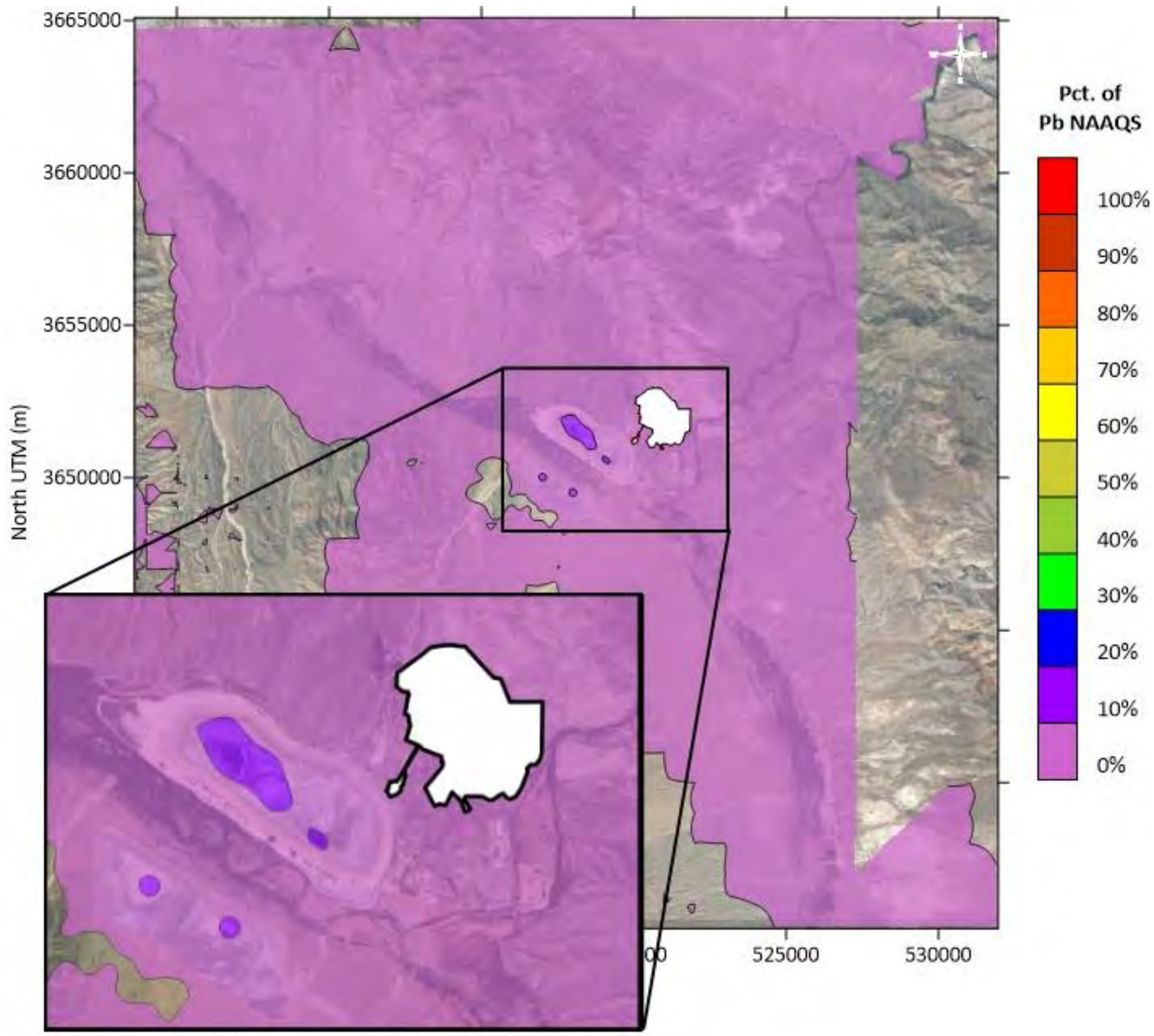


Figure 8-10: 3-Month Pb Concentrations

Hayden Old Jail Meteorological Data

Tailings Only

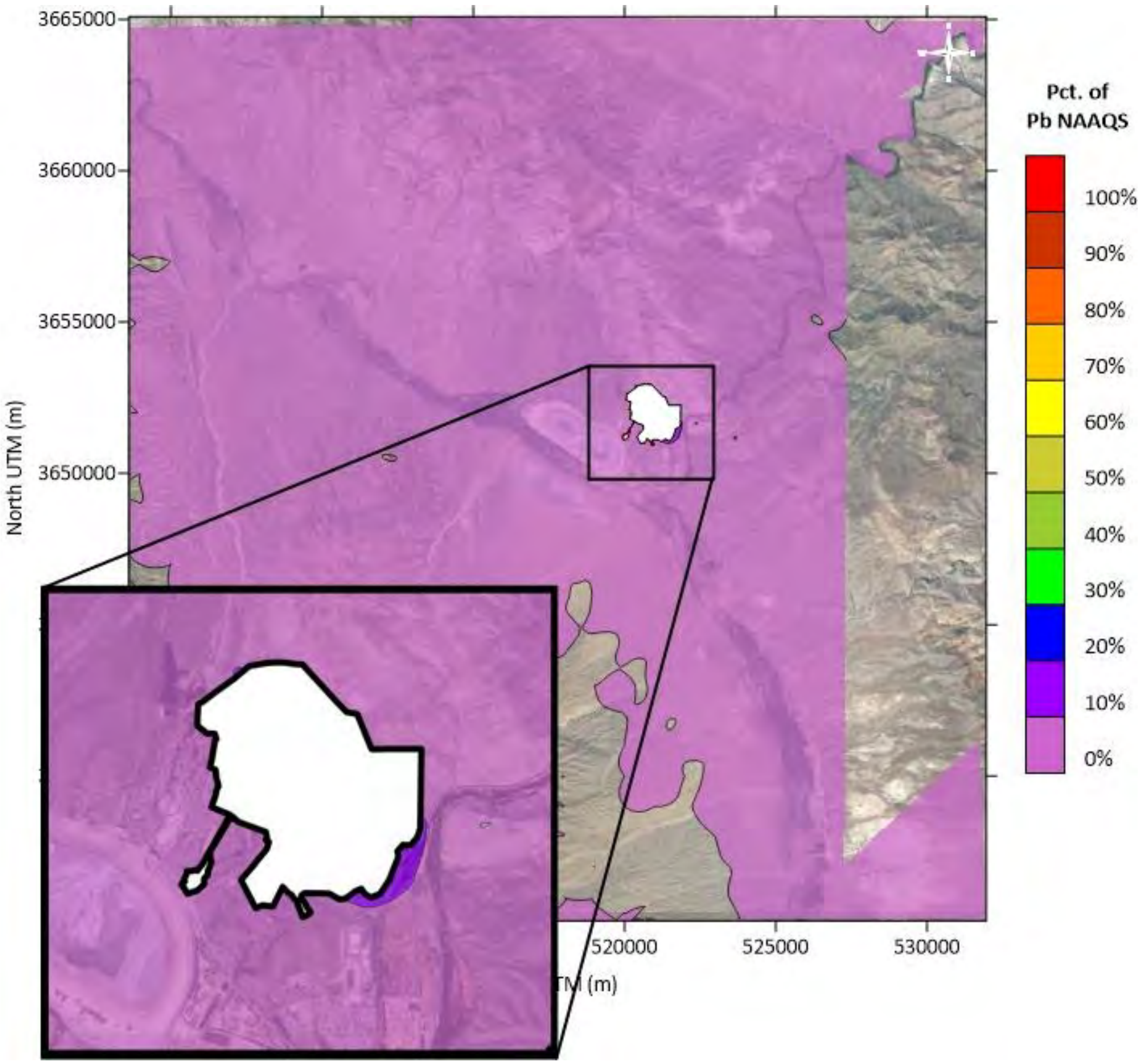


Figure 8-11: 3-Month Pb Concentrations

Hayden Old Jail Meteorological Data

Unpaved Roads Only

8.2 Compliance Methods

To ensure attainment of the NAAQS in the 2026 attainment year and beyond, the SIP revision will include numerous methods for the smelter to demonstrate compliance. These compliance methods, along with monitoring, recordkeeping, and reporting requirements prescribed by the air quality permit are summarized in Table 8-2 below. The table below is intended to provide insight to the public for how the Permittee is required to demonstrate compliance with the various forms of limits in the permit.

Table 8-2: Permit Revision No. 97168 Summary

Emission Unit	Pollutant	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Main Stack	Pb	Monitor the pressure drop across the anode secondary hood baghouse.	Record major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment.	Submit semiannual compliance reports on construction of any such equipment.
		Monitor the damper positions for the Uptake Improvement System and Fuming Ladle Control System at all times.	Record required performance tests, test plans, and audits.	Submit quarterly summary reports that include dates, times, and descriptions of deviations when the facility operated smelting processes and related control equipment.
		Monitor PM Continuous Emissions Monitoring System (CEMS) - exit of the Anode Secondary Hood Baghouse.	Record output of the PM CEMS.	Submit quarterly summary report showing the date, time and magnitude of any exceedance of the PM CEMS (or approved alternative monitoring system and any exceedance of the fugitive parameters calculation).
			Record required compliance calculations.	

8.2.1 Main Stack

For the attainment demonstration ADEQ retained the existing 0.683 pound per hour main stack permit limit. Additionally, to strengthen the SIP, a continuous compliance element through a PM continuous emissions monitoring system (CEMS) at the exit of the anode secondary hood baghouse has been included in Asarco's latest permit. These PM CEMS would undergo PS-11 certification. If the PM CEMS certify, then they will be used to monitor exit gas of the baghouse as a continuous assurance of effective control. If the PM CEMS does not certify then Asarco must submit an alternative monitoring plan, as provided in the Consent Decree for other sources, to ADEQ for approval. For more information on the stipulations surrounding this monitoring approach see the Asarco's latest permit revision.

8.2.2 Roofline Emissions

The January 2022 Subpart QQQ proposed rulemaking demonstrated that the rate of PM emission is a surrogate for the effectiveness of controls for HAPs (including lead). However, isokinetic test methods like Method 5 are inappropriate for measuring PM emissions at the Smelter roofline. The explanation for this has been included in Attachment 3 of Asarco's 12-16-2022 permit revision application.

In the absence of a nationally applicable rule that identifies the use of MiniVol Samplers as a reference or equivalent method of determining fugitive emissions rates, the SIP revision for the Hayden Pb NAA and corresponding permit revision will rely on:

1. The construction of the three projects discussed in Section 8.1,
2. The operation of the resulting capture and control mechanisms,
3. Recordkeeping and reporting requirements to demonstrate that the operation of those mechanisms is being conducted according to their design, to ensure the roofline emission rates used in the attainment model will not be exceeded.[13]

However, Asarco's latest permit revision proposes supplementing the work practice standards with numeric emissions limits at the rooflines, if, the the results of the two studies show that MiniVol Samplers are a reliable means of measuring rates of fugitive emissions, specifically at the Hayden roofline.

[13] Appendix L provides a quantitative demonstration showing that enforceable work practices are capable of achieving and maintaining the expected reductions from the new projects discussed in Section 8.1.

9.0 References

Auer, A.H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, 17:636-643.

ADEQ Technical Support Document on Technical Review and Evaluation of the Crushing and Screeining General Permit

U.S. EPA. 2008 Lead National Ambient Air Quality Standards Implementation Questions and Answers.

U.S. EPA. 2012 Haul Road Workgroup Final Report, North Carolina 27771.

U.S. EPA. 2014. Addendum User's Guide For The AMS/EPA Regulatory Model – AERMOD (EPA-454/B-03-001, September 2004). Research Triangle Park, North Carolina 27771.

U.S. EPA. 2014. Addendum User's Guide for the AERMOD Meteorological Preprocessor (AERMET) (EPA-454/B-03-002). Research Triangle Park, North Carolina, North Carolina 27771.

U.S. EPA. 2013. AERSURFACE User's Guide. EPA-454/B-08-001 (Revised 01/16/2013). Research Triangle Park, North Carolina, North Carolina 27771.

U.S. EPA. 2011. Addendum User's Guide for the AERMOD Terrain Preprocessor(AERMAP) (EPA-454/B-03-003). Research Triangle Park, North Carolina 27711.

U.S. EPA. 2005. Guideline on Air Quality Models: 40 CFR Part 51, Appendix W. Research Triangle Park, North Carolina 27711.

U.S. EPA. 2004. User's Guide to the Building Profile Input Program. EPA-454/R-93-038. Research Triangle Park, North Carolina 27711.

U.S. EPA. 2003. Risk Assessment Document for Coke Oven MACT Residual Risk. Research Triangle Park, North Carolina 27711.

U.S. EPA. 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications. EPA-454/R-99-005. Research Triangle Park, North Carolina 27771.

National Stone, Sand and Gravel Association (NSSGA) 2004 Modeling Fugitive Dust Sources.

Appendix A: Asarco's Updated Ambient Air Boundary

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MEMORANDUM

TO: ADEQ SIP Group; U.S. EPA Region 9 SIP Group

FROM: Eric L. Hiser

DATE: September 16, 2016

SUBJECT: Justification of Asarco Hayden ambient air boundary

As requested by ADEQ and EPA, Asarco is providing the following more refined ambient air boundary around its facility, including the following explanation of why this boundary represents a practical ability to preclude entrance from the general public. Asarco is following precedent established by EPA for the Kennecott smelter in Utah.

As EPA observed regard to the Kennecott smelter when a similar question was raised: "the cumulative effect of Kennecott's property holdings, property exchanges, installation of fences, posts, and no trespassing signs, and security patrolling supports the Company's claim to control and exclusive use of the relevant Property." 50 Fed. Reg. 7056, 7057 (Feb. 20, 1985). EPA guidance is also clear that "'Preclude' does not necessarily imply that public access is absolutely impossible, but rather that the likelihood of such access is small." EPA, June 22, 2007, "Interpretation of 'Ambient Air' in Situations Involving Leased Land Under the Regulations for Prevention of Significant Deterioration (PSD)." As in the Kennecott case, Asarco believes that the cumulative effect of the rugged terrain, its fencing, physical barriers, and active patrolling of the smelter and concentrator sites, combine to ensure that the likelihood of public access is small.

The attached contour map shows the Hayden smelter and surrounding area. Asarco has set forth the proposed ambient air boundary (AAB) in light blue, with other colors on the outside representing the type of barrier used to exclude the public. The following explanation follows the contour map and proposed AAB clockwise, starting at the top with "A".

A. **Northeast section of smelter site.** In this area, the smelter backs up against the Dripping Springs mountains. These mountains are extremely rugged, on a high slope, and cannot easily be accessed from the sides or rear. These areas are identified by orange cross hatching. Asarco has defined the AAB at the north along its quarry access road; then along a section of cliff, and then along another access road, and finally along a section of very steep terrain adjoining the slag pile. In much of this area, Asarco security patrols either patrol the roads or can see the terrain from areas where they patrol. The combination of impassable terrain and security patrols creates a practical ability to exclude the general public.

- **Photo A.1.** Photograph of Dripping Springs Mountains looking east behind smelter site.

B. Southeast section of smelter at slag pile and contractor gate. In this area, the smelter site opens up into the Gila River Valley. Asarco has defined the AAB at the north end and to the contractor gate as the edge of the slag pile. The slag pile is nearly vertical and the rock is both loose in places and jagged (slag is glass-like), making access to the smelter over the slag pile essentially impassable. This area is defined by the orange cross hatching. Asarco security patrols the road areas on top of the slag pile. The combination of impassable terrain and security patrols creates a practical ability to exclude the general public.

- **Photo B.1.** Photograph of slag area at exit from Highway 77.
- **Photo B.2.** Photograph of slag area and signage at exit from Highway 77.
- **Photo B.3.** Photograph showing height of slag in area.

C. Contractor gate area. In this area, which is located in the south-southeast, Asarco has its contractor gate. The AAB follows the fence line in this area. The fence is a 6 foot chain link topped by barbed wire. The fence is marked by the yellow shading. The contractor gate is manned by Asarco security 24 hours a day. The area is also patrolled by Asarco security. The combination of the gate, security and security goals creates a practical ability to exclude the general public.

D. South smelter loop road way. In this area, the smelter is situated above a steep valley. There is also a partial fence near the property boundary considerably south of the proposed AAB. Asarco has drawn the AAB to follow the south side of the smelter loop road, which is the primary access between the contractor gate and the smelter proper. This area is heavily traveled, patrolled by Asarco security and access requires crossing a fence close to the highway and climbing a steep valley side (indicated with orange cross hatching) to reach the loop road, all exposed to view from the road. The combination of rugged terrain, partial fencing, and security patrols creates a practical ability to exclude the general public.

- **Photo D.1.** Photo looking down from edge of smelter loop road.
- **Photo D.2.** Photo looking across at smelter loop road.

E. Former Smithco revert crushing area. This is an elevated ridge upon which Smithco, an Asarco contractor, formerly operated a revert crushing area. It extends to the west back along the loop road. Asarco has drawn the AAB along the fence line in this area. The fence is a 6 foot chain link fence surmounted by razor wire (indicated with the dark black line; regular 6 foot fence with barbed wire is shown in yellow). Asarco will maintain at least the 6 foot chain link fence in this area; it is also considering placing receptors to the south of the smelter loop road to allow the possibility of pulling the fence line back to the loop road in the future without affecting the attainment demonstration. The area is patrolled by Asarco security. The combination of the fence and security patrols creates a practical ability to exclude the general public from this area.

- **Photo E.1.** Photo showing typical fence with razor wire.

F. Calcium sulfate pond. This area is a fenced calcium sulfate pond that will be closed and remediated in the future. Asarco has drawn the AAB along the fence line. The fence is a 6 foot chain link fence topped with barbed wire (indicated with yellow shading). The area is easily viewed by security patrols along the smelter loop road. The combination of fence and security patrols creates the practical ability to exclude the general public.

G. **Powerhouse Canyon area.** Powerhouse Canyon is a geographic feature in the central part of the smelter area and divides the concentrator from the smelter. The smelter main gate road goes up the right side of the canyon on the top; the concentrator haul road runs at the bottom. The left side is characterized by steep cliffs (shown by the orange hatching). The bottom of Powerhouse Canyon is the Asarco secondary/tertiary crusher and is controlled by a gate and fencing (shown with yellow shading). The AAB is shown with two possibilities: Option A follows the existing fence line to around the health clinic and then new fencing and a gate will be added at the health clinic and fencing will extend to the start of the steep canyon wall, the canyon itself would not be fenced; Option B pushes further down the smelter main gate access road below the bunk house and then new fencing and a gate will be added below the bunk house and the fencing will extend to the start of the steep canyon wall, the canyon itself would not be fenced. This area is patrolled by Asarco security and subject to observation from the health clinic as well. The combination of fence, rugged terrain, employee observation and security patrols creates the practical ability to exclude the general public.

H. **Town of Hayden area.** Inside the Town of Hayden, Asarco has a six foot chain link or masonry fence, topped with barbed wire (shown with yellow shading), extending up from Powerhouse Canyon along the property boundary and continuing west and north all the way to the railroad tracks on the northeast side of the smelter. Asarco has drawn the AAB along this fence line. The combination of the fence line and Asarco security patrols creates the practical ability to exclude the general public from this area.

I. **Northwest area.** The railroad tracks are located on a steep, difficult to access embankment; further west, the Kennecott slag pile creates a steep, jagged impassable physical barrier; north of the Kennecott slag pile are steep ravines with cholla and other cactus that preclude casual travel. These areas are marked by the orange hatching. Asarco drawn the AAB following the quarry access road, which is patrolled by Asarco security. The combination of the rugged terrain, slag piles, steep slopes, and security patrols creates the practical ability to exclude the general public from this area.

- **Photo I.1.** This photo shows Dripping Springs Mountains behind plant.
- **Photo I.2.** This photo shows Dripping Springs Mountains central area behind plant.
- **Photo I.3.** This photo shows the rugged terrain north of the plant.
- **Photo I.4.** This photo shows concrete barriers, gate and no trespassing sign on road approaching plant site from north.

Asarco hopes that this information is helpful. Please call Jack Garrity, Amy Veek or Eric Hiser if you have any questions.

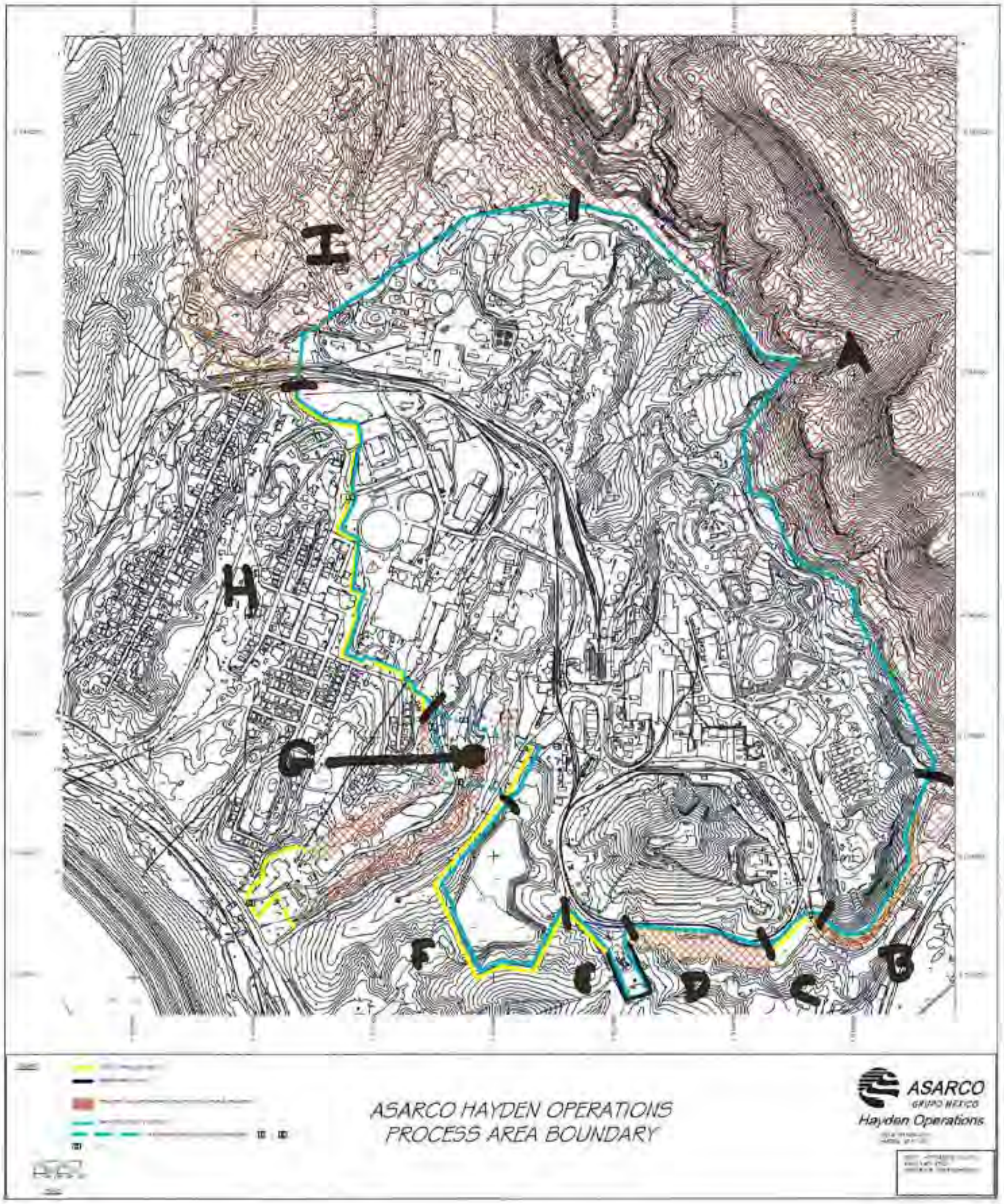

ASARCO HAYDEN OPERATIONS
PROCESS AREA BOUNDARY
ASARCO
GRUPO MEXICO
Hayden Operations
A
B
C
D
E
F
G
H
I

Photo A.1- Dripping Spring East

Photo B.1-Slag

Photo B.2-Slag

Photo B.3- Slag

Photo D.1- Looking Down from Loop Road

Photo D.2- Looking Across at Loop Road

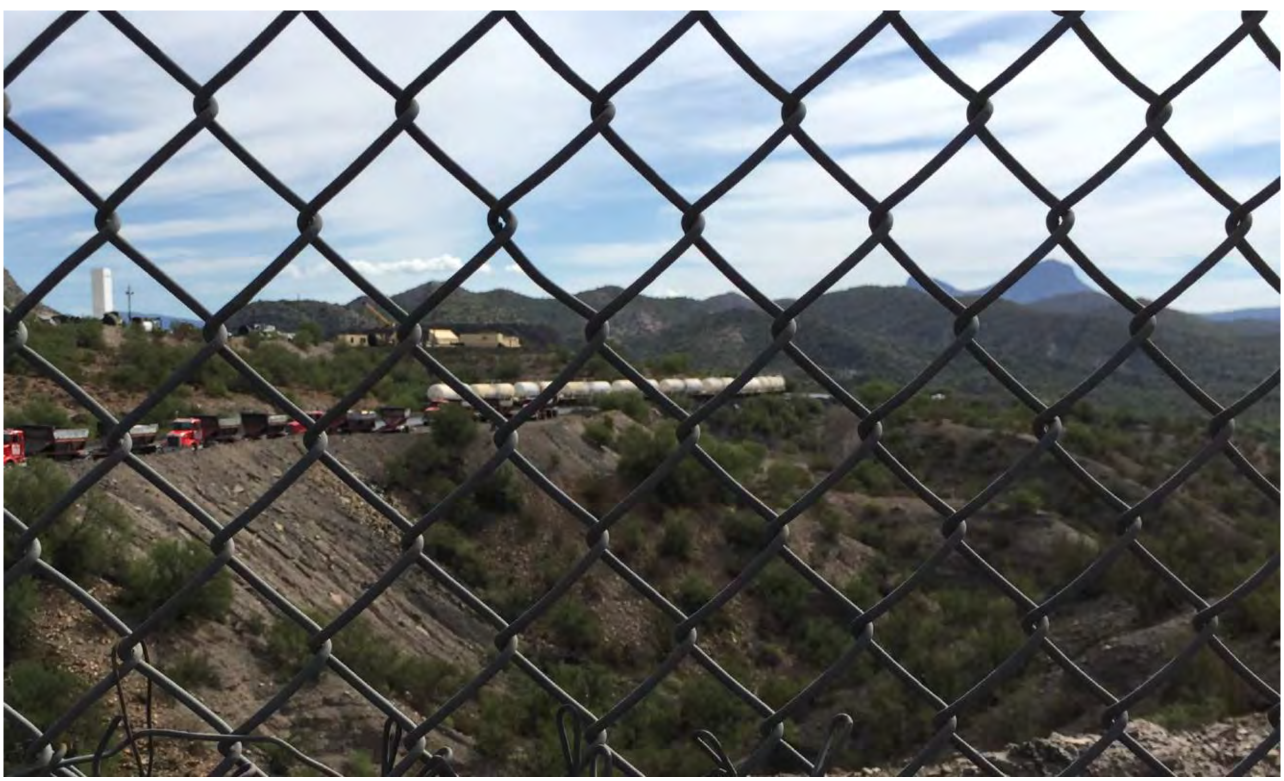


Photo E.1- SmithCo. Razor Wire Fence

Photo I.1- Dripping Springs West

Photo I.2- Dripping Springs Central

Photo I.3- Rough Terrain to North

Photo I.4- Barricade on Road in North


Photo I.4 - Barricade on road in north

Appendix B: Performance Evaluation of the Hybrid Approach

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY TECHNICAL MEMORANDUM

HAYDEN PB MODEL PERFORMANCE EVALUATION

SEPTEMBER 26, 2016

The following memorandum presents a comparison of three modeling approaches available for the Arizona Department of Environmental Quality's (ADEQ) Lead (Pb) State Implementation Plan (SIP) attainment model. The three approaches differ in the meteorological (MET) conditions used, said approaches are: a hybrid approach using both the Camera Hill (CH) and HOJ (HOJ) MET station, using only the HOJ station, and using only the CH station.

Background

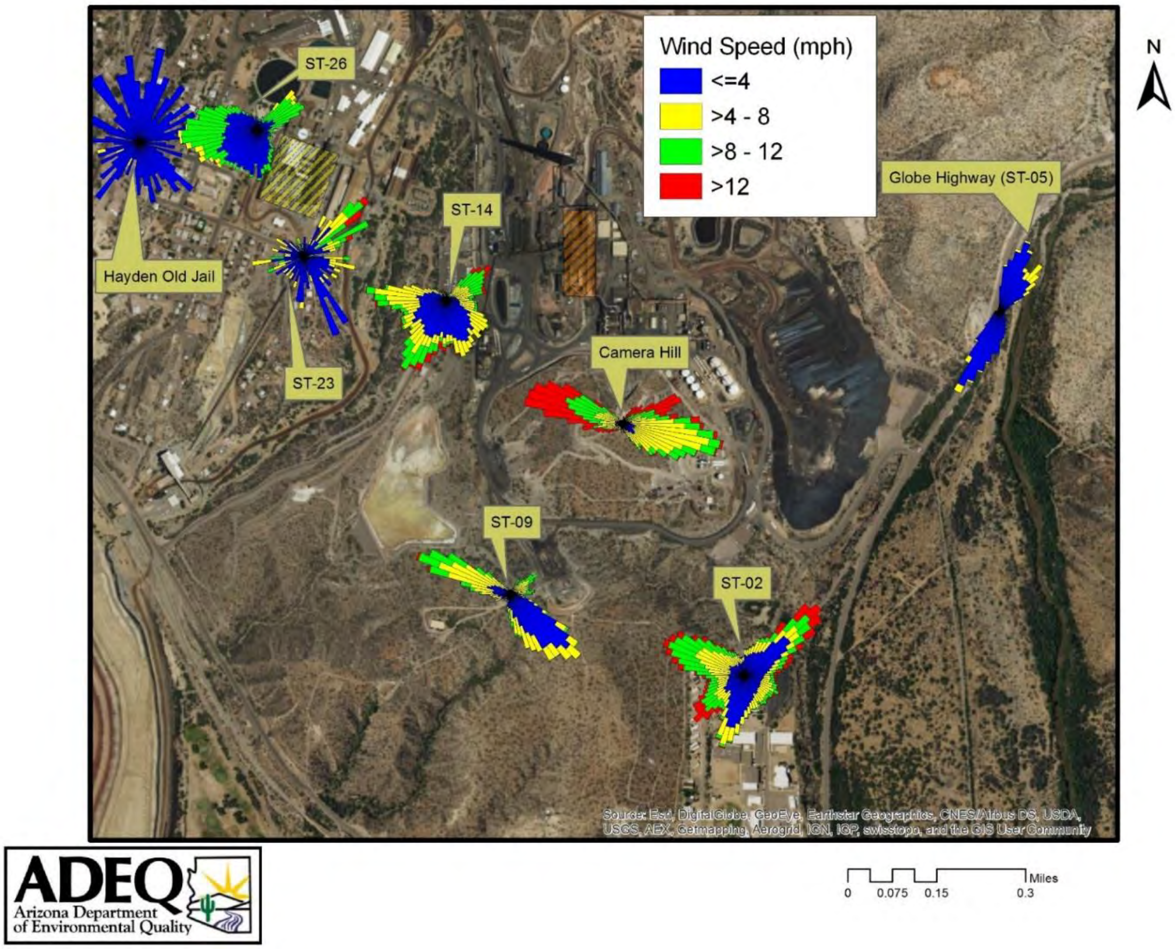
Situated in a low-lying portion of a valley, with mountains reaching over 4,000 feet to the north, east and southwest, Hayden is subject to a distinct mountain-valley diurnal wind pattern. Under stable atmospheric conditions, nighttime winds are typically from the southeast with speeds less than 10 miles per hour. These conditions cause air to pool in low-lying areas at night, causing pollutants within the air to settle in these areas. The up-slope air flows and convection that occur during the day increase dispersion out of the Hayden area. Under normal daytime conditions, surface winds in the Hayden area range from west-southwesterly to west-northwesterly as the atmosphere becomes less stable.

Two networks of meteorological (MET) monitors exist within Hayden. The first includes the HOJ (HOJ) and Globe Highway monitor, which are maintained by ADEQ. The other network includes monitors installed as part of the Remedial Investigation & Feasibility Study (RI/FS) (indicated as ST- # and includes the Camera Hill monitor). These monitors are maintained by Haley & Aldrich, the firm retained by Asarco to conduct the RI/FS. The locations, wind speed, and wind directions seen at all the aforementioned monitors are shown in Figure 1.

Due to QA/QC and monitor siting requirements for attainment modeling, ADEQ considered only the Camera Hill and HOJ monitors for the following Model Performance Evaluation (MPE). As seen in Figure 1, these monitors vary significantly regarding both wind speed and direction. This is due to the elevation difference between the two monitors, which is roughly 300 feet, and the local topography.

In past Hayden SIP modeling efforts, Camera Hill was used because it best represented MET conditions seen at the main stack (Hayden SO_2 SIP). However, for the Hayden Pb SIP a large number of sources exist near ground level, because of this difference ADEQ has used a hybrid approach to model the Pb emissions and conducted the following MPE.

Figure 1 - Process Fugitive Sources



Approach

ADEQ started by collecting emissions data from the facility's annual emissions inventory and other related sources. The existing source categories represented in this study included:

- Point Sources
    - Main Stack (inner & annulus)
    - Anode Baghouse Stack
    - Roofline Fugitives (anode, converter, and flash furnace)
- Roads
    - Smelter (paved & unpaved)
    - Concentrator (paved & unpaved)

- Process Fugitives

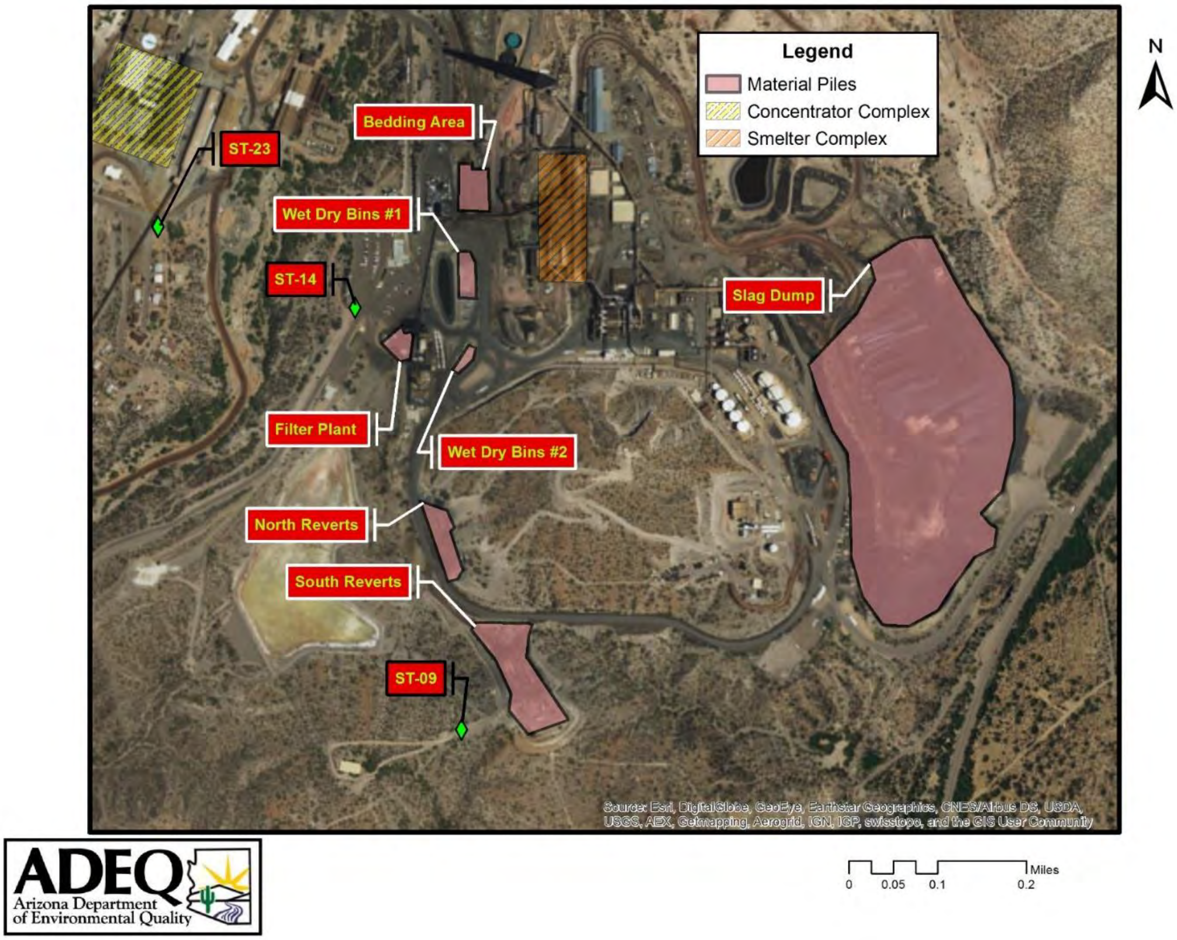
- Bedding Area
- Slag Dump
- Concentrate Storage Area
- South Reverts Storage Area
- North Reverts Storage Area
- Wet Dry Bins
- Filter Plant Area
- Smithco Crusher

The locations of the above process fugitive sources are shown in Figure 2. Sources missing from Figure 2 include the concentrate storage area and Smithco Crusher. These sources are located north of the area shown in said figure. Moreover, emission rates for all sources were the same between the three approaches.

For all three scenarios (hybrid, HOJ only, and CH only), one year of MET data was used. Specifically, the runs started on August 16, 2013 and ended on August 15, 2014. This period of time coincided with approximately 250 ambient air monitor samples collected at ST-02, 05, 14, 23, and 26 (see Figure 1 for location). As a note, all RI/FS monitors did not start collected Pb data until October 2013. In AERMOD, about 100 flagpole receptors were placed around each of these five monitor locations for model performance evaluation purposes.

The hybrid approach involved creating two identical AERMOD runs, however, emissions and the MET data used differed between the two runs. One run used the HOJ MET data and had roofline fugitive (flash furnace, converter, and anode furnace) and main stack emission rates be zero. The second run used CH MET data and had emission rates for process fugitives, roads, and slag dumping be zero. This effectively paired ground level sources with the HOJ monitor and elevated sources with the CH station.

Figure 2: Process Fugitive Sources



Results & Discussion

In order to obtain a general comparison of the three approaches, ADEQ - Technical Analysis Unit (TAU) staff started by calculating the model to monitor concentration ratio (R) for each month at all five stations (Equation 1).

$$R = \frac{Pb_{model}}{Pb_{observed}} \qquad e.q.1$$

This was done by averaging the modeled concentrations of roughly 150 flagpole receptors, per monitor, for each day the RI/FS monitors collected a sample. This gave an average modeled concentration for every sample day (at all monitors). A sample calculation is shown below where the modeled daily concentration 0.0973 µg/m^3.

$$\mathbf{0.0973} = \frac{1}{N_F}\left(0.0965 + 0.0924 + \cdots + c_n\right)$$

c_n = nth modeled concentration for a given flagpole receptor
N_F = number of flagpole receptors at a given monitor

After determining an R value for all sample days at all monitors, TAU determined the performance of each model approach. This was done by specifying three categories to compare calculated R values to. These categories were under predicted, predicted, and over predicted. R values between 0 and 0.8 were defined as under predicted, between 0.8 and 1.2 were predicted, and ratios greater than 1.2 were considered over predicted. The results of this analysis are shown below.

Table 1 - Hybrid Approach Prediction Analysis

Hybrid Approach Sample Prediction				
Monitor	**Under**	**Predicted**	**Over**	**Station Total**
ST-02	7	1	44	52
ST-05	19	4	19	42
ST-14	22	9	17	48
ST-23	18	8	23	49
ST-26	10	17	24	51
Total	**76**	**39**	**127**	**242**
Monitor	**Under**	**Predicted or Over**	**Predicted**	**Over**
ST-02	13%	87%	2%	85%
ST-05	45%	55%	10%	45%
ST-14	46%	54%	19%	35%
ST-23	37%	63%	16%	47%
ST-26	20%	80%	33%	47%
Model Performance	**31%**	**69%**	**16%**	**52%**

Table 2- HOJ Prediction Analysis

HOJ Sample Prediction				
Monitor	**Under**	**Predicted**	**Over**	**Total**
ST-02	5	0	44	49
ST-05	20	5	17	42
ST-14	24	8	15	47
ST-23	25	7	17	49
ST-26	23	6	22	51
Total	**97**	**26**	**115**	**238**
Monitor	**Under**	**Predicted or Over**	**Predicted**	**Over**
ST-02	10%	90%	0%	90%
ST-05	48%	52%	12%	40%
ST-14	51%	49%	17%	32%
ST-23	51%	49%	14%	35%
ST-26	45%	55%	12%	43%
Model Performance	**41%**	**59%**	**11%**	**48%**

Table 3 - Camera Hill Prediction Analysis

Camera Hill Sample Prediction				
Monitor	**Under**	**Predicted**	**Over**	**Station Total**
ST-02	51	0	1	52
ST-05	41	1	0	42
ST-14	40	5	3	48
ST-23	37	3	9	49
ST-26	39	7	5	51
Total	**208**	**16**	**18**	**242**
Monitor	**Under**	**Predicted or Over**	**Predicted**	**Over**
ST-02	98%	2%	0%	2%
ST-05	98%	2%	2%	0%
ST-14	83%	17%	10%	6%
ST-23	76%	24%	6%	18%
ST-26	76%	24%	14%	10%
Model Performance	**86%**	**14%**	**7%**	**7%**

As can be seen in the tables above, the hybrid approach had the lowest percent of sample days that were under predicted at 31%. The modeling approach which resulted in the most under prediction was the CH approach with under predicted sample days at 86%.

When comparing the hybrid and HOJ approaches the largest difference is seen at the monitors west of the smelter. These monitors are ST-14, 23, and 26. The model performance at these three monitors is significant because the highest ambient air concentrations are seen at said monitors.

The biggest discrepancy involved the ST-26 monitor. Using the hybrid approach 17 sample days fell within the predicted range, while only 6 samples were accurately predicted using the HOJ approach. Moreover, aggregating the results from these three monitors gives: 50 samples under predicted using the hybrid approach, while 72 samples were under predicted using HOJ; 98 samples were either accurately predicted or over predicted using the hybrid approach, while 75 samples fell into the same category using HOJ.

The monitor of most interest to ADEQ is ST-23. This is because the location of ST-23 is adjacent to the SLAMS monitor measuring the highest impact (Hillcrest). Using the hybrid approach ST-23 predicted or over predicted 63% (16% predicted and 47% over predicted) of sample days. Using the HOJ approach 49% (14% predicted and 35% over predicted) of sample days were predicted or over predicted. Given this, TAU is most comfortable moving forward with the attainment demonstration with the hybrid approach, due to the margin of safety provided.

TAU theorizes the hybrid approach shows better performance because of the wind pattern discrepancy between the HOJ and CH monitors. As seen in Figure 1, wind directions observed at HOJ are not defined and sporadic. Conversely, wind directions observed at CH follow a defined east west pattern. Specifically, the easterly winds align with the CERCLA monitors resulting in better prediction in terms of roofline fugitive sources. While roofline fugitives in the HOJ model are not being directed towards the monitors resulting in lower prediction/over prediction results seen in table 2.

In addition to model to monitor ratios, quantile-quantile plots (q-q plots) were created (Figures 3 – 17). In these figures the orange line represents a perfect fit between the model and monitor. Data points above the line correspond with under prediction by the model, while data points under the line represent over prediction.

In the figures below the CH approach consistently under predicts at monitors east of the smelter. However, monitors west of the smelter predict reasonably well (although not as well as the hybrid and HOJ approaches). The exception is the higher sample days at ST-14. These western monitor predictions further reinforce what TAU theorized in the previous paragraphs regarding roofline fugitive behavior.

To better understand how the viable approaches (hybrid and HOJ) performed near the NAAQS concentration of .15 $\mu g/m^3$ TAU staff narrowed the Q-Q plot scales, as seen in Figures 18 - 27. For the eastern monitors (ST-02 and 05) there is little difference between predicted values at this scale. However, there are variations between the two approaches at the western monitors. The Hybrid approach over predicts at ST-26 and ST-23, while at ST-14 the HOJ over predicts.

Again, given the SLAMS monitor showing the highest exceedance of the NAAQS is located adjacent to ST-23, and the hybrid approach gives slightly more conservative predictions in this area. In order to build a margin of safety in the attainment model, TAU is most comfortable moving forward using the hybrid approach.

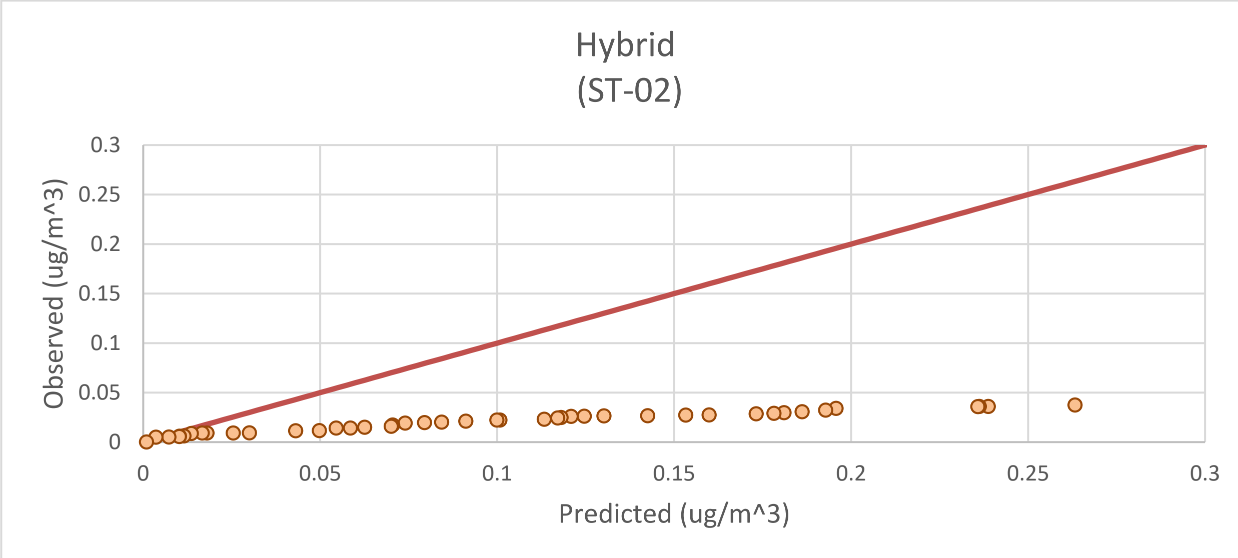


Figure 3 - Q-Q Plot Hybrid ST-02

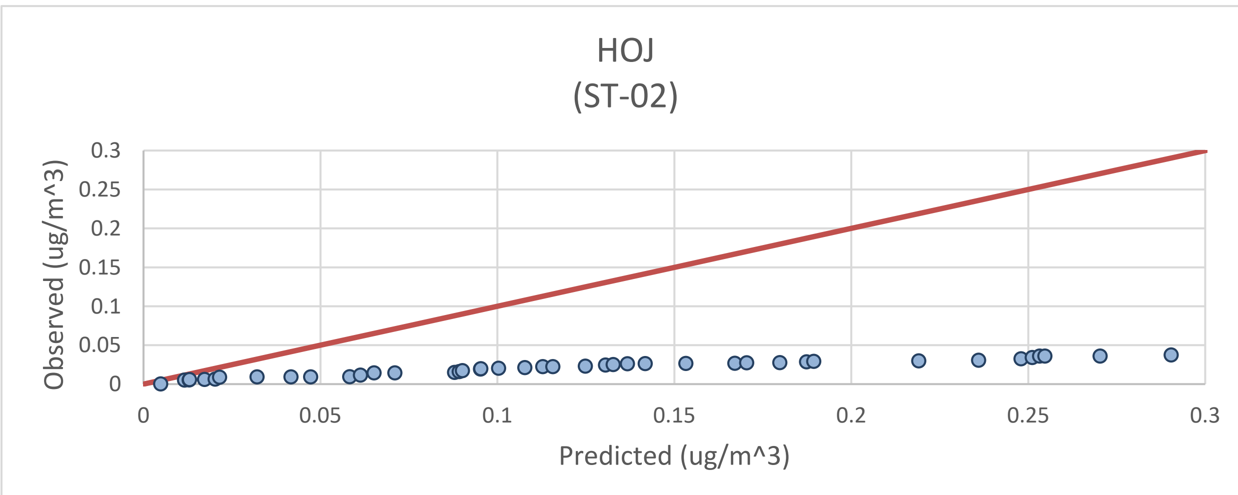


Figure 4 - Q-Q Plot HOJ ST-02

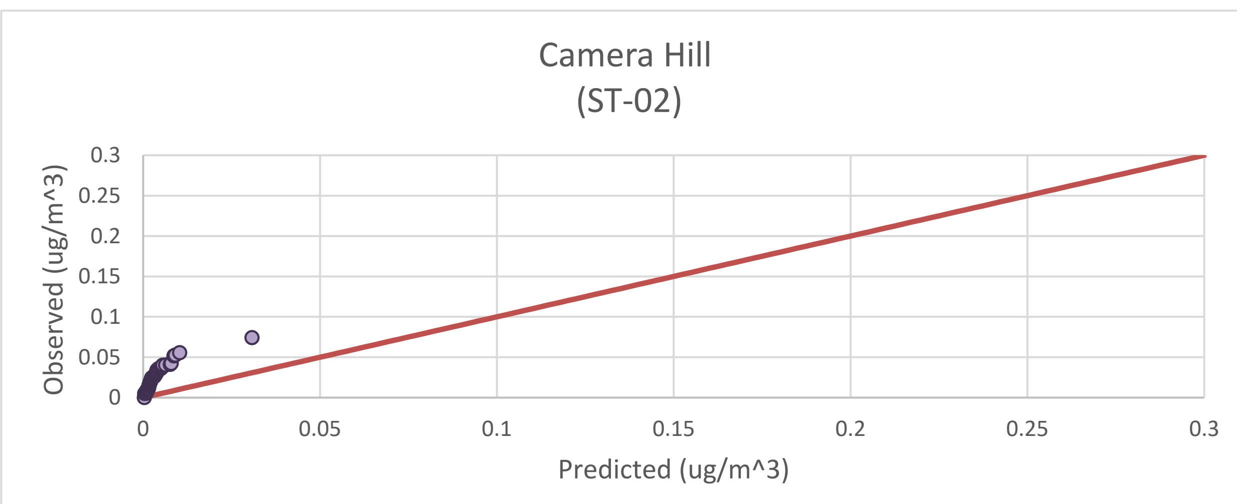


Figure 5 - Q-Q Plot CH ST-02

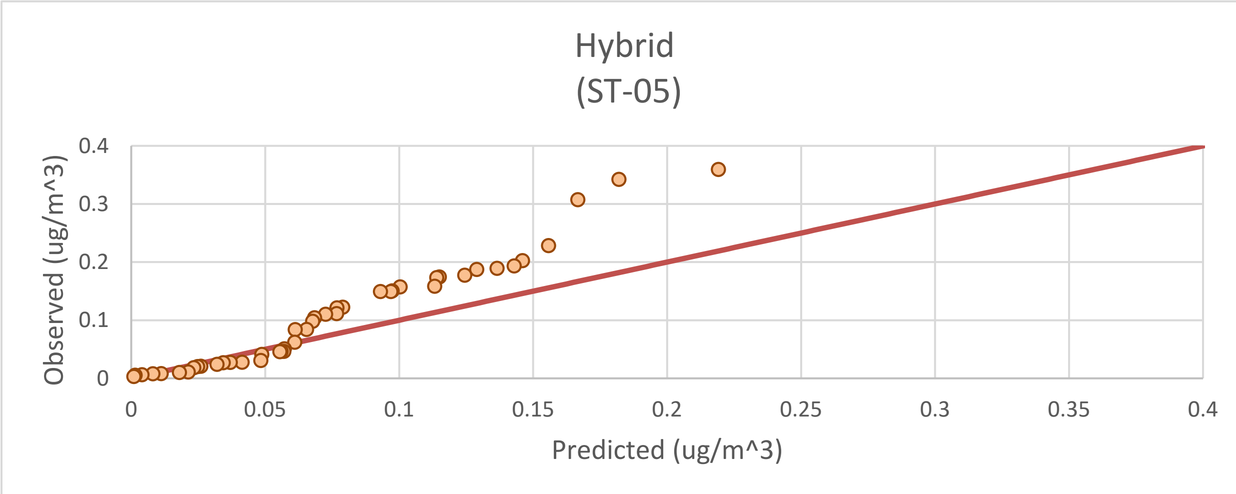


Figure 6 - Q-Q Plot Hybrid ST-05

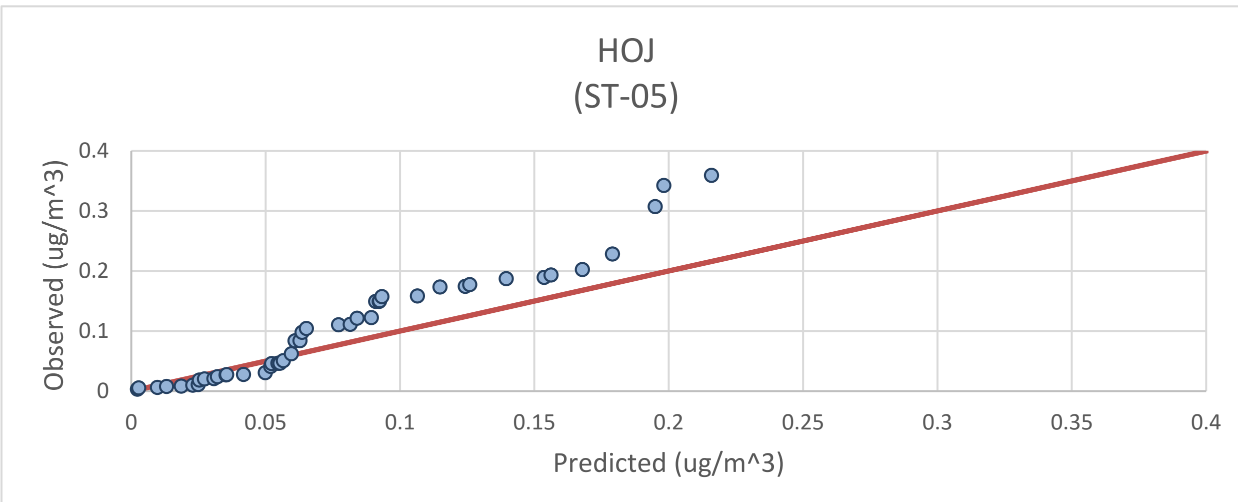


Figure 7 - Q-Q Plot HOJ ST-05

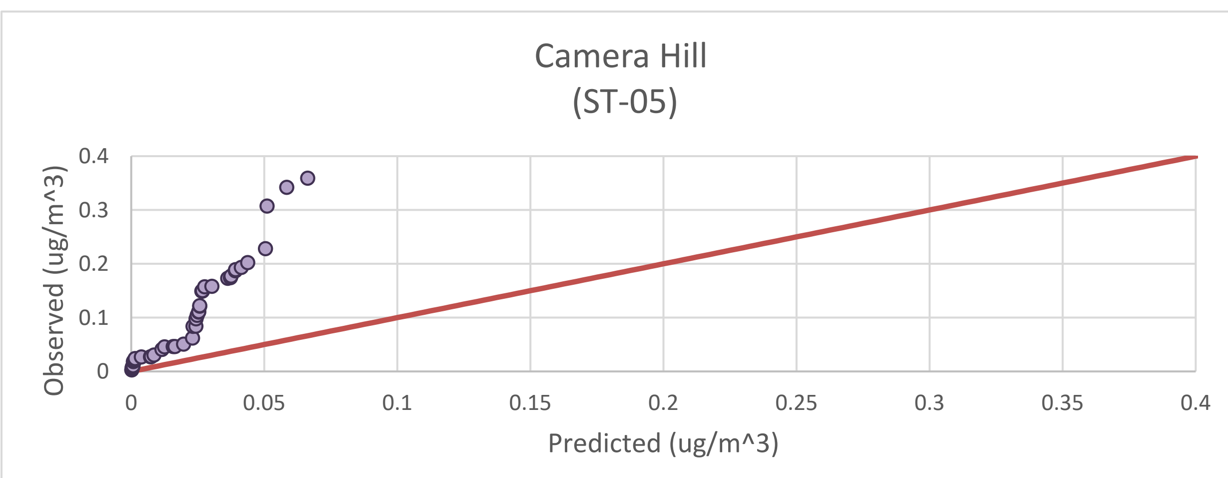


Figure 8 - Q-Q Plot CH ST-05

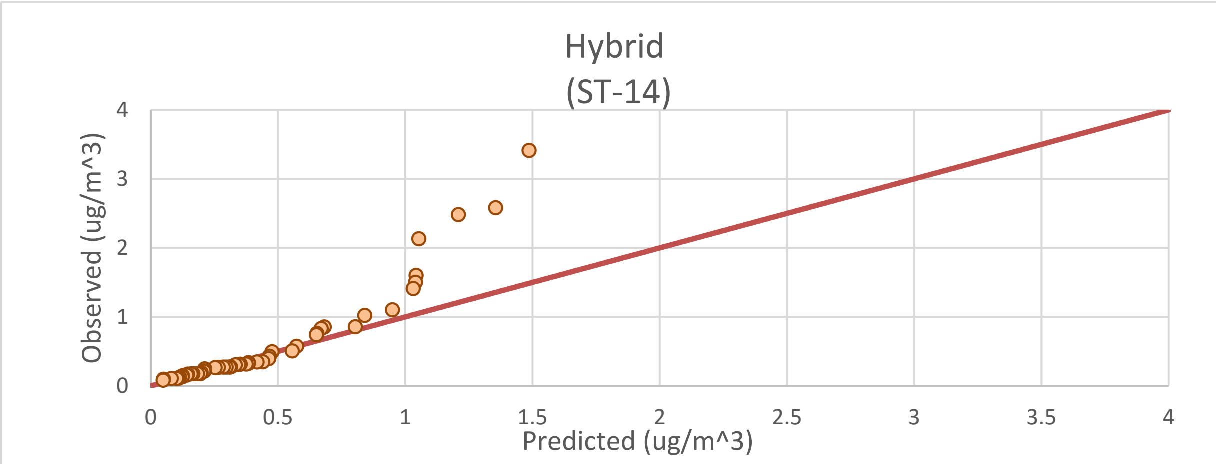


Figure 9 - Q-Q Plot Hybrid ST-14

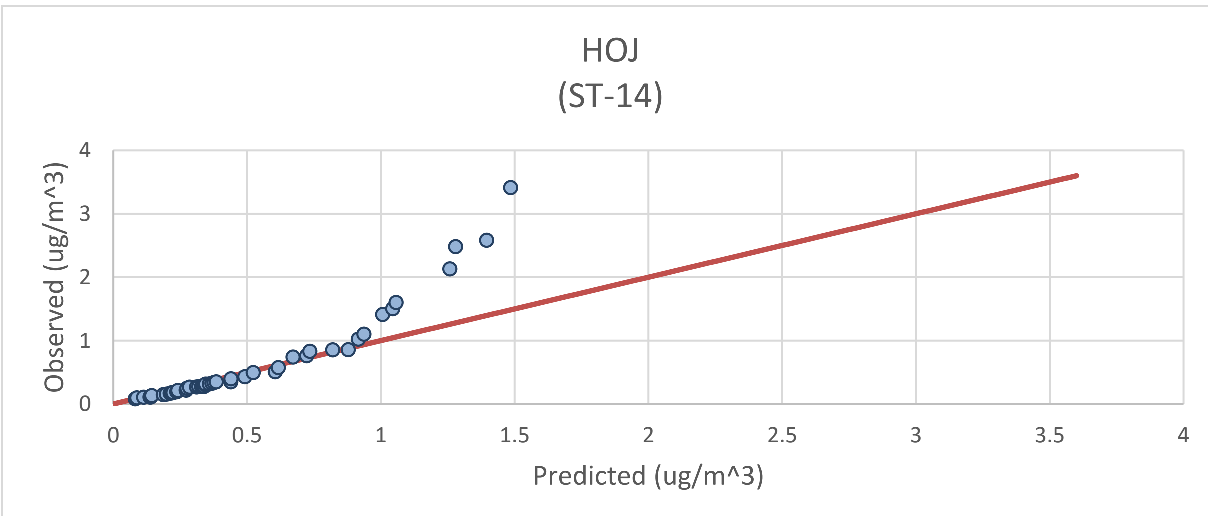


Figure 10 - Q-Q Plot HOJ ST-14

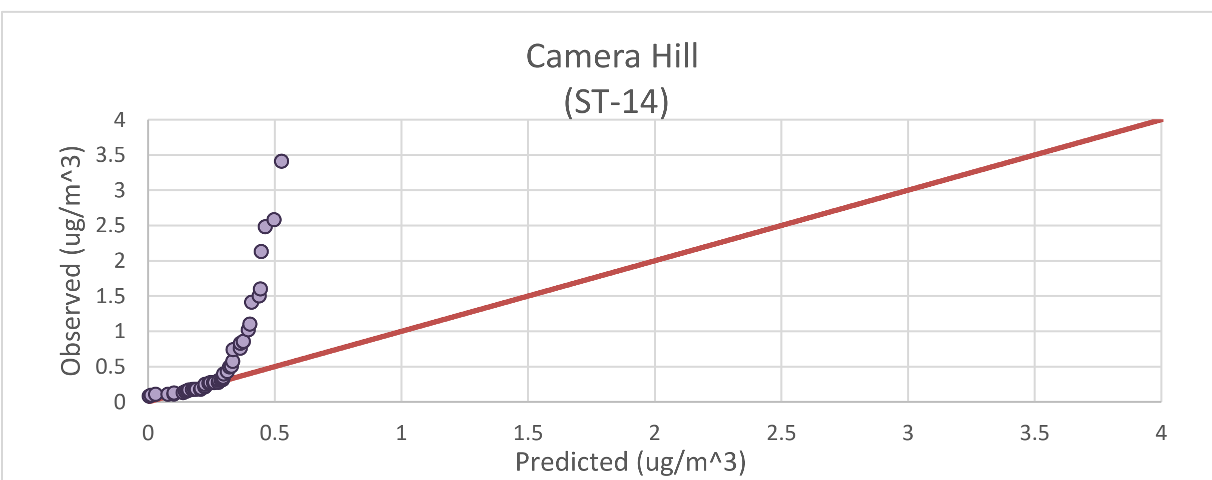


Figure 11 - Q-Q Plot CH ST-14

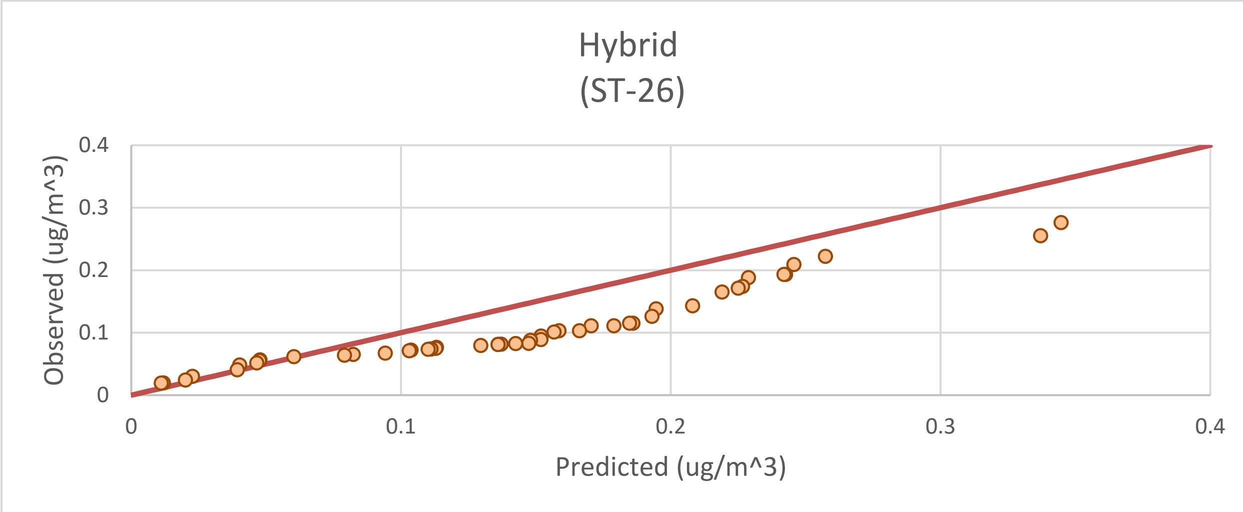


Figure 12 - Q-Q Plot Hybrid ST-26

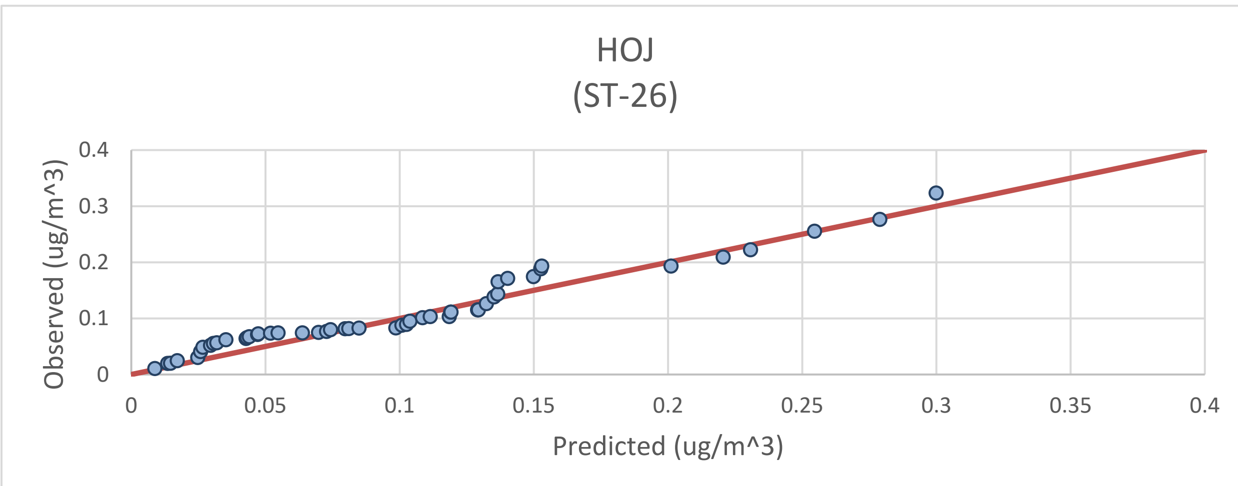


Figure 13 - Q-Q Plot HOJ ST-26

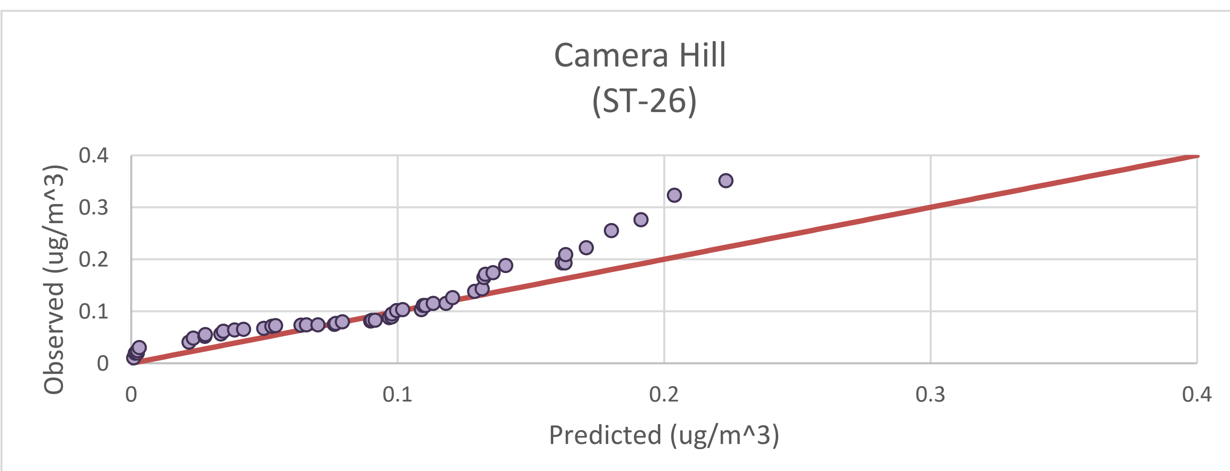


Figure 14 - Q-Q Plot CH ST-26

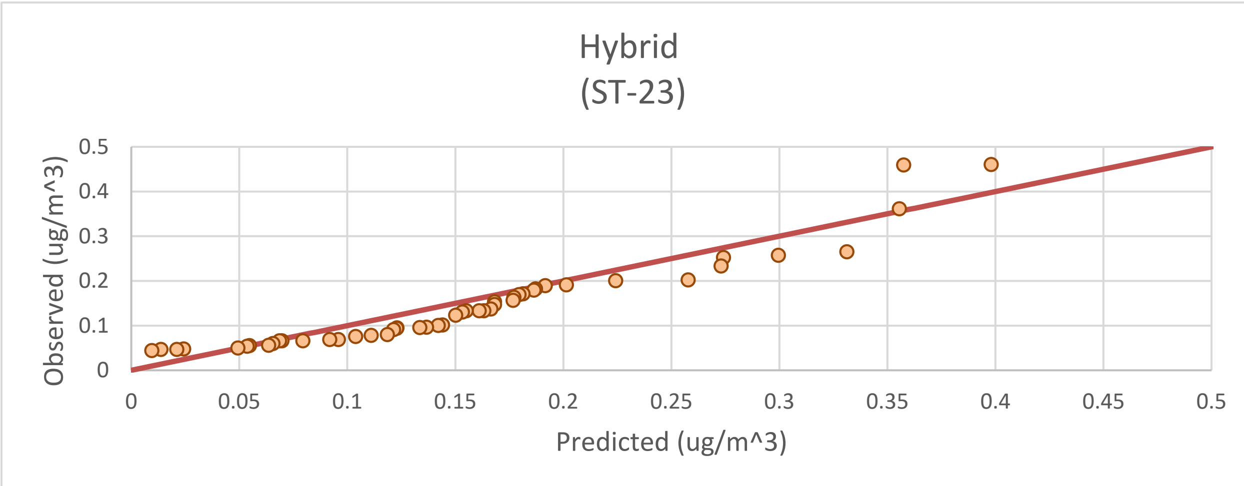


Figure 15 - Q-Q Plot Hybrid ST-23

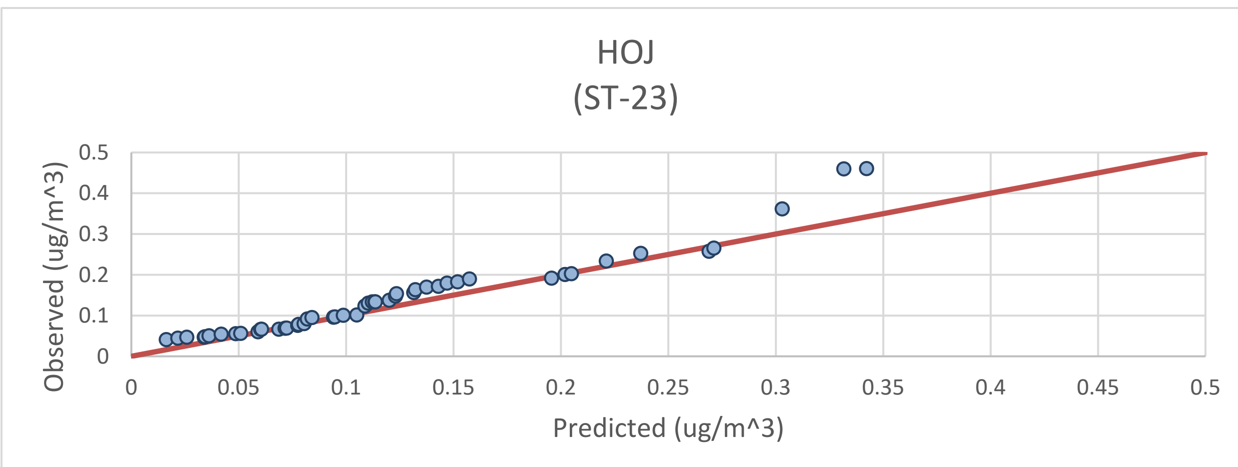


Figure 16 - Q-Q Plot HOJ ST-23

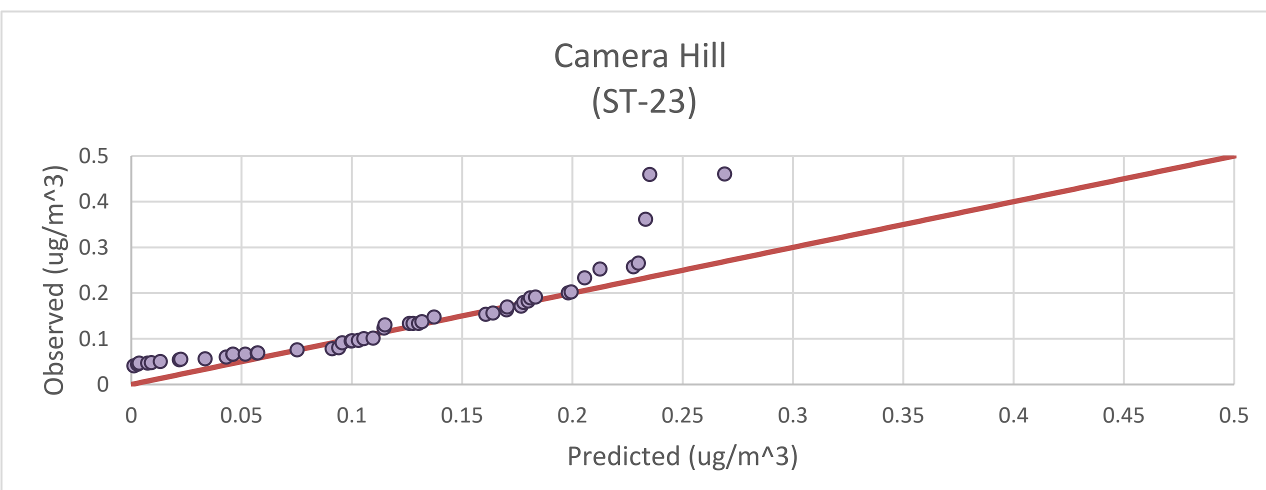


Figure 17 - Q-Q Plot CH ST-23

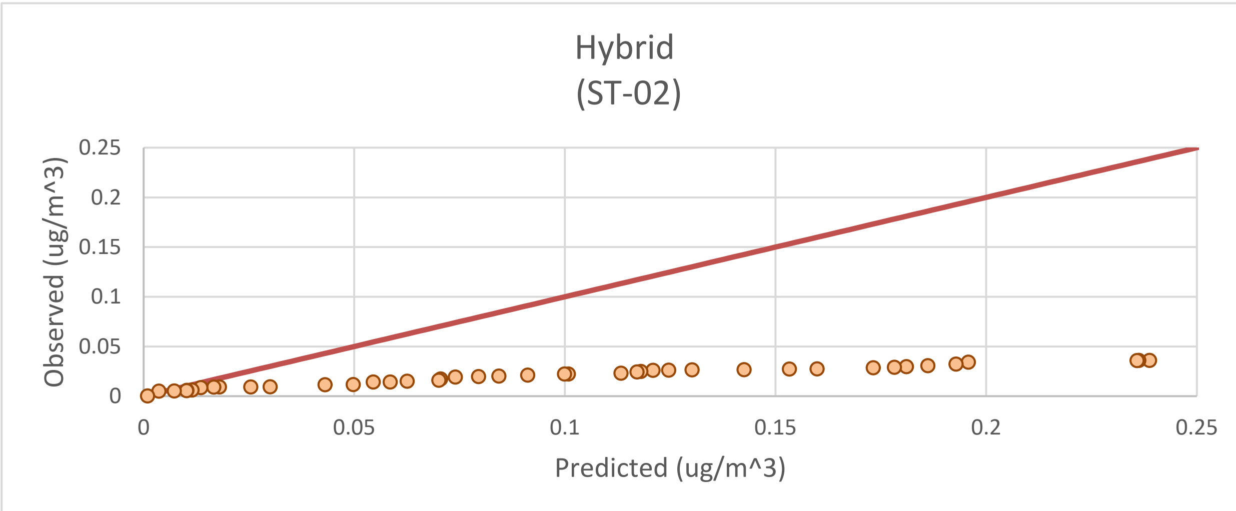


Figure 18 - Q-Q Plot Hybrid ST-02 (NAAQS Scale)

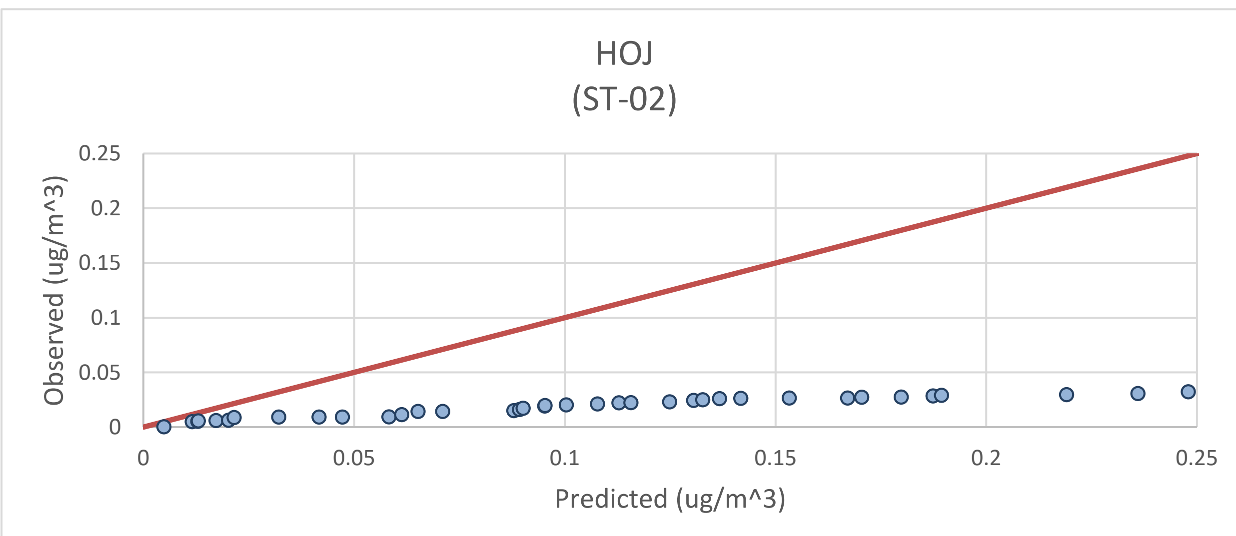


Figure 19 - Q-Q Plot HOJ ST-02 (NAAQS Scale)

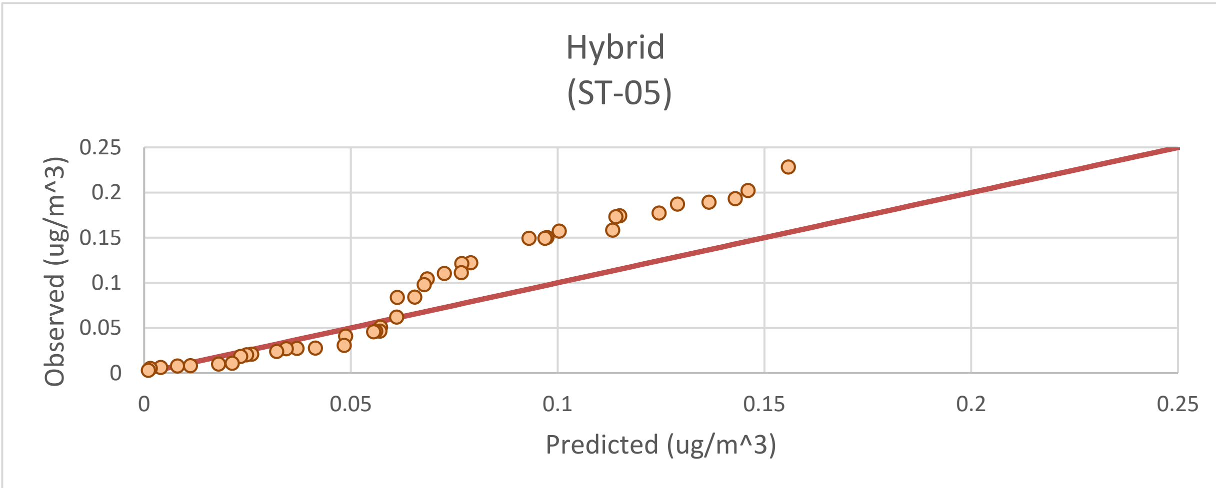


Figure 20 - Q-Q Plot Hybrid ST-05 (NAAQS Scale)

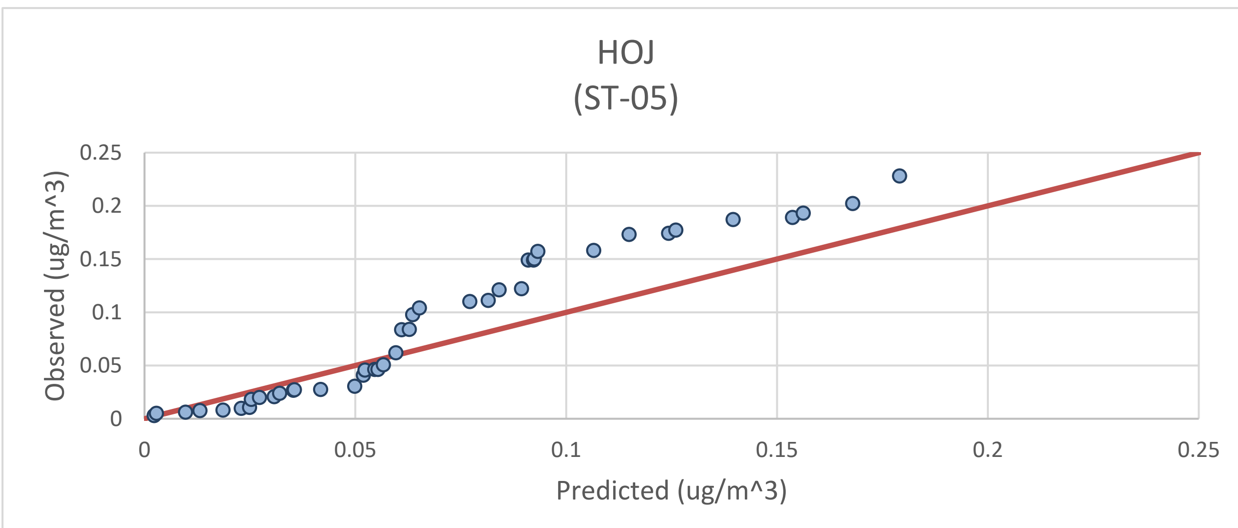


Figure 21 - Q-Q Plot HOJ ST-05 (NAAQS Scale)

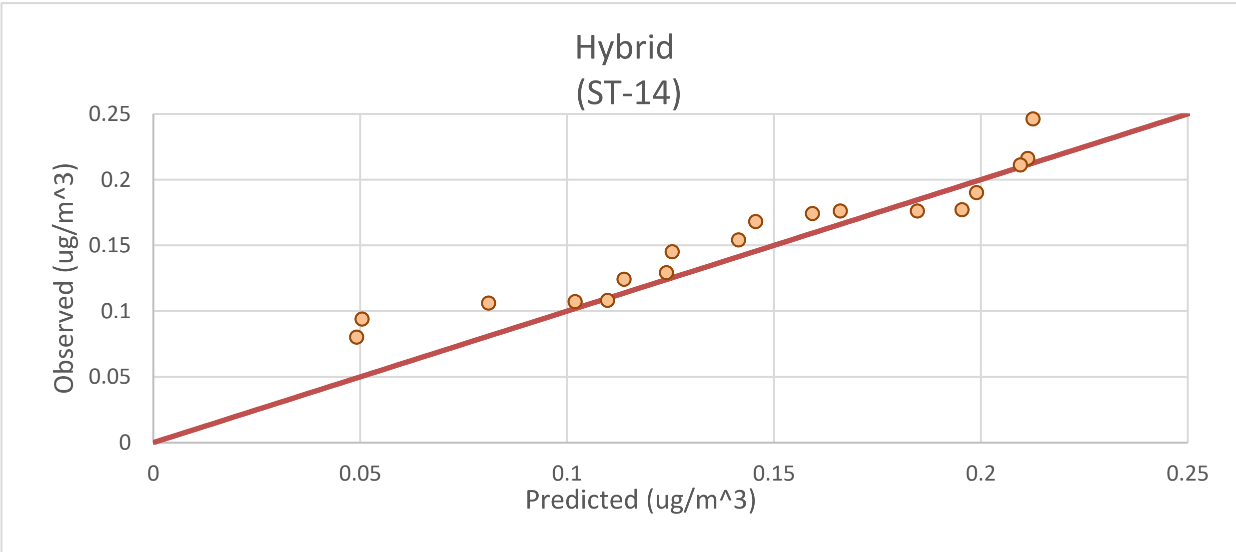


Figure 22 - Q-Q Plot Hybrid ST-14 (NAAQS Scale)

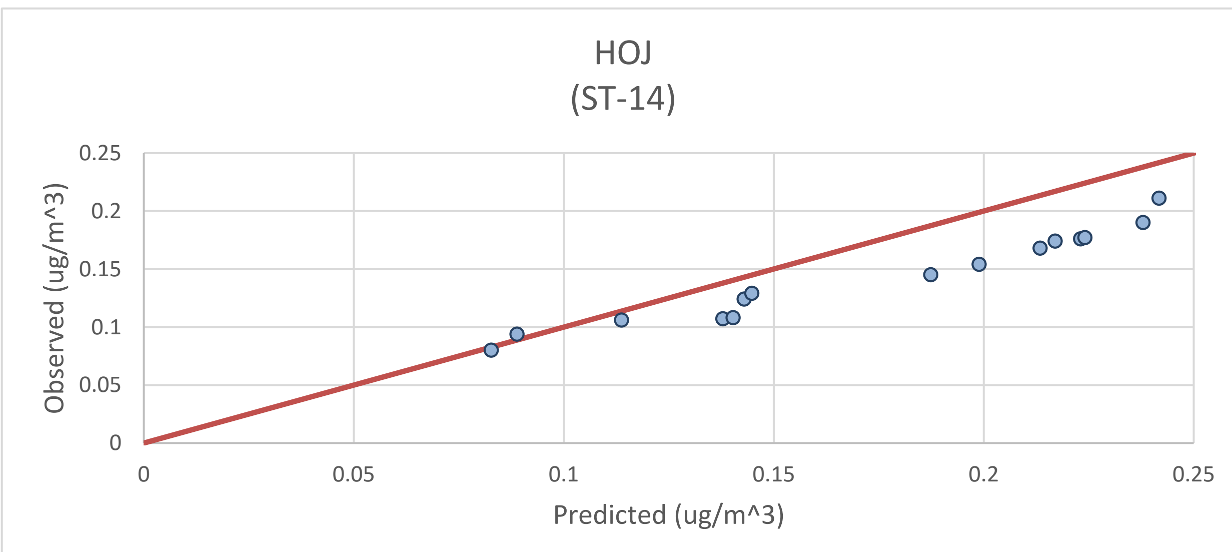


Figure 23 - Q-Q Plot HOJ ST-14 (NAAQS Scale)

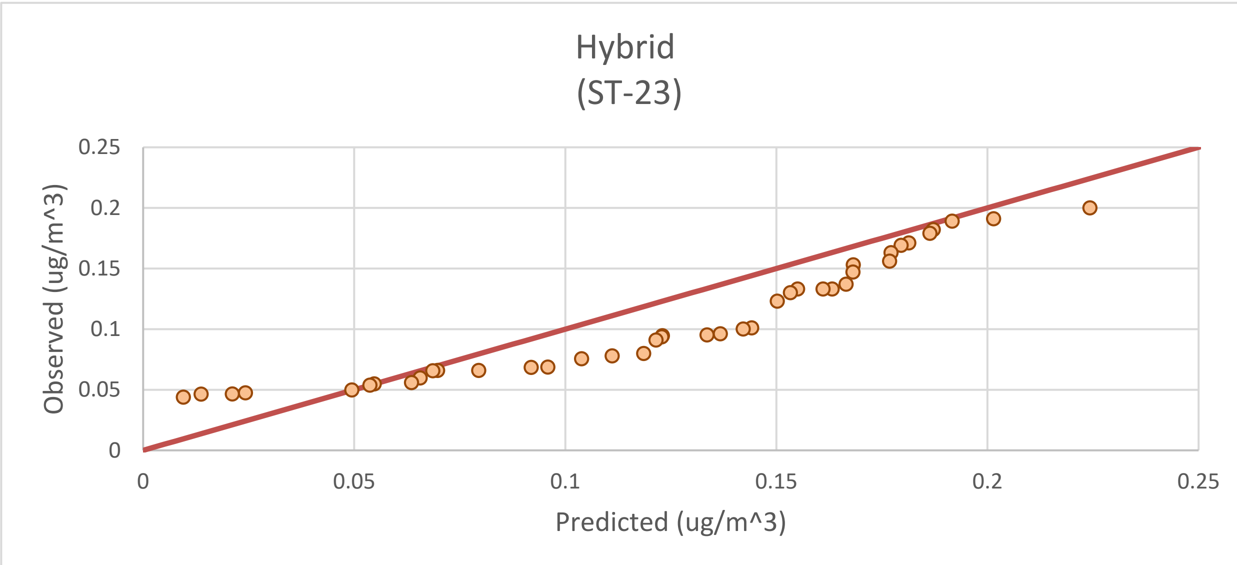


Figure 24 - Q-Q Plot Hybrid ST-23 (NAAQS Scale)

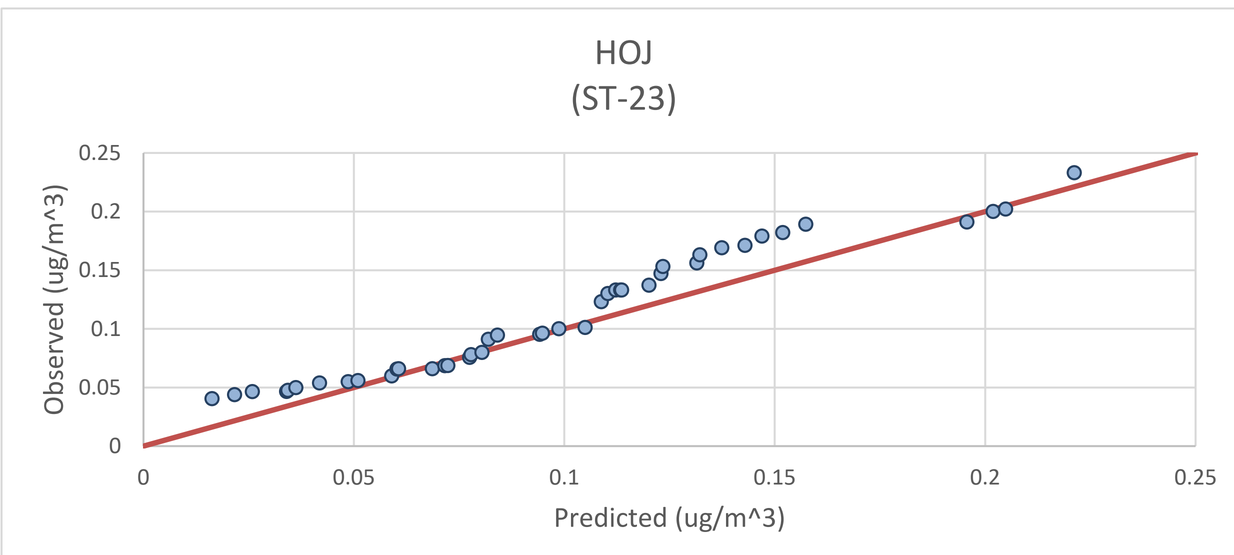


Figure 25 - Q-Q Plot HOJ ST-23 (NAAQS Scale)

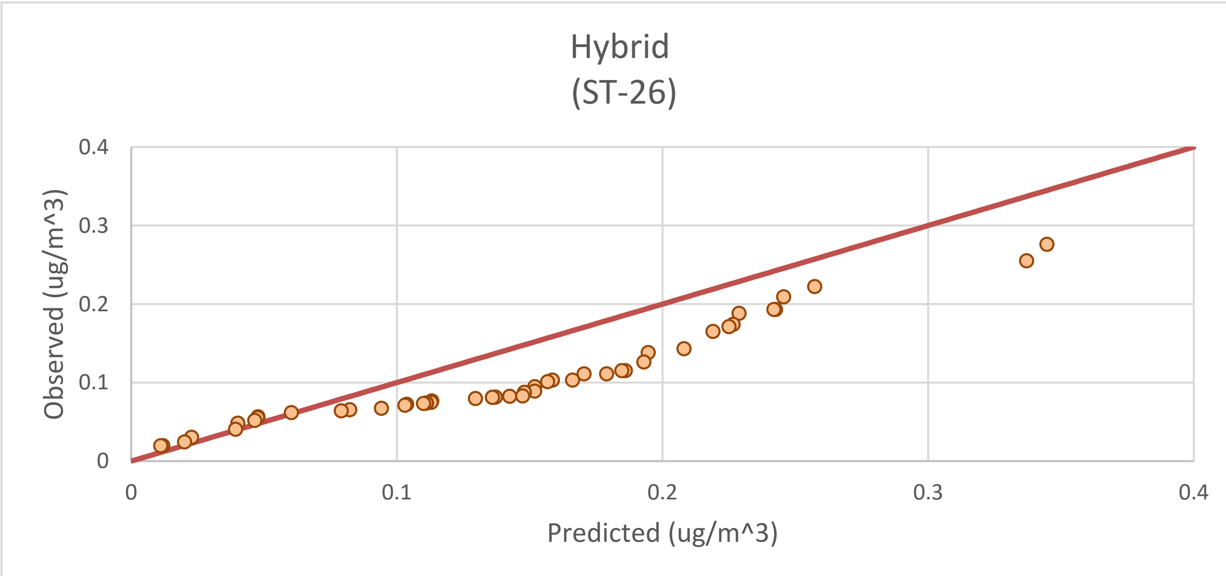


Figure 26 - Q-Q Plot Hybrid ST-26 (NAAQS Scale)

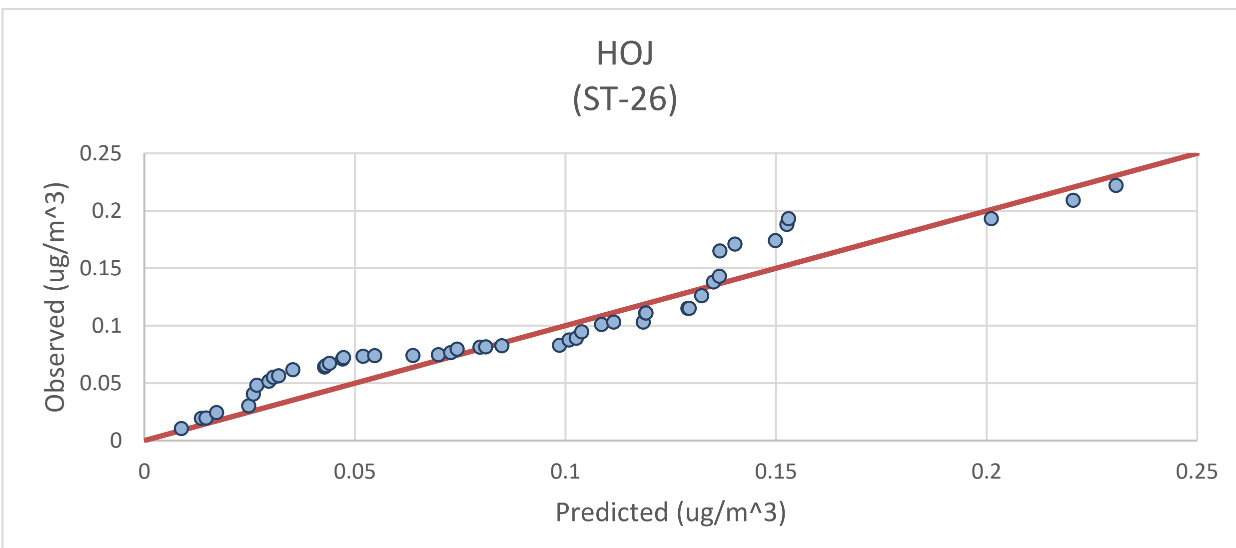


Figure 27 - Q-Q Plot HOJ ST-26 (NAAQS Scale)

Appendix C: Calculation of Source Parameters

Main Stack Source Parameters – Anode Furnace Primary to Center and Anode Furnace Secondary to Annulus

Stack Center	
Flow (scfm)	163,800
Temp (F)	380
Diameter (ft)	17.0
Area (ft2)	227
Stack Annulus	
Flow (scfm)	1,038,100
Temp (F)	140
Diameter (ft)	23.9
Area (ft2)	449
For Combined Annulus and Center	
Flow (SCFM)	1,201,900
Flow Rated-Weighted Temperature (F)	173
Equivalent Diameter (ft)	29.3
Area (ft2)	676
Total Flow (ACFM)	1,653,627
Equivalent Velocity (ft/s)	40.8

Volume Source Characteristics

Flash Furnace Fugitives

Roof Monitors

<u>Assumptions</u>

Initial lateral Dimesion (Yo): Line Source Represented by Adjacent Volume Sources Initial Vertical Dimension (Zo): Elevated Sources (h > 0) on or Adjacent to a Building

Length of side: 1.5 m

Building height: 42.67 m

Sigma Y: 0.70 m

Sigma Z: 19.85 m

Release Height: 43.67 m

Penthouse, East and West vents

Assumptions

Initial lateral Dimesion (Yo): Line Source Represented by Adjacent Volume Sources Initial Vertical Dimension (Zo): Elevated Sources (h > 0) on or Adjacent to a Building

Length of side: 16 m

Building height: 44.5 m

Sigma Y: 7.44 m

Sigma Z: 20.70 m

Release Height: 43.59 m

Penthouse, North and South vents

Assumptions

Initial lateral Dimesion (Yo): Line Source Represented by Adjacent Volume Sources Initial Vertical Dimension (Zo): Elevated Sources (h > 0) on or Adjacent to a Building

Length of side: 7 m

Building height: 44.5 m

Sigma Y: 3.26 m

Sigma Z: 20.70 m

Release Height: 44.50 m

Converter Aisle Fugitives

Assumptions

Initial lateral Dimesion (Yo): Line Source Represented by Adjacent Volume Sources Initial Vertical Dimension (Zo): Elevated Sources (h > 0) on or Adjacent to a Building

Length of side: 1.5 m

Building height, Monitor N: 24.38 m

Building height, Monitor S: 22.86 m

Sigma Y: 0.70 m

Sigma Z, Monitor N: 11.34 m

Sigma Z, Monitor S: 10.63 m

Release Height, Monitor N: 31.35 m

Release Height, Monitor S: 25.40 m

Anode Furnace Fugitives

Assumptions

Initial lateral Dimesion (Yo): Line Source Represented by Adjacent Volume Sources Initial Vertical Dimension (Zo): Elevated Sources (h > 0) on or Adjacent to a Building

Length of side:	1.5	m	Estimate from field observations and photographs
Building height, Monitor N:	24.38	m	Estimate from field observations and photographs
Sigma Y:	0.70	m	
Sigma Z, Monitor N:	11.34	m	
Release Height, Monitor N:	31.35	m	Height of monitor vents is estimated to be 9/7 height of Converter Aisle Building on northern end (e.g., above Anode Furnace)

SLAG POURING EFFECTIVE STACK PARAMETER CALCULATIONS

Assumptions/Inputs

Ambient temperature (T_a)	308	^oK
Average Temp of slag and pour gases during pour (T)	1333	^oK
Acceleration of gravity (g)	9.807	m/s
Effective diameter of the poured slag area (D)	13.3	m
Net heat release rate (Q_N/sec)	1.31E+07	cal/sec

Methodology

According to Briggs (1969), the plume rise of a non-stack release can be estimated by calculating equivalent stack parameters when the buoyancy flux is know. The buoyancy flux can be described by the following equations

EQN1: F = $(gvd^2)/4[(T-T_a)/T]$

EQN2: F = 3.7 x 10-5 Q_N/sec

where

v = the effecrtive upward velocity of the release (m/s)

Setting Equations 1 and 2 equal:

Effective upward velocity (v) = $(3.7 \times 10^{-5})\ (4)\ (T)\ (Q_N) / (gd^2(T-T_a))$

Effective upward velocity (v) = 1.45

Appendix D: ADEQ TSD on Technical Review and Evaluation of the Crushing and Screening General Permit

ADEQ Arizona Department of Environmental Quality
Janice K. Brewer, Governor
Henry R. Darwin, Director

TECHNICAL SUPPORT DOCUMENT

TECHNICAL REVIEW AND EVALUATION OF THE CRUSHING AND SCREENING GENERAL PERMIT

I. INTRODUCTION

The Crushing and Screening General Permit is a permit for a facility class (crushing and screening plants) that contains 10 or more facilities that are similar in nature, have substantially similar emissions, and would be subject to the same or substantially similar requirements. The general permit will last for 5 years from the date of its issuance. Equipment that is covered under the general permit will be required to have an "Authorization to Operate" (ATO). The ATO will identify the piece of equipment by having the manufacture, date of manufacture, maximum capacity, and serial number and /or equipment number along with the hours of operation limitation depending on the equipment and the county it is operating in. This general permit allows for portable crushing and screening plants to move to other locations statewide. This general permit also allows the Permittee to co-locate a concrete batch plant with the crushing and screening plant.

The Permittee that applies for an ATO under the general permit shall pay to the Department a flat permit processing fee of $500 with the submittal of the permit application. The Permittee must also pay, for each calendar year, the applicable administrative or inspection fees as described in the Arizona Administrative Code Title 18, Chapter 2, Article 5, section 511 (A.A.C. R18-2-511).

Due the fact that this is a statewide general permit there is the potential that the Permittee may operate in a PM_{10} or $PM_{2.5}$ non-attainment area in the state of Arizona. The $PM_{10/2.5}$ non-attainment areas for purposes of this permit are listed in Table 1 below:

Table 1: Non-Attainment Area Summary

County	Townships	Section Where Visual Representation Is Shown
Maricopa	All	N/A
Pinal County and the Phoenix Planning Area	T1S, R8E, T2S, R8E, T3S, R7E, T3S, R8E, T4S, R8E, (excluding all lands within the Gila River Indian Community). T5S, R5E – R8E (excluding all lands within the Gila River Indian Community). T6S, R3E – R8E, T7S, R3E – R8E Sections 1-6. Phoenix Planning Area: T1N, R8E.	Appendix A
Santa Cruz	The portions of the following Townships which are within the State of Arizona and lie east of 111 degrees longitude:T23S-R13E, T23S-R14E, T24S-R13E and T24S-R14E	Appendix B

County	Townships	Section Where Visual Representation Is Shown
Gila and Pinal	T1S-R13E (sections 7–36); T1S-R14E (sections 25–36);T2S-R13E; T2S-R14E; T2S-R15E; T3S-R13E; T3S-R14E; T3S-R15E; T3S-R16E (except that portion in the San Carlos Apache Indian Reservation); T4S-R13E; T4S-R14E; T4S-R15E; T4S-R16E; T5S-R13E; T5S-R14E; T5S-R15E; T5S-R16E; T6S-R13E; T6S-R14E; T6S-R15E; and T6S-R16E. Miami planning area T1N-R13E; T1N-R14E; T1N-R15E; T1S-R13E (sections 1–6); T1S-R14E (sections 1-24); T1S-R14 1/2E; and T1S-R15E.	Appendix C
Pima	T11S-R9E, T11S-R10E, T11S-R11E, T11S-R12E, T12S-R8E, T12S-R9E, T12S-R10E, T12S-R11E and T12S-R12E. The Ajo planning area Township T12S, R6W, T12S, R5W (Sections 6–8, 17-20, and 29-32).	Appendix D
Yuma	T7S-R21W, T7S-R22W, T8S-R21W, T8S-R22W, T8S-R23W, T8S-R24W, T9S-R21W, T9S-R22W, T9S-R23W, T9S-R24W, T9S-R25W, T10S-R21W, T10S-R22W, T10S-R23W, T10S-R24W, and T10S-R25W	Appendix E
Cochise	T23S, R25E, T23S-R26E, T23S-R27E, T23S-R28E, T24S-R25E, T24S-R26E, T24S-R27E, and T24S-R28E	Appendix F

Notes: 1. No operations are permitted within the portion of Pinal County: T4S, R3E – R4E, T5S, R3E – R4E (excluding sections 12, 13, 24, and 25) identified as "Prohibited Area" in Appendix "A" of the general permit.

2. No operations are permitted in the portions of Santa Cruz County, identified as a non-attainment area in Appendix "B", on any day that the Nogales particle pollution risk forecast at http://www.azdeq.gov/environ/air/ozone/nogales.pdf shows the risk of unhealthy particulate matter concentration to be High or if the Air Quality Index (AQI) for $PM_{2.5}$ is forecast as Unhealthy for Sensitive Groups.

II. OPERATING LIMITS AND ASSOCIATED EMISSIONS

Based on the modeled results (refer to Section V for detailed modeling analysis), the production limitations for crushing and screening plants along with collocated concrete batch plants have been established. Table 2 on the following page below summarizes the production limitations:

Table 2: Modeling - Based Production Limitations

Facility	Maximum Daily Operation	
	PM_{10} Attainment Area	PM_{10} Nonattainment Area
Stand-alone crushing and screening plant	6,500 tons per day	4,410 tons per day
Crushing and screening plant collocated with concrete batch plants	C&S: 6,500 tons per day CBP: 1,275 yd^3 per day	C&S: 4,095 tons per day CBP: 1,275 yd^3 per day

In addition to the above limitations, the Permittee may also be subject to operating hour limitations in the ATOs. These limits shall be calculated based on the potential to emit calculations. In no case shall the emissions from the facility exceed the statewide emission limits required to stay below major source thresholds, or the Maricopa County emissions limits which is required to avoid BACT review under Maricopa County Rule 241. These limitations are identified in Table 3 below:

Table 3: Emission Limitations

Pollutants	Statewide Emission limit (excluding Maricopa County)	Emission Limit in Maricopa County	
	(ton/yr)	(lb/day)	(ton/yr)
PM	90	135	22.5
PM_{10}	90	76.5	13.5
CO	90	495	90
NO_x	90	135	22.5
SO_2	90	135	22.5
VOC	90	135	22.5

III. APPLICABLE REGULATIONS

The Department has identified the applicable regulations that apply to each unit at a crushing and screening facility. Table 4 on the following page summarizes the findings of the Department with respect to the regulations that are applicable to each emissions unit.

Table 4: Applicable Regulations Statewide

Unit ID	Control Equipment	Applicable Regulations	Verification
Crushing and Screening Plants (NSPS)	Wet Scrubbers, Spray Bars, wet suppressant, and enclosures.	40 CFR 60 Subpart OOO	New Source Performance Standards Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants. Affected facilities include crushers, grinding mill, screening operation, bucket elevators, belt conveyors, bagging operations, storage bins, and enclosed truck or railcar loading stations built or reconstructed after August 31, 1983.
Crushing and Screening Plants (Non-NSPS)	Wet Scrubbers, Spray Bars, wet suppressant, and enclosures	A.A.C. R18-2-722	Standards of Performance for Existing or Crushed Stone Processing Plants.
Internal Combustion Engines	None	A.A.C. R18-2-719 40 CFR 63 Subpart ZZZZ	Standards of Performance for Existing Stationary Rotating Machinery.
Internal Combustion Engines (NSPS)	None	40 CFR 60 Subpart IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.
Internal Combustion Engines (NSPS)	None	40 CFR 60 Subpart JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.
Concrete Batch Plants	Baghouses and wet suppressants	A.A.C. R18-2-702.B A.A.C. R18-2-723	The conditions stated here are the opacity limitations.
Boilers	Not Applicable	A.A.C. R18-2-724	Standards of Performance for Fossil-fuel Fired Industrial and Commercial Equipment.
Fugitive Dust	Control Measures	A.A.C. R18-2-604 through R18-2-607.	Emissions from Fugitive Dust Sources.

Unit ID	Control Equipment	Applicable Regulations	Verification
Mobile Sources	None	A.A.C. R18-2-801 through A.A.C R18-2-806	Emissions from Mobile Source

Table 5: Applicable Regulations for Maricopa County

Unit ID	Start-up date	Control Equipment	Applicable Regulations	Verification
Facility Wide Requirements	Not Applicable	None	Maricopa County Rule 100	General Provisions and Definitions
			Maricopa County Rule 200	Permit Requirements
			Maricopa County Rule 220	Non-Title V Permit Provisions
			Maricopa County Rule 230	General Permits
			Maricopa County Rule 300	Visible Emissions
			Maricopa County Rule 310	Fugitive Dust from Dust-Generating Operations
			Maricopa County Rule 312	Abrasive Blasting
			Maricopa County Rule 315	Spray Coating Operations
			Maricopa County Rule 320	Odors And Gaseous Air Contaminants
Crushing and Screening Operation Concrete Batch Plants Fugitive Dust	Not Applicable	Wet Scrubbers, Spray Bars, wet suppressants, and enclosures	Maricopa County Rule 316	Nonmetallic Mineral Processing located in Maricopa County
Internal Combustion Engines	Not Applicable	None	Maricopa County Rule 324	Stationary Rotating Machinery subject to State rules located in Maricopa County.

IV. PERIODIC MONITORING, RECORDKEEPING AND REPORTING REQUIREMENTS

A. Facility wide General Requirements

1. The Permittee must maintain daily records of the operating hours of the equipment covered under the General Permit which are subject to an hourly restriction.

2. The Permittee must maintain records of the total daily throughput of material for the crushing and screening plant (in tons per day) and for the concrete batch plant (in cubic yards per day) covered under this General Permit.

3. The Permittee must keep on-site records of maintenance performed on all emission related equipment.

4. At the time the compliance certifications are submitted, the Permittee must submit reports of all monitoring, recordkeeping, and testing activities required by the permit within during that period.

5. The Permittee is required to conduct a monthly visual survey on all process equipment and all fugitive dust sources. If the source appears to exceed the standard, the Permittee must conduct an EPA Reference Method 9 observation. The Permittee must keep records of all surveys and EPA Reference Method 9 observations performed. These records will include the emission point observed, location of observer, name of observer, date and time of observation, and the results of the observation. If the observation shows a Method 9 opacity reading in excess of the opacity standard, the Permittee will be required to initiate appropriate corrective action to reduce the opacity below the standard. The Permittee will keep a record of the corrective action performed. These logs must be maintained on-site and be available to ADEQ representative upon request.

V. AIR DISPERSION MODELING ANALYSIS

A. Model Selection

The most recent version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD, version 11103) was used in this modeling analysis. AERMOD is the EPA's preferred near-field dispersion modeling system for a wide range of regulatory applications. The AERMOD modeling system includes four regulatory components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BRIPPRIME: the building input processor

The terrain processor (AERMAP) and the building input processor (BRIPPRIME) were not used in this analysis because both of them require site-specific information. Moreover, an assumption of "Flat Terrain" was believed to be reasonable.

The terrain processor (AERMAP) and the building input processor (BRIPPRIME) were not used in this analysis because both of them require site-specific information. Additionally, an assumption of "Flat Terrain" was determined to be acceptable, since the emission sources of a crushing & screening plant or a concrete batch plant are mainly ground level sources and the worst-case impacts are expected to occur in or near the process area boundary.

B. Model Source Input

The model source input involves the development of appropriate inputs for dispersion modeling with the AERMOD modeling system.

1. Emission Rate Methodology

Particulate Matter (PM) is the primary pollutant emitted from a crushing & screening plant as well as a concrete batch plant. If there are internal combustion engines (generators) or boilers in the facility, gaseous pollutants such as SO_2, NO_x, and CO are also generated.

a. Determining Emission Rate

Emission rates were estimated according to latest AP-42 emission factors for concrete batching, crushing & screening, internal combustion engines, boilers, wind erosion and unpaved roads. In particular, a consistent approach was developed for estimating $PM_{2.5}$ and PM_{10} emissions for batch drop operations and material transfer operations. This approach was based on AP-42 Section 13.2.4 Equation 1:

$$E = k(0.032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \text{(Equation 1)}$$

Where:
E = emission factor (lb/ton) k = particle size multiplier (dimensionless), 0.35 for PM_{10} and 0.053 for $PM_{2.5}$
U = mean wind speed (miles per hour)
M = material moisture content (%)

State-wide meteorological data sets were reviewed and a mean wind speed of 7.5 miles per hour was determined. Due to very limited data available for the parameter M, the moisture content was set as 5% for controlled emissions.

b. Emission Inventory

A comprehensive emission inventory was developed for a crushing & screening plant with an operating capacity of 315 tons per hour (Table 7). *Note that this capacity is used for the convenience of emission estimation only, and it may not represent the maximum allowable throughput for a crushing & screening plant in the General Permit.* To model the operating capacity other than 315 tons per hour, the emission rates listed in Table 7 were adjusted. Comparatively, the operating capacity for a concrete batch plant in this modeling analysis was fixed at 1275 yd^3 per day, which was previously determined in the General Permit for Concrete Batch Plants. Table 8 lists the corresponding emission rates for all sources in the concrete batch plant. Besides the sources above, emissions from unpaved roads and a large internal combustion engine (generator) were also modeled. The emission rates of pollutants from the two sources are summarized in Table 9.

c. Modeled Emission Rates

Emissions used for modeling must be matched to the averaging time being assessed. For 24-hour PM_{10} and 24-hour $PM_{2.5}$, if a crushing & screening plant was modeled to run at a specific capacity (tons/hour) at a certain hours per day, the modeled hourly emission rates for applicable sources were adjusted by using Emission Rate Flag HROFDY in AERMOD:

$$HROFDY = \frac{\text{Modeled operating capacity (tons/hour)}}{\text{315 tons/hour}} \times \frac{\text{Modeled operating hours}}{24} \quad \text{(Equation 2)}$$

Most of operations in concrete batch plants and crushing & screening plants are not continuous and the emission sources are typically characterized as intermittent sources. The Emission Rate Flag approach substitutes an intermittent source with a continuous source that emits an identical amount of PM_{10} or $PM_{2.5}$ over a 24-hour time period. Such treatment should provide a reasonable approximation of 24-hour average impact. For SO_2 and CO, maximum hourly emission rates were modeled for comparisons to their short-term air quality standards. As the SO_2 emissions are relatively small, maximum hourly emission rates were also used to provide a conservative estimation for annual impacts. To model annual average NO_2 concentrations, annual averaging hourly emission rates were used. Moreover, the NO_2/NOx ratio was set as 0.75, the national annual default value.

Table 7: Maximum Hourly Emission Rates for Crushing & Screening Plant*

Area Source			
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*
CS_WEAS	Aggregate Storage Pile	1.16E-05	1.16E-05
CS_WEFS	Fines Storage Pile	2.61E-05	2.61E-05
CS_TRANS	Transfer Points	5.10E-03	2.52E-02
Volume Sources			
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*
CS_PCRSH	Primary Crusher-Jaw	3.98E-03	2.15E-02

CS_SCR1	Screen #1	1.99E-03	2.94E-02
CS_SCR2	Screen #2	1.99E-03	2.94E-02
CS_FSCR	Fine Screen	4.41E-03	8.75E-02
CS_SCRSH	Secondary Crusher -Core	3.98E-03	2.15E-02
CS_TCRSH	Tertiary Crusher	2.87E-03	1.55E-02
CSLT01	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT02	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT03	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT04	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT05	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT06	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT07	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT08	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT09	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT10	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT11	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT12	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT13	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT14	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT15	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT16	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT17	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT18	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT19	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT20	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT21	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT22	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT23	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT24	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT25	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT26	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT27	C&S Loader Traffic	5.70E-04	4.34E-03
CSLT28	C&S Loader Traffic	5.70E-04	4.34E-03

Table 8: Maximum Hourly Emission Rates for Concrete Batch Plant*

Point Sources						
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*	*NOx (g/s)*	*SO_2 (g/s)*	*CO (g/s)*
CBP_CSTS	Cement Supplement Transfer to Cement Silo	1.80E-04	1.20E-03	-	-	-
CBP_CTCS	Cement Transfer to Cement Silo	8.40E-05	5.60E-04	-	-	-
CBP_BOIL	Boiler	1.17E-02	1.17E-02	1.80E-01	1.92E-03	4.51E-02
Area Sources						
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*			
CBP_WEAS	Aggregate Storage Pile	1.16E-05	1.16E-05			
CBP_WESS	Sand Storage Pile	6.53E-06	6.53E-06			
Volume Sources						
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*			
CBP_ADGS	Aggregate Delivery to Ground Storage	4.98E-04	3.29E-03			
CBP_SDGS	Sand Delivery to Ground Storage	3.81E-04	2.52E-03			
CBP_ATC	Aggregate Transfer to Conveyor	4.98E-04	3.29E-03			
CBP_STC	Sand Transfer to Conveyor	3.81E-04	2.52E-03			
CBP_ATEB	Aggregate Transfer to Elevation Bins	4.98E-04	3.29E-03			
CBP_STEB	Sand Transfer to Elevation Bins	3.81E-04	2.52E-03			
CBP_WHL	Weigh Hopper Loading	3.98E-04	2.65E-03			
CBP_TML	Truck Mix Loading (controlled)	1.56E-03	1.04E-02			
CBPLT01	CBP Loader Traffic	5.70E-04	4.34E-03			
CBPLT02	CBP Loader Traffic	5.70E-04	4.34E-03			
CBPLT03	CBP Loader Traffic	5.70E-04	4.34E-03			

Table 9 Maximum Hourly Emission Rates for Other Sources

Point Sources						
Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*	*NOx (g/s)*	*SO_2 (g/s)*	*CO (g/s)*
GEN_LAR	Generator >= 600 hp	8.84E-02	8.84E-02	3.03E+00	1.53E-03	6.95E-01
Volume Sources						
Source ID	*Source Description*		*$PM_{2.5}$ (g/s)*		*PM_{10} (g/s)*	
TRUCK01	Truck Traffic		3.05E-04		2.50E-03	
TRUCK02	Truck Traffic		3.05E-04		2.50E-03	
TRUCK03	Truck Traffic		3.05E-04		2.50E-03	
TRUCK04	Truck Traffic		3.05E-04		2.50E-03	
TRUCK05	Truck Traffic		3.05E-04		2.50E-03	
TRUCK06	Truck Traffic		3.05E-04		2.50E-03	
TRUCK07	Truck Traffic		3.05E-04		2.50E-03	
TRUCK08	Truck Traffic		3.05E-04		2.50E-03	
TRUCK09	Truck Traffic		3.05E-04		2.50E-03	
TRUCK10	Truck Traffic		3.05E-04		2.50E-03	
TRUCK11	Truck Traffic		3.05E-04		2.50E-03	
TRUCK12	Truck Traffic		3.05E-04		2.50E-03	
TRUCK13	Truck Traffic		3.05E-04		2.50E-03	
TRUCK14	Truck Traffic		3.05E-04		2.50E-03	
TRUCK15	Truck Traffic		3.05E-04		2.50E-03	
TRUCK16	Truck Traffic		3.05E-04		2.50E-03	
TRUCK17	Truck Traffic		3.05E-04		2.50E-03	
TRUCK18	Truck Traffic		3.05E-04		2.50E-03	
TRUCK19	Truck Traffic		3.05E-04		2.50E-03	
TRUCK20	Truck Traffic		3.05E-04		2.50E-03	
TRUCK21	Truck Traffic		3.05E-04		2.50E-03	
TRUCK22	Truck Traffic		3.05E-04		2.50E-03	
TRUCK23	Truck Traffic		3.05E-04		2.50E-03	
TRUCK24	Truck Traffic		3.05E-04		2.50E-03	
TRUCK25	Truck Traffic		3.05E-04		2.50E-03	
TRUCK26	Truck Traffic		3.05E-04		2.50E-03	
TRUCK27	Truck Traffic		3.05E-04		2.50E-03	
TRUCK28	Truck Traffic		3.05E-04		2.50E-03	
TRUCK29	Truck Traffic		3.05E-04		2.50E-03	
TRUCK30	Truck Traffic		3.05E-04		2.50E-03	
TRUCK31	Truck Traffic		3.05E-04		2.50E-03	
TRUCK32	Truck Traffic		3.05E-04		2.50E-03	
TRUCK33	Truck Traffic		3.05E-04		2.50E-03	
TRUCK34	Truck Traffic		3.05E-04		2.50E-03	
TRUCK35	Truck Traffic		3.05E-04		2.50E-03	
TRUCK36	Truck Traffic		3.05E-04		2.50E-03	
TRUCK37	Truck Traffic		3.05E-04		2.50E-03	
TRUCK38	Truck Traffic		3.05E-04		2.50E-03	
TRUCK39	Truck Traffic		3.05E-04		2.50E-03	

Table 9 (continued)

Source ID	*Source Description*	*$PM_{2.5}$ (g/s)*	*PM_{10} (g/s)*
TRUCK40	Truck Traffic	3.05E-04	2.50E-03
TRUCK41	Truck Traffic	3.05E-04	2.50E-03
TRUCK42	Truck Traffic	3.05E-04	2.50E-03
TRUCK43	Truck Traffic	3.05E-04	2.50E-03
TRUCK44	Truck Traffic	3.05E-04	2.50E-03
TRUCK45	Truck Traffic	3.05E-04	2.50E-03
TRUCK46	Truck Traffic	3.05E-04	2.50E-03
TRUCK47	Truck Traffic	3.05E-04	2.50E-03
TRUCK48	Truck Traffic	3.05E-04	2.50E-03
TRUCK49	Truck Traffic	3.05E-04	2.50E-03
TRUCK50	Truck Traffic	3.05E-04	2.50E-03
TRUCK51	Truck Traffic	3.05E-04	2.50E-03
TRUCK52	Truck Traffic	3.05E-04	2.50E-03
TRUCK53	Truck Traffic	3.05E-04	2.50E-03
TRUCK54	Truck Traffic	3.05E-04	2.50E-03

C. Source Layout

The layout of crushing & screening plants generally differs from one site to another. To simplify the modeling analysis, a generic site plan was developed for a crushing & screening plant alone or co-located with a concrete batch plant, as shown in Figure 1 and Figure 2 on the following page, respectively. The layout of sources was determined according to the site plans of several existing plants.

D. Source Release Parameters

The emission sources, categorized by source type (release characteristics), are as follows:

Point Sources: cement silo, boiler, and generator;

Area Sources: aggregate storage pile wind erosion, sand storage pile wind erosion, combined transfer points in crushing & screening plants;

Volume Sources: crushing & screening operations, batch drop operations, material transfer operations, trucks/front-end loaders traveling on unpaved roads.

Tables 10-12 summarize the source release parameters used in the modeling analysis. These parameters were determined following the ADEQ air modeling guidelines as well as the methodology for modeling fugitive dust sources developed by National Stone, Sand & Gravel Association. The representative physical dimensions for stacks, crushers, screens, storage piles, hoppers, bins, silos, trucks, and front-end loaders were determined on the basis of actual measurements or testing data from three facilities in Maricopa County.

Figure 1: Source Layout of a Generic Crushing & Screening Plant (refer to Table 8 and Table 9 for detailed source descriptions)

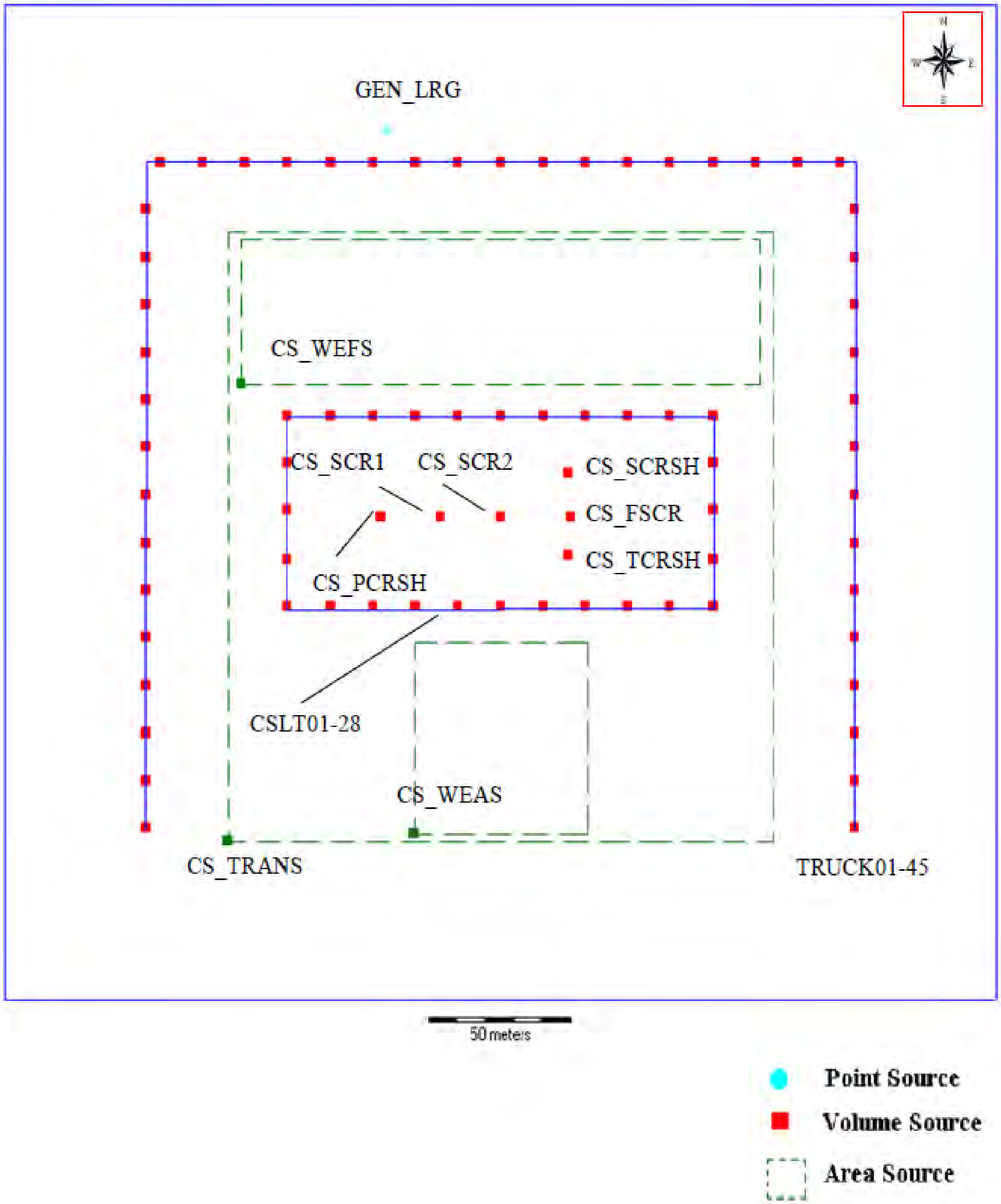


Figure 2: Source Layout of a Generic Crushing and Screening Plant Co-located with a Concrete Batch Plant (refer to Tables 7-9 for detailed source descriptions)

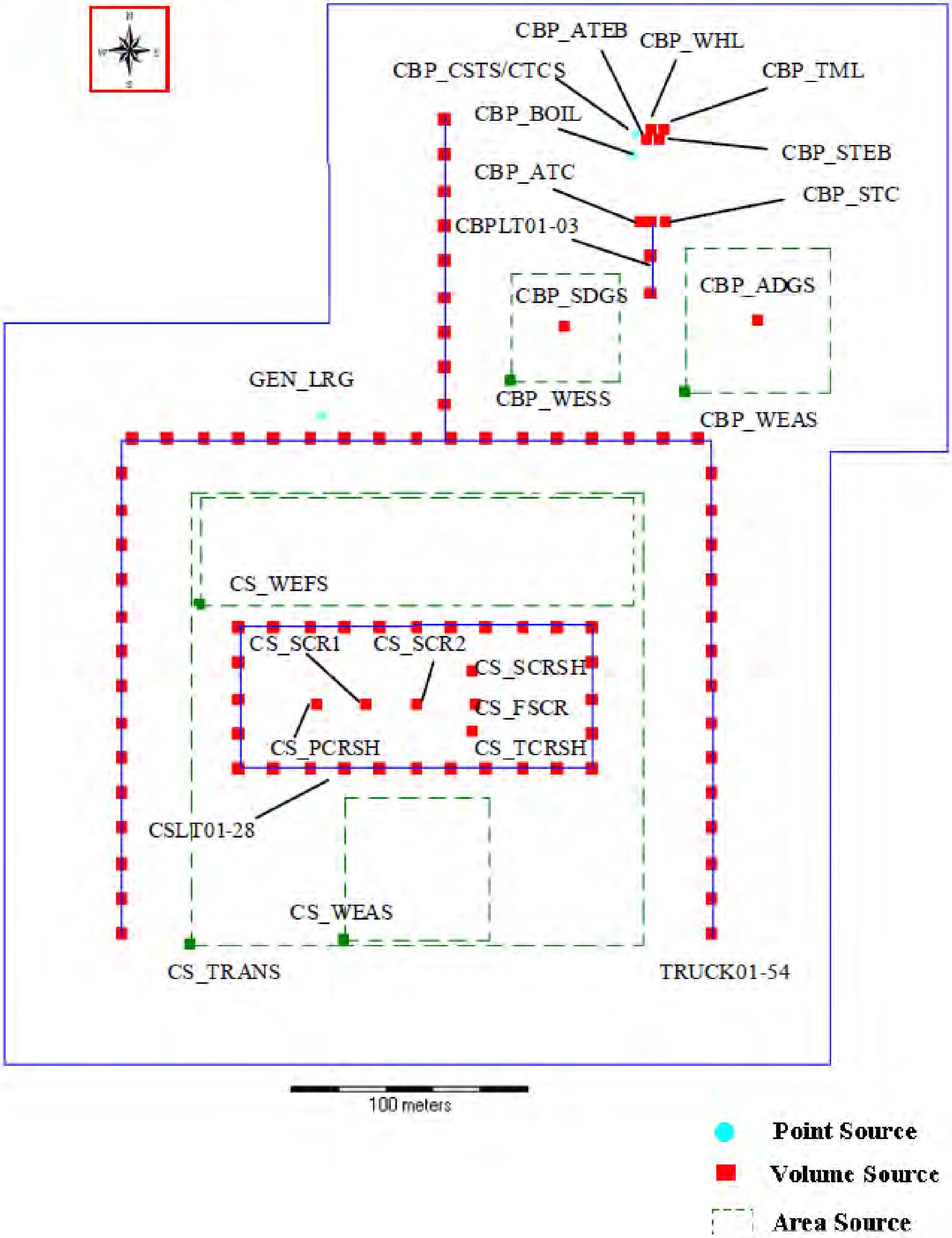


Table 10: Modeling Source Parameters for Crushing & Screening Plant

Area Source					
Source ID	*Source Description*	*Release Height (m)*	X-Length (m)	Y-Length (m)	Angel (degree)
CS_WEAS	Aggregate Storage Pile	1.83	60.96	60.96	0.00
CS_WEFS	Fines Storage Pile	1.83	182.88	45.72	0.00
CS_TRANS	Transfer Points	1.52	192.02	192.02	0.00

Volume Sources				
Source ID	*Source Description*	*Release Height (m)*	Initial Horizontal Dimensions (m)	Initial Vertical Dimensions (m)
CS_PCRSH	Primary Crusher-Jaw	5.18	0.43	2.41
CS_SCR1	Screen #1	7.62	0.85	3.54
CS_SCR2	Screen #2	7.62	0.85	3.54
CS_FSCR	Fine Screen	7.62	0.85	3.54
CS_SCRSH	Secondary Crusher -Core	7.62	0.37	3.54
CS_TCRSH	Tertiary Crusher	6.10	0.27	2.83
CSLT01	C&S Loader Traffic	3.00	7.00	2.80
CSLT02	C&S Loader Traffic	3.00	7.00	2.80
CSLT03	C&S Loader Traffic	3.00	7.00	2.80
CSLT04	C&S Loader Traffic	3.00	7.00	2.80
CSLT05	C&S Loader Traffic	3.00	7.00	2.80
CSLT06	C&S Loader Traffic	3.00	7.00	2.80
CSLT07	C&S Loader Traffic	3.00	7.00	2.80
CSLT08	C&S Loader Traffic	3.00	7.00	2.80
CSLT09	C&S Loader Traffic	3.00	7.00	2.80
CSLT10	C&S Loader Traffic	3.00	7.00	2.80
CSLT11	C&S Loader Traffic	3.00	7.00	2.80
CSLT12	C&S Loader Traffic	3.00	7.00	2.80
CSLT13	C&S Loader Traffic	3.00	7.00	2.80
CSLT14	C&S Loader Traffic	3.00	7.00	2.80
CSLT15	C&S Loader Traffic	3.00	7.00	2.80
CSLT16	C&S Loader Traffic	3.00	7.00	2.80
CSLT17	C&S Loader Traffic	3.00	7.00	2.80
CSLT18	C&S Loader Traffic	3.00	7.00	2.80
CSLT19	C&S Loader Traffic	3.00	7.00	2.80
CSLT20	C&S Loader Traffic	3.00	7.00	2.80
CSLT21	C&S Loader Traffic	3.00	7.00	2.80
CSLT22	C&S Loader Traffic	3.00	7.00	2.80
CSLT23	C&S Loader Traffic	3.00	7.00	2.80
CSLT24	C&S Loader Traffic	3.00	7.00	2.80
CSLT25	C&S Loader Traffic	3.00	7.00	2.80
CSLT26	C&S Loader Traffic	3.00	7.00	2.80

CSLT27	C&S Loader Traffic	3.00	7.00	2.80
CSLT28	C&S Loader Traffic	3.00	7.00	2.80

Table 11: Modeling Source Parameters for Concrete Batch Plants

Point Sources					
Source ID	*Source Description*	*Release Height (m)*	*Stack Temperatur e (K)*	*Stack Velocity (m/s)*	*Stack Diameter (m)*
CBP_CSTS	Cement Supplement Transfer to Cement Silo	12.20	408.00	4.00	0.32
CBP_CTC S	Cement Transfer to Cement Silo	12.20	408.00	4.00	0.32
CBP_BOIL	Boiler	12.19	533.00	7.62	0.30
Area Sources					
Source ID	*Source Description*	*Release Height (m)*	*X-length*	*Y-length*	*Angel (degree)*
CBP_WEA S	Aggregate Storage Pile	1.83	60.96	60.96	0.00
CBP_WES S	Sand Storage Pile	1.83	45.72	45.72	0.00
Volume Sources					
Source ID	*Source Description*	*Release Height (m)*	*Initial Horizontal Dimensions (m)*	*Initial Vertical Dimensions (m)*	
CBP_ADG S	Aggregate Delivery to Ground Storage	6.17	1.60	2.20	
CBP_SDG S	Sand Delivery to Ground Storage	6.17	1.60	2.20	
CBP_ATC	Aggregate Transfer to Conveyor	3.51	0.85	0.43	
CBP_STC	Sand Transfer to Conveyor	3.51	0.85	0.43	
CBP_ATE B	Aggregate Transfer to Elevation Bins	8.08	0.71	0.43	
CBP_STEB	Sand Transfer to Elevation Bins	8.08	0.71	0.43	
CBP_WHL	Weigh Hopper Loading	4.72	0.85	0.14	
CBP_TML	Truck Mix Loading (controlled)	3.05	0.25	0.50	
CBPLT01	CBP Loader Traffic	3.00	7.00	2.80	

CBPLT02	CBP Loader Traffic	3.00	7.00	2.80
CBPLT03	CBP Loader Traffic	3.00	7.00	2.80

Table 12: Modeling Source Parameters for Other Sources

Point Sources					
Source ID	*Source Description*	*Release Height (m)*	*Stack Temperature (K)*	*Stack Velocity (m/s)*	*Stack Diameter (m)*
GEN_LAR	Generator >= 600 hp	6.71	783.00	30.50	0.20

Volume Sources				
Source ID	*Source Description*	*Release Height (m)*	Initial Horizontal Dimensions (m)	Initial Vertical Dimensions (m)
TRUCK01	Truck Traffic	3.00	7.00	2.80
TRUCK02	Truck Traffic	3.00	7.00	2.80
TRUCK03	Truck Traffic	3.00	7.00	2.80
TRUCK04	Truck Traffic	3.00	7.00	2.80
TRUCK05	Truck Traffic	3.00	7.00	2.80
TRUCK06	Truck Traffic	3.00	7.00	2.80
TRUCK07	Truck Traffic	3.00	7.00	2.80
TRUCK08	Truck Traffic	3.00	7.00	2.80
TRUCK09	Truck Traffic	3.00	7.00	2.80
TRUCK10	Truck Traffic	3.00	7.00	2.80
TRUCK11	Truck Traffic	3.00	7.00	2.80
TRUCK12	Truck Traffic	3.00	7.00	2.80
TRUCK13	Truck Traffic	3.00	7.00	2.80
TRUCK14	Truck Traffic	3.00	7.00	2.80
TRUCK15	Truck Traffic	3.00	7.00	2.80
TRUCK16	Truck Traffic	3.00	7.00	2.80
TRUCK17	Truck Traffic	3.00	7.00	2.80
TRUCK18	Truck Traffic	3.00	7.00	2.80
TRUCK19	Truck Traffic	3.00	7.00	2.80
TRUCK20	Truck Traffic	3.00	7.00	2.80
TRUCK21	Truck Traffic	3.00	7.00	2.80
TRUCK22	Truck Traffic	3.00	7.00	2.80
TRUCK23	Truck Traffic	3.00	7.00	2.80
TRUCK24	Truck Traffic	3.00	7.00	2.80
TRUCK25	Truck Traffic	3.00	7.00	2.80
TRUCK26	Truck Traffic	3.00	7.00	2.80
TRUCK27	Truck Traffic	3.00	7.00	2.80
TRUCK28	Truck Traffic	3.00	7.00	2.80
TRUCK29	Truck Traffic	3.00	7.00	2.80

TRUCK30	Truck Traffic	3.00	7.00	2.80
TRUCK31	Truck Traffic	3.00	7.00	2.80
TRUCK32	Truck Traffic	3.00	7.00	2.80
TRUCK33	Truck Traffic	3.00	7.00	2.80
TRUCK34	Truck Traffic	3.00	7.00	2.80
TRUCK35	Truck Traffic	3.00	7.00	2.80
TRUCK36	Truck Traffic	3.00	7.00	2.80
TRUCK37	Truck Traffic	3.00	7.00	2.80
TRUCK38	Truck Traffic	3.00	7.00	2.80
TRUCK39	Truck Traffic	3.00	7.00	2.80
TRUCK40	Truck Traffic	3.00	7.00	2.80
TRUCK41	Truck Traffic	3.00	7.00	2.80
TRUCK42	Truck Traffic	3.00	7.00	2.80
TRUCK43	Truck Traffic	3.00	7.00	2.80
TRUCK44	Truck Traffic	3.00	7.00	2.80
TRUCK45	Truck Traffic	3.00	7.00	2.80
TRUCK46	Truck Traffic	3.00	7.00	2.80
TRUCK47	Truck Traffic	3.00	7.00	2.80
TRUCK48	Truck Traffic	3.00	7.00	2.80
TRUCK49	Truck Traffic	3.00	7.00	2.80
TRUCK50	Truck Traffic	3.00	7.00	2.80
TRUCK51	Truck Traffic	3.00	7.00	2.80
TRUCK52	Truck Traffic	3.00	7.00	2.80
TRUCK53	Truck Traffic	3.00	7.00	2.80
TRUCK54	Truck Traffic	3.00	7.00	2.80

Appendix E: Basis for Future Pb Potential to Emit

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MEMORANDUM

TO:	Marina Mejia, ADEQ SIP Manager
FROM:	Eric L. Hiser
DATE:	May 31, 2016
SUBJECT:	Basis for future lead potential to emit

You asked Asarco to provide the basis for the estimated lead potential to emit. This memorandum addresses the lead potential to emit from the smelting process sources (e.g., concentrate dryers, flash furnace, converters, anode furnaces and casting). Amy Veek has previously provided information on all of the material handling and concentrator operations.

In its December 22, 2014 supplemental permit application for the converter retrofit project (CRP), Asarco proposed, in response to a request from ADEQ, to "net down" emissions from the smelter primary process equipment to allow the CRP to proceed to permitting more expeditiously. Asarco proposed the following lead limit for the non-anode sources:

- Main stack 12 month rolling emission limits as follows:
  - Lead: 2.9 tons, an increase of 1.731 tons from 1.169 tons in 2011-2012, but this increase is netted out by reductions from the Anode Furnace Baghouse project (see netting discussion below)

Asarco, CRP Application, 4 (Dec. 22, 2014). The netting discussion stated as follows in relevant parts:

> As outlined above, Asarco is proposing a small net down for this permit. All pollutants show an actual to potential increase of less than zero except for particulate matter and lead. These will net out of NNSR review when the emissions decreases associated with the Anode Furnace Baghouse installation are considered.
>
> There are two projects within the contemporaneous period: the addition of Revert Screen #3 and its associated diesel engine and the Anode Furnace Baghouse project. … For the Anode Furnace Baghouse project, Asarco counted the difference between the new potential to emit and past actual emissions (65.02 tons/year) and treated this decrease as a contemporaneous emissions decrease because it is enforceable as a practical matter (Asarco took specific emissions limitations in the Anode Furnace Baghouse permit, No. 54251, for this purpose).

Accounting for these increases and decreases results in the following conclusion:
Estimated Net Emissions Impact (all in tons/year):

Pollutant	New Limit	Past Actual	Revert	Anode BH	Net Change
Lead:	2.91	1.169	0.00	-1.79	-0.049

Asarco, CRP Application, 6. Because the anode furnace baghouse is now being routed to the main stack, the lead emissions from the anode furnace, as limited by Permit No. 54251, need to be added to the main stack. While Permit No. 54251 does not establish a lead limit per se, it limits stack emissions to 0.003 gr/scf and estimated total metal HAPs at 0.39 tons (down from 5.33 tons). ADEQ, Permit No. 54251 Technical Support Document, at 2. Looking at the permit application submitted in support of the anode furnace baghouse project gives the following data:

Current (2009-2010) lead emissions:	1.20 ton/year
Controlled (future limit) lead emissions:	0.089 ton/year
Fugitive lead (after controls) emissions:	0.036 ton/year

Asarco, Anode Furnace Baghouse permit application, at D.1-4 (May 19, 2011). Based on the application, then 0.089 ton/year should be added to the 2.91 ton/year in the CRP application to reflect the relocation of the anode furnace baghouse stack emissions to the main stack. The new main stack limit would be 2.91 + 0.089 = 2.999 ton/year of lead, which Asarco proposes to round to 3.0 ton/year of lead.

Similarly, the fugitive limits from the CRP were set at 1.400 ton/year from the flash furnace and converter aisle in 2011-2012. Asarco, CRP application at C, Lead 16. To this should be added the 0.036 ton/year from the anode furnace fugitives. The total lead fugitive limit from the process sources would be 1.400 + 0.036 = 1.436 ton/year of lead. For post-CRP modeling purposes, Asarco recommends a ratio of SHBH = 26.5%, VGBH = 73.5% of the 1.400 tons/year, with the anode furnace fugitives carried at 0.036 ton/yr.

As noted above, the material handling emissions for concentrate prior to processing and post-processing, as well as road emissions, are addressed in materials provided by Amy Veek. Please review this discussion and let us know if it answers your questions.

Cc: J. Garrity, Asarco, Hayden Operations
A. Veek, Asarco, Hayden Operations

Appendix F: Unpaved Roads De Minimis Analysis

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY TECHNICAL MEMORANDUM

UNPAVED ROADS DE MINIMIS ANALYSIS

OCTOBER 20, 2016

The following memorandum presents an analysis performed by the Technical Analysis Unit (TAU) for the Arizona Department of Environmental Quality's (ADEQ) Lead (Pb) State Implementation Plan (SIP) revision. The goal of this analysis was to determine which unpaved roads at the Asarco facility are likely contributing to elevated ambient air lead concentrations.

Background

TAU started its analysis by collecting information regarding which roads within Asarco's ambient air boundary are paved and unpaved. Figure 1 on the following page was created based on data supplied by the source. Although more unpaved roads exist north of the smelter, these roads are less traveled and further from high lead sources, and therefore were not included in the de minimis analysis.

The unpaved roads shown in the figure were selected due to their proximity to high lead sources and trips per day, these high lead sources include: wet dry bin activities, concentrate handling activities (both bedding area and overflow storage), and slag dump activities. In Figure 1 on the next page four unpaved road segments are identified. These segments are termed, slag dump (green), smelter support area (orange), concentrator access road (gold), and concentrate storage (blue).

To determine which segments were significant, and should be included in ADEQ's SIP efforts, soil sample data was collected from the Remedial Investigation and Feasibility Study (RI/FS), which was performed from 2013 to 2015. TAU then set a criteria for determine if a road was a significant contributor. This criteria was based on the Arizona residential soil remediation level (SRL).

The residential SRL (as defined in A.A.C. R18-7-205 Appendix A) sets a standard of 400 parts per million (ppm). Chronic exposure to leaded soils greater than 400 ppm result in a cumulative excess lifetime cancer risk between 1×10^{-6} and 1×10^{-4} and a Hazard Index number greater than 1 (based on residential exposure assumptions)[14]. Although the general public does not have access to these roads, and therefore chronic exposure is not likely, the residential SRL sets a conservative criteria for the purposes of this analysis.

[14] A.A.C. R18-7-201

Figure 0-1: Facility Roads

Slag Dump

The slag dump area is located east of the smelter (green road in Figure 1). All RI/FS sampling locations are shown in Figure 2.

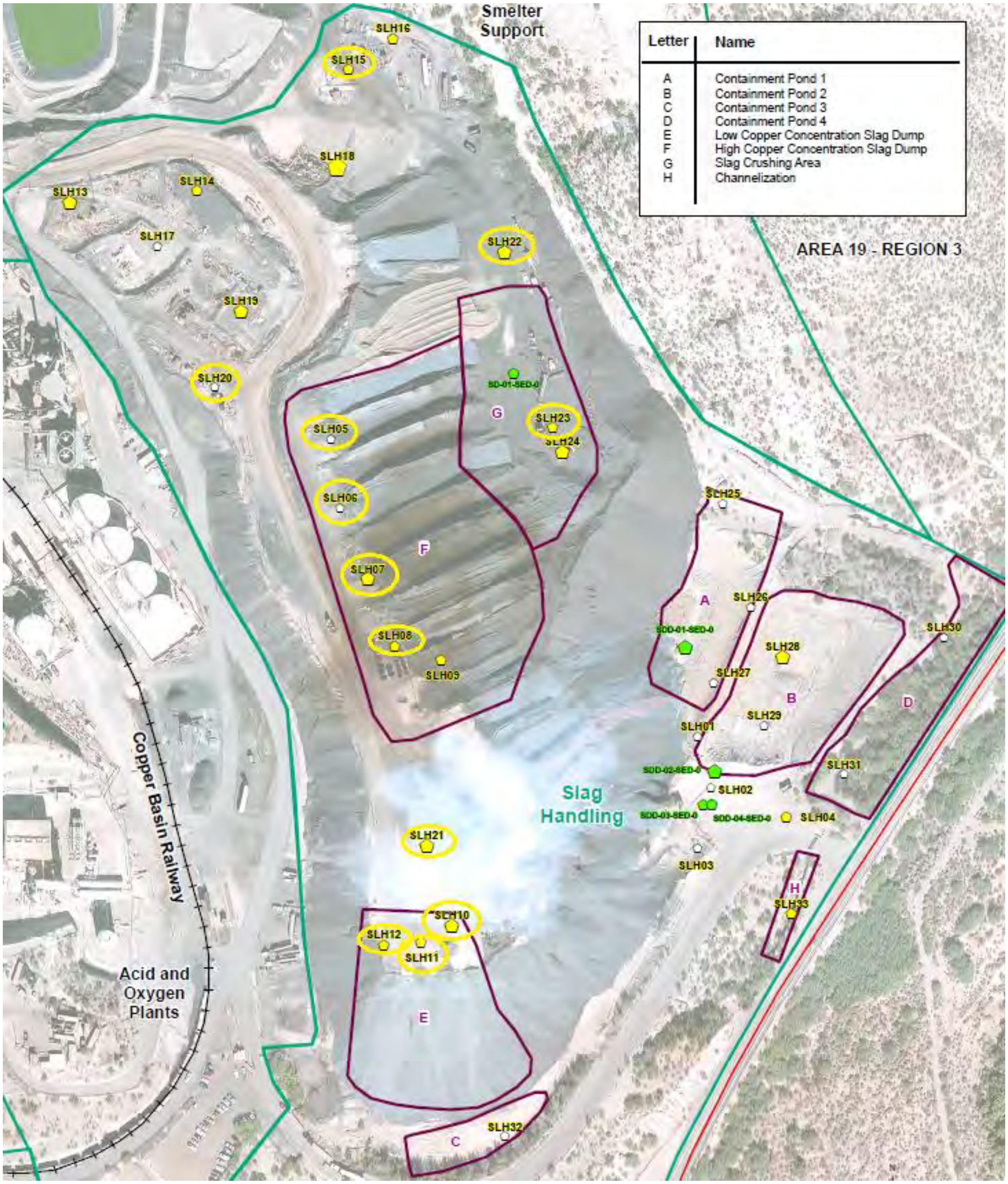


Figure 0-2: Slag Dump Sampling

The sample locations chosen for this analysis are circled in yellow. No direct samples were taken of the slag haul road, therefore, samples adjacent to this road are considered surrogates. Although the slag haul road is located on top of the slag dump, vehicle traffic does occur at the bottom of the dump, which is why several RI/FS samples were chosen in that area (SLH23, SLH22, and SLH15).

As seen in the table, SLH21 is significantly higher than the surrounding samples. TAU is not aware of why there is such a large discrepancy between 21 and the remaining samples. If 21 was excluded the new average would be 453 ppm.

Table 4: Slag Dump Sample Results

Slag Dump	
Sample ID	**Concentration (ppm)**
SLH12	420
SLH11	440
SLH10	380
SLH21	3800
SLH08	390
SLH07	550
SLH06	460
SLH05	290
SLH20	14
SLH23	810
SLH22	830
SLH15	400
Max Sample	**3800**
Min Sample	**14**
Average	**732.0**
Samples ≥ 400 ppm	**67%**

Concentrate Storage

The concentrate storage area is located north of the concentrator and northeast of the smelter (blue road in Figure 1). All RI/FS sampling locations are shown in Figure 3.

The sample locations chosen for this analysis are circled in yellow. Unlike the slag dump, the RI/FS sampling did appear to take samples directly on the unpaved road, for example LFP 12, 13, 14, and 15.

Table 5: Concentrate Storage Sample Results

Concentrate Storage	
Sample ID	**Concentration (ppm)**
LFP11	67
LFP12	1700
LFP14	3100
LFP15	590
LFP13	1800
LFP16	590
LFP17	870
LFP18	3900
LFP20	670
LFP19	640
LFP21	450
LFP30	230
Max Sample	**3900**
Min Sample	**67**
Average	**1217.3**
Samples ≥ 400 ppm	**83%**

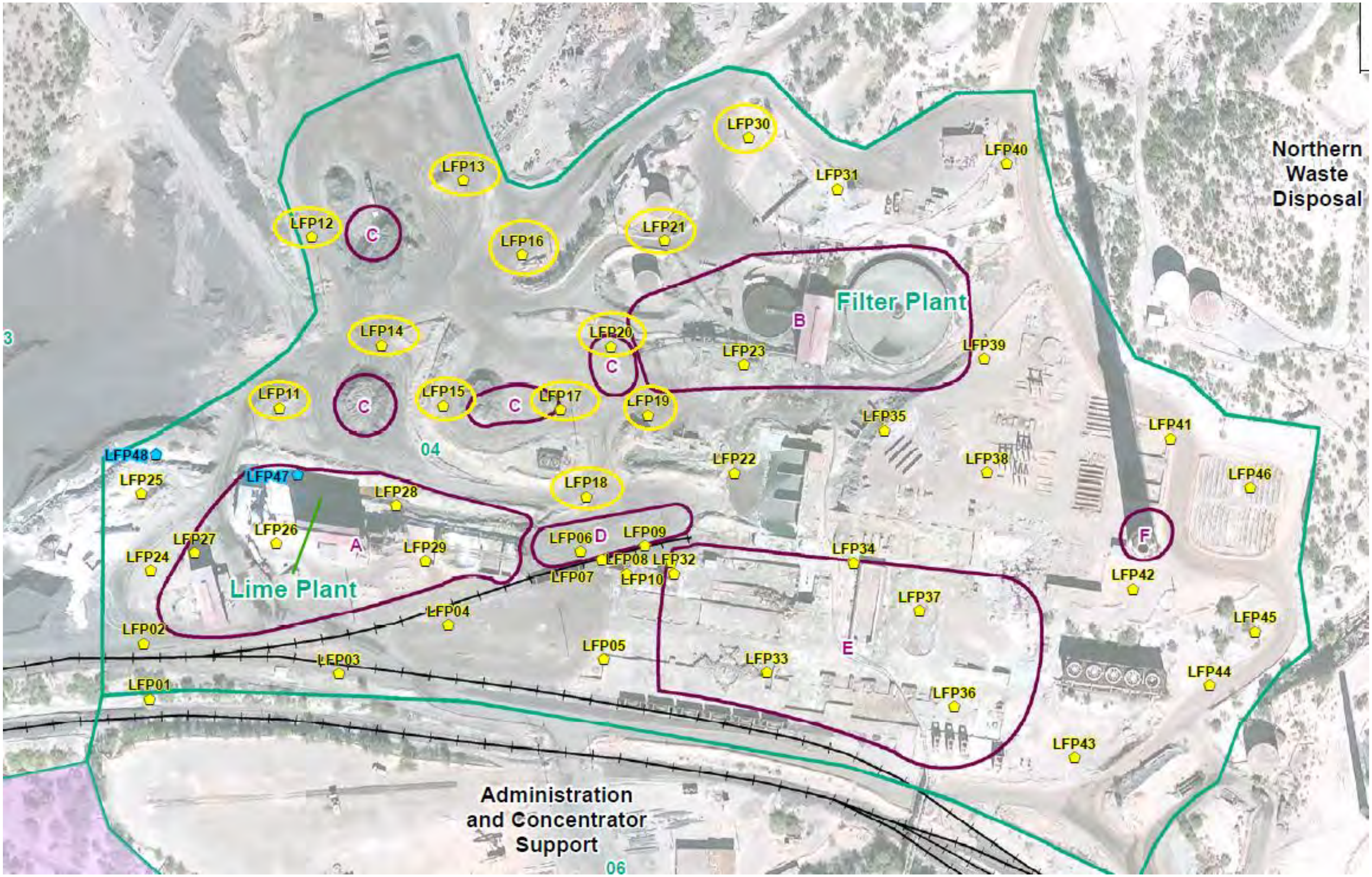


Figure 0-3: Concentrate Storage Sampling

Smelter Support Area

The smelter support area is located northeast of the smelter (orange road in Figure 1). All RI/FS sample locations are shown in Figure 4.

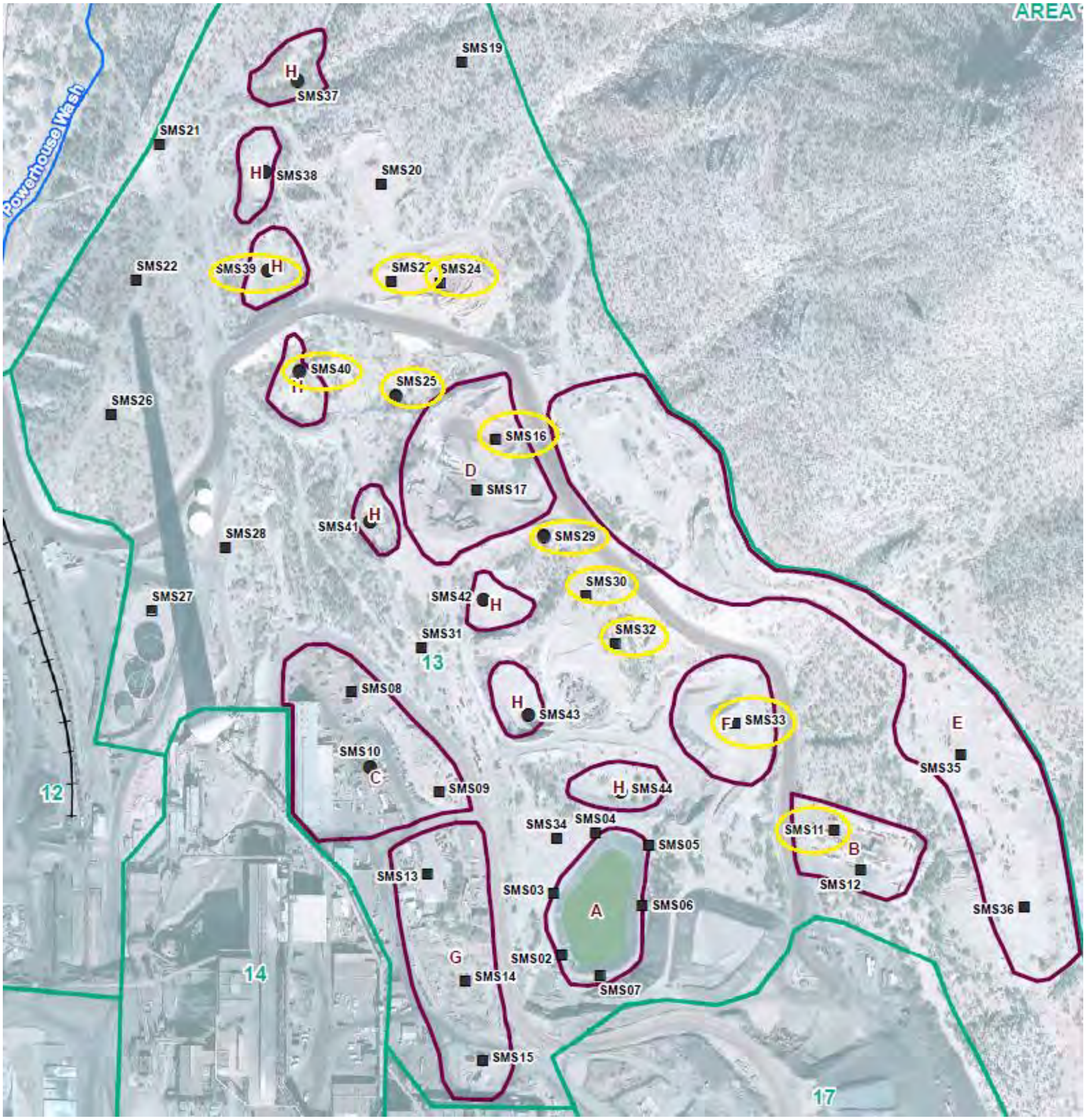


Figure 0-4: Smelter Support Sampling

The sample locations chosen for this analysis are circled in yellow. Like the slag haul road, no samples were directly taken from the unpaved road, therefore, the samples adjacent to the unpaved road are surrogates. In the table below, sample SMS33 is roughly three times higher than the other samples. After reviewing technical memos for this area, TAU discovered the area from which SMS33 was taken is a historic solid waste landfill.

Table 6: Smelter Support Sample Results

Smelter Support Area	
Sample ID	**Concentration (ppm)**
SMS39	230
SMS40	190
SMS23	180
SMS24	25
SMS25	140
SMS16	13
SMS29	240
SMS30	250
SMS32	82
SMS33	900
SMS11	350
Max Sample	**900**
Min Sample	**13**
Average	**236.4**
Samples ≥ 400 ppm	**9%**

Concentrator Access Road

The concentrator access road is located east of the concentrator (gold road in Figure 1). All RI/FS samples are shown in Figures 5 & 6.

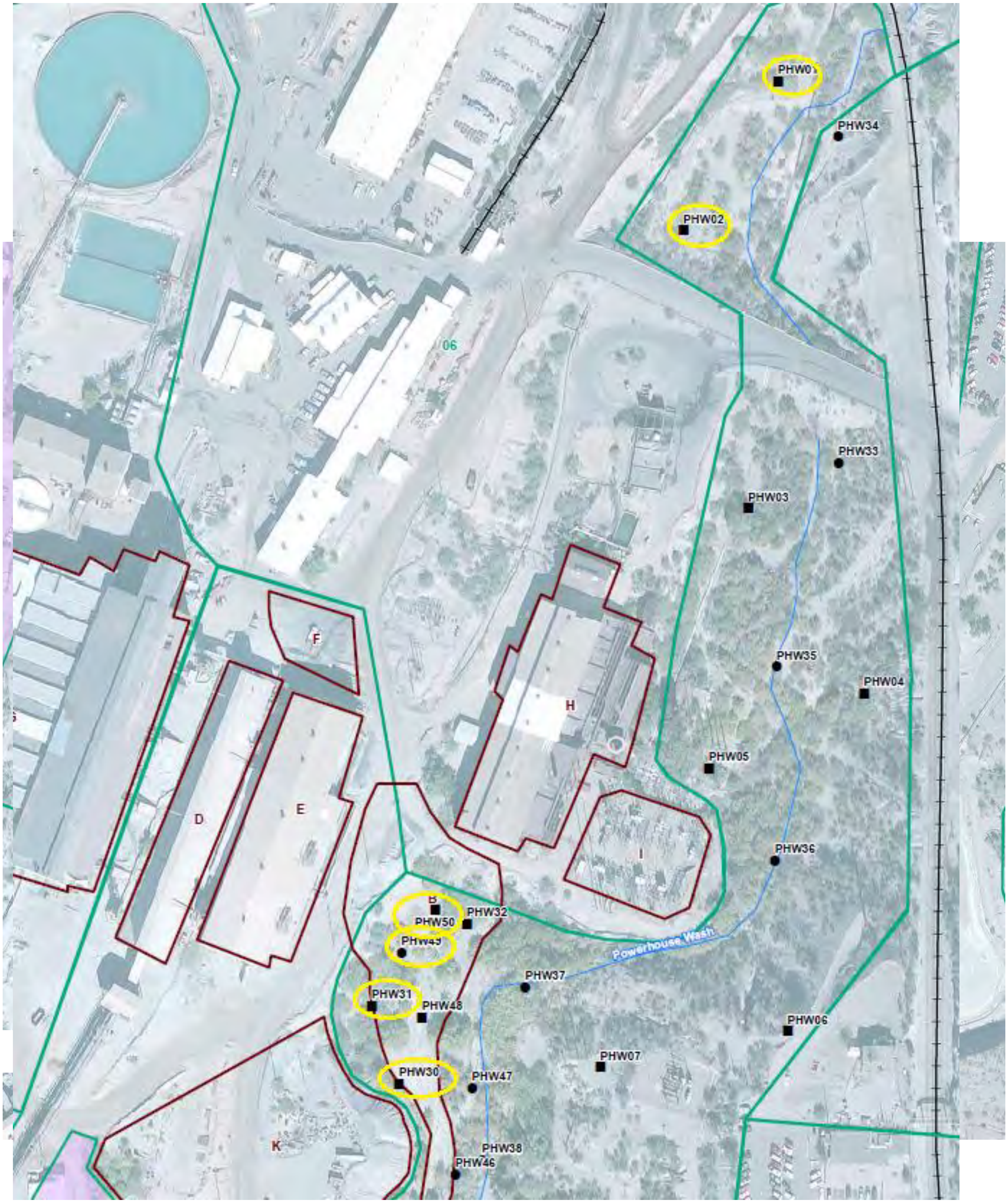


Figure 0-6: Concentrator Access Road (2/2)

The sample locations chosen for this analysis are circled in yellow. In the figures above, the area shown in Figure 5 is located south of the area in Figure 6. The only RI/FS sample taken directly from the paved road was PHW27 (based on aerial photography), all other samples are surrogates.

Table 7: Concentrator Unpaved Road Sample Results

Concentrator Unpaved Access Road	
Sample ID	**Concentration (ppm)**
PHW23	321
PHW27	77.2
PHW26	244
PHW28	153
PHW43	167
PHW42	211
PHW17	171
PHW41	213
PHW14	473
PHW11	159
PHW10	362
PHW09	125
PHW30	54.5
PHW31	78.4
PHW49	185
PHW50	85.2
PHW02	432
PHW01	210
Max Sample	**473**
Min Sample	**54.5**
Average	**206.7**
Samples ≥ 400 ppm	**11%**

Results & Conclusion

As seen in table 5, the majority of adjacent/on road samples at the slag dump and concentrate storage area are over the 400 ppm criteria. In addition, the average of the adjacent/on road samples from the smelter support area and concentrator access road are roughly half of the 400 ppm criteria.

A limitation of this analysis is relating soil concentrations to ambient air concentrations. A more accurate way to conduct this analysis would have been to use results from the resuspension analysis done for the RI/FS. This analysis found the percent mass of lead in the 10 and 2.5 micron range, after a sample had been artificially re-suspended in a lab. However, not all roads (and no unpaved roads) were considered in said analysis. The connection made between the two mediums (soil and air) in this analysis is more simplified. And can be summarized as, the higher the lead concentration in the soil, the more of a threat said soil poses to ambient air.

TAU believes the results in Table 5 are a product of proximity to high lead sources. Moreover, given these results, TAU is comfortable moving forward with its SIP model including the slag dump and concentrate storage area and considering the remaining two unpaved roads de minimis.

Table 8: Summary Table

Summary Table				
Unpaved Road	**Samples ≥ 400 ppm**	**Average**	**Max Sample**	**Min Sample**
Slag Dump	67%	732.0	3800	14
Concentrate Storage	83%	1217.3	3900	67
Smelter Support Area	9%	236.4	900	13
Concentrator Access Road	11%	206.7	473	54.5

Appendix G: Ambient Air Boundary

1. *Overview*

On Thursday, February 23rd Arizona Department of Environmental Quality (ADEQ) personnel performed an on-site tour of the ambient air boundary (AAB) used for the Hayden SO_2 and Pb nonattainment plans. During this tour ADEQ personnel traveled and documented the portions of the AAB that were reasonably accessible. Figure 1-1 details the approximate locations along the AAB that were visited. Section 2 provides some of the photographs taken during this visit along with descriptive annotations. The location numbers correspond to the locations displayed in Figure 1-1 and indicate the approximate location where the photos were taken. Also, where appropriate ADEQ has included drawings on the photos to indicate the approximate location of the AAB where no fencing is present.

In general, upon visiting the site and inspecting the AAB, ADEQ concurs with the AAB assessment provided by Asarco[15] and agrees that the boundary represents a practical ability to preclude public access. The portions of the AAB that are nearest to the town of Hayden are fenced, and the portions of the AAB that are not fenced are remote and far from any publicly accessed road.

In evaluating the AAB, ADEQ considered the definition of “ambient air” as “that portion of the atmosphere, external to buildings, to which the general public has access[16]”. ADEQ believes that the combination of fencing, terrain, and remoteness is appropriate for delineating the AAB as it precludes access by the general public. Additionally, any individual attempting to gain access would have to scale fences or traverse difficult terrain and open desert. Furthermore, such individual would be intercepted by Asarco security and removed from the site immediately.

[15] See Hayden SO_2 Modeling Technical Support Document Appendix C.

[16] A.A.C. R18-2-101(14)

Figure 1: Approximate Locations Along the AAB that Were Visited

2. Annotated Photos

Figure 2-1: Location #1

	Looking north-northeast. Shows general location where fencing ends. Fence continues down slope and terminates at a set of railroad tracks. AAB runs along fence line.
	Looking north. View from location where fencing ends showing railroad tracks and current concentrate storage area in background. Yellow dotted line added to indicate approximate location of AAB.

	Looking south. Typical fencing used along AAB through the town of Hayden. AAB runs along fence line.

Figure 2-2: Location #2

	Looking north. Located just east of Hayden Post Office. Typical fencing used along AAB through the town of Hayden. AAB runs along fence line.

Figure 2-3: Location #3

Looking east. Fencing runs from left side of image (obscured by bush) and continues downslope into thick vegetation.

Yellow dotted line added to indicate approximate location of fence and AAB.

Figure 2-4: Location #4

	Looking west. Fencing and gate leading to secondary crusher. AAB not visible in this view, as boundary is located further north (right side of image). The AAB runs across a ravine and this location represented the nearest ingress point.
	Looking east. Main entrance to the secondary crusher. AAB not visible in this view, as boundary is located further north (left side of image). The AAB runs across a ravine and this location represented the nearest ingress point.

Figure 2-5: Location #5

	Looking northeast. Fencing ends at drainage pipe located at bottom of ravine. AAB not visible in this view, as boundary is located further north (left side of image). The AAB runs across a ravine and this location represented the nearest ingress point.

Figure 2-6: Location #6

	Looking west. View across ravine which runs north-south along road to smelter employee parking lot. AAB not visible in this view, as boundary is located further north (right side of image).

Figure 2-7: Location #7

	Looking south. Fencing along south side of smelter parking lot. In background, fencing can be seen that runs around water retention basin. AAB runs along fence line.

Figure 2-8: Location #8

	Looking south. Looking through barbed wire topped fence. In background fence which runs around water retention basin. AAB runs along fence line.
	Looking east. Barbed wire topped fence continues to location #9. AAB runs along fence line.

Figure 2-9: Location #9

	Looking east. This location is near terminus of barbed wire topped fencing shown at location #8. Steep slope and berm provides significant impedance to access. Yellow dotted line added to indicate approximate location of AAB boundary.

Figure 2-10: Location #10

	Looking southwest. View of contractor access road with slag dump to the right. Yellow dotted line added to indicate approximate location of AAB boundary.

	Looking northeast. Contractor parking area with bolder used to restrict vehicle access. Slag dump and water retention basin in background. Yellow dotted line added to indicate approximate location of AAB boundary.
	Looking west. Image taken from water retention basin with view of slag dump. Asarco employee in background for perspective. Yellow dotted line added to indicate approximate location of AAB boundary.

Figure 2-11: Location #11

	Looking east. This view captures the general area that was added to AAB due to Asarco’s land purchase. AAB boundary lies beyond the hills in this image.
	Looking north. This view captures the general area that was added to AAB due to Asarco’s land purchase. AAB boundary lies beyond the hills in this image.

Figure 2-12: Location #12

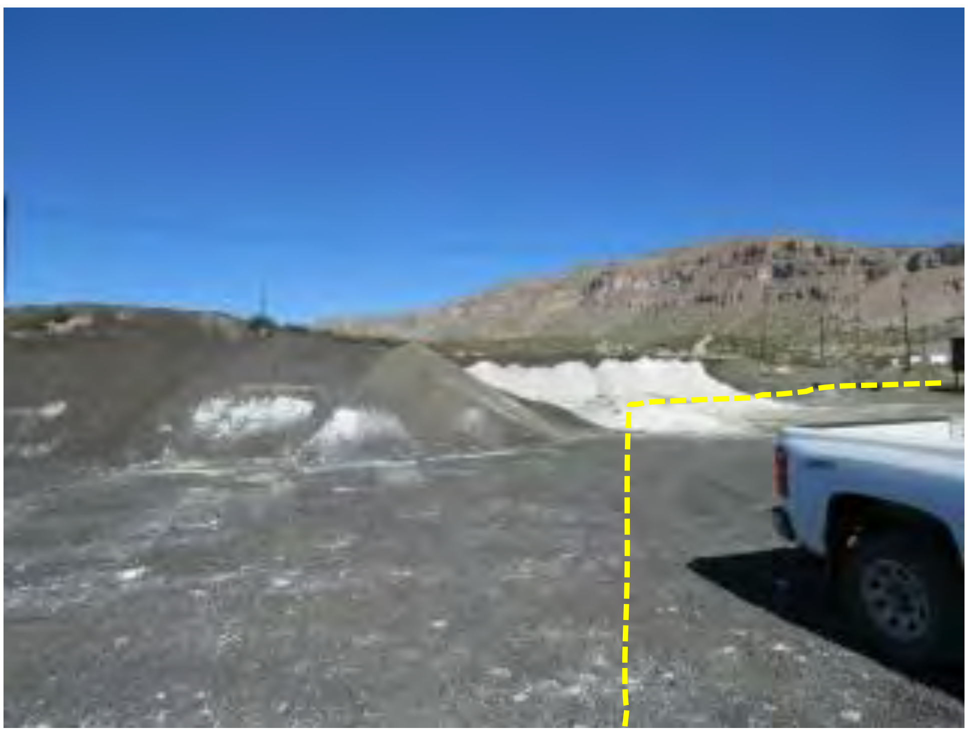
	Looking south. View from concentrate storage area towards location #1 where fencing ends. Ravine with train tracks visible. Yellow dotted line added to indicate approximate location of AAB. Line starts where fencing ends.
	Looking north. View of concentrate and lime (white substance) storage area. Yellow dotted line added to indicate approximate location of AAB. AAB runs north from location #1 to approximate location of lime storage then follows roadway (not visible).

Figure 2-13: Location #13

	Looking northeast. View of mountain ridge which runs along the northeast and eastern side of AAB. Yellow dotted line added to indicate approximate location of AAB.
	Looking southwest. View of roadway that is used to demarcate the northwestern edge of AAB. Yellow dotted line added to indicate approximate location of AAB.

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MODELING REPORT
FOR THE
HAYDEN LEAD NONATTAINMENT AREA

Submitted To:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
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On Behalf of:

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Prepared By:

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DECEMBER 20, 2022

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APPENDICES

Appendix A: Volume Source Supporting Information, Non-Roads

Appendix B: Volume Source Supporting Information, Roads

Appendix C: Background Concentration Supporting Information

1.0 INTRODUCTION

Effective January 12, 2009, the U.S. Environmental Protection Agency (EPA) revised the National Ambient Air Quality Standard for lead to establish a revised primary standard of 0.15 $\mu g/m^3$ based on the highest quarterly average during a three-year period (Pb NAAQS).

On October 3, 2014, EPA designated the area of Hayden, Arizona as being in nonattainment for the Pb NAAQS (Hayden Pb NAA).

Asarco LLC (Asarco) operates a copper smelter in Hayden. The Hayden smelter is the largest source of lead (Pb) emissions in the Hayden Pb NAA.

On March 2, 2017, ADEQ submitted to EPA the "Arizona State Implementation Plan Revision: Hayden Lead Nonattainment Area for the 2008 Lead NAAQS" (2017 SIP). The 2017 SIP included the Converter Retrofit Project (CRP), which was required pursuant to the December 30, 2015 Consent Decree in United States v. Asarco LLC, No. CV-15-02206-PHX (D. Ariz). The main purpose of the CRP was to implement additional emissions capture and control technologies to reduce SO_2 and hazardous air pollutant, including lead, emissions at the Hayden smelter.

On November 14, 2018, EPA published its approval of the 2017 SIP.

In 2017 and 2018, Asarco performed the bulk of the CRP. The CRP in fact substantially reduced Pb emissions at the Hayden smelter.

On January 31, 2022, EPA issued a finding that the Hayden Pb NAA continues to be in nonattainment of the Pb NAAQS. That finding has triggered Clean Air Act requirements to prepare and submit to EPA a revised state implementation plan (Pb SIP) to assure attainment of the Pb NAAQS in the Hayden Pb NAA. The deadline for submittal of the Pb SIP is January 31, 2023.

To assist the Arizona Department of Environmental Quality (ADEQ) in the development of the Pb SIP, Asarco is submitting to ADEQ a petition to include three additional emissions capture and control projects and related information in the Pb SIP. These projects will further reduce Pb emissions from the Hayden smelter.

Asarco has retained Blue Sky Modeling, LLC (BSM) to conduct an air dispersion modeling analysis to demonstrate that the three projects, once implemented, will assure that the Hayden Pb NAA attains the Pb NAAQS (Pb SIP modeling).

This document is the report of BSM's modeling analysis, which follows the approach presented in an email from Bill Jones of BSM to Feng Mao of ADEQ[1]. It is being submitted in support of Asarco's petition.

[1] Email from Bill Jones (BSM) to Feng Mao (ADEQ), November 23, 2022

The report is organized as follows:

- Section 2 provides an overview of the general regional characteristics of the Hayden Pb NAA, including topography, land use, and climate;
- Section 3 provides a discussion on the determination of the modeling domain, sources to explicitly model and the receptor grid;
- Section 4 provides a discussion on the model selection;
- Section 5 provides detailed source inputs, including source configuration, source emissions, source release parameters, Good Engineering Practice (GEP) stack height, and urban/rural determination;
- Section 6 provides a discussion on the selection and processing of meteorological data;
- Section 7 provides a discussion on the determination of background concentrations; and
- Section 8 provides a discussion of the modeling results.

2.0 OVERVIEW OF HAYDEN NONATTAINMENT AREA (NAA) FOR LEAD

The Hayden Pb NAA is comprised of the portions of Pinal and Gila County, as presented in Figure 2-1

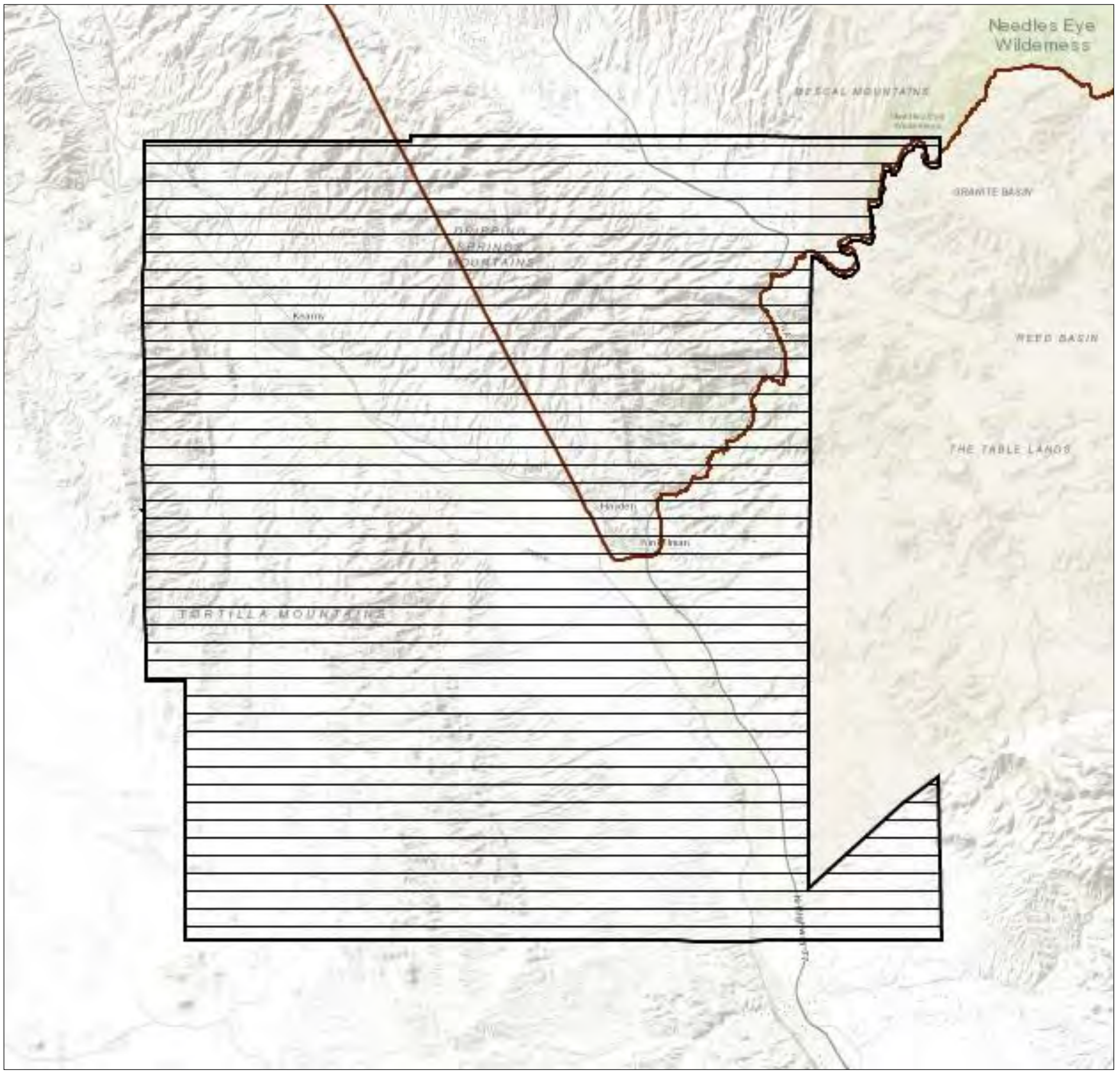


Figure 2-1
Hayden Pb NAA

2.1 LAND USE

The Hayden Pb NAA area encompasses portions of two counties: Gila and Pinal. The Gila County portion of the NAA is approximately 58 square miles while the Pinal County portion is approximately 217 square miles. The majority of the land within the NAA is owned and managed by the either the Bureau of Land Management (39.1%) or the Arizona State Land Department (35.5%). The remainder of the land within the NAA is comprised of privately held land along with a small area of land located to the east of Winkelman, which the Bureau of Reclamation manages. A breakdown of the land owners in the Hayden Pb NAA are presented in Table 2-1.

Table 2-1. Land Use Area

Land Owner	Area (sq miles)	Percentage
Bureau of Land Management	106.816	39.1%
State Trust Land	96.876	35.5%
Private Land	68.932	25.2%
Bureau of Reclamation	0.499	0.2%

Further discussion of land use, as it pertains to dispersion modeling and meteorological processing inputs, is provided in Sections 5.4 of this document.

2.2 TOPOGRAPHY

Asarco operations in Hayden, Arizona are located on the southwestern flank of the Dripping Spring Mountains, a range rising rapidly just to the north and east of Asarco. Bisected by numerous northeast- southwest oriented arroyos, this terrain in the immediate vicinity of the Asarco Hayden operations is rugged and variable in elevation. To the south of Asarco, the terrain is smoother, dominated by the northwest-southeast aligned valley of the Gila and San Pedro Rivers. The Tortilla Mountains, which form the western border of the Gila River Valley, are located several miles to the west of Asarco. The topography of the modeling domain is depicted in Figure 2-2.

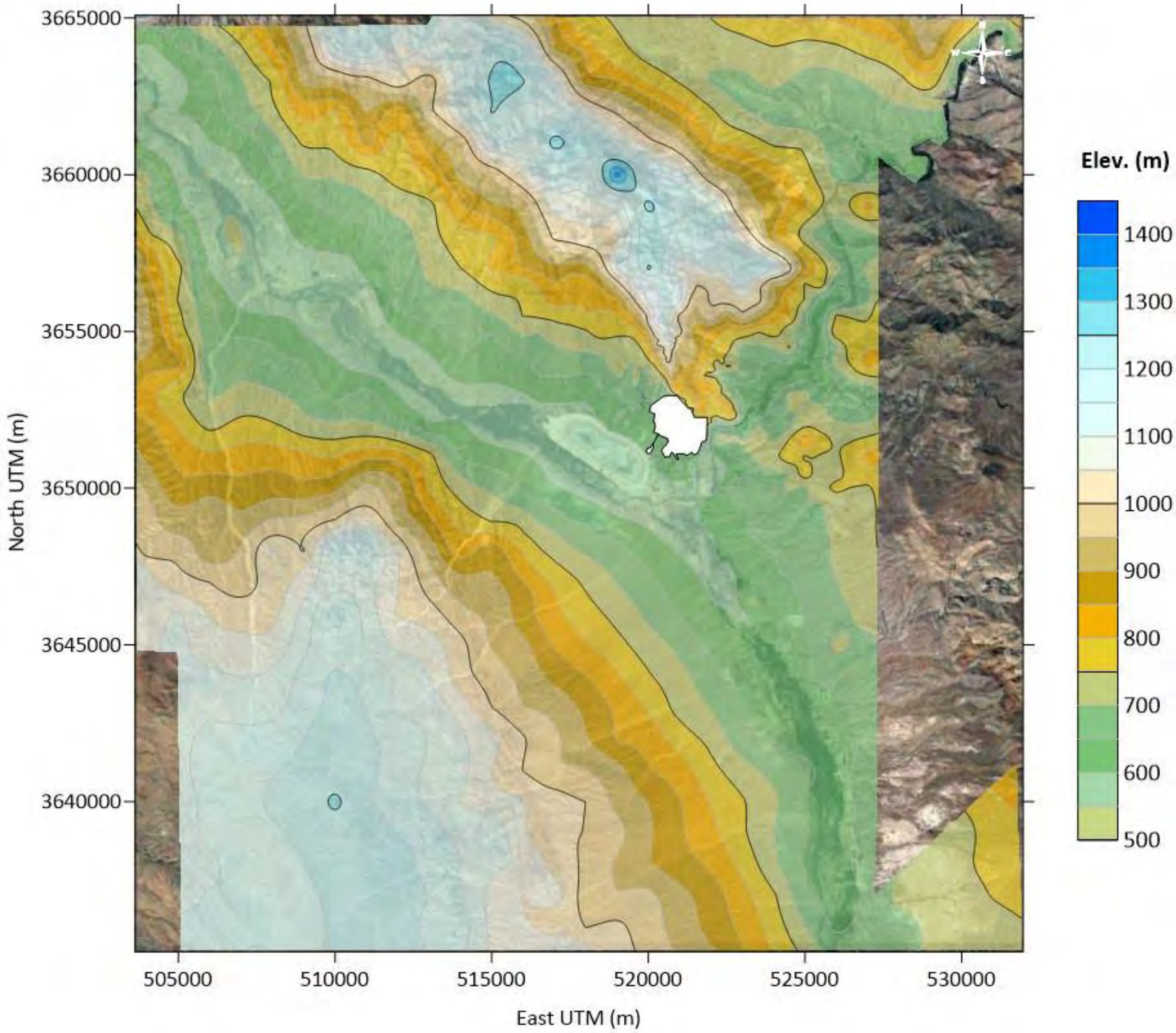


Figure 2-2

Topography of Modeling Domain

2.3 CLIMATE

Both desert terrain and mountain ranges are found across the southern Gila County and eastern Pinal County landscape. Elevations range from near 1,800 feet to more than 4,400 feet above sea level in the NAA with the town of Hayden situated at an elevation near 2,050 feet. This unique environment experiences both warm desert and cool alpine climates. The climate of the area is arid, with annual average precipitation of about 14 inches. Temperatures range from an average low in the winter of 31°F to an average high of 99°F in the summer. Wind directions in the area generally conform to the river valley orientations, with westerly and southeasterly winds predominating in Hayden.

Synoptic scale air flows and local topographically driven surface winds influence the speed and direction of air pollution transport throughout the Hayden area. Local wind patterns in the Gila River Airshed are greatly influenced by the complex local topography. Hayden is located at the junction of two rivers, the Gila and the San Pedro. Situated in a low-lying part of a valley with mountains reaching over 4,000 feet to the north, east and southwest, Hayden is subject to a distinct mountain-valley diurnal wind pattern. Under stable atmospheric conditions, nighttime winds are typically from the southeast with speeds less than 10 miles per hour (4.47 meters per second). These conditions can cause air pooling in low-lying areas at night, allowing for pollutants to settle in these areas. The up-slope air flows and convection that occurs during the day increases dispersion and flow out of the Hayden area. Under normal daytime conditions, surface winds in the Hayden area range from west-southwesterly to west-northwesterly as the atmosphere becomes less stable. This pattern is repeated throughout the complex terrain found in the Hayden area.

During the wintertime, relatively strong inversions (where cold air becomes trapped at the surface by warmer air aloft) create extremely stable atmospheric conditions. Depending on the strength of the inversion and amount of daytime surface heating, the inversion may break by the early afternoon, permitting the air to mix vertically. Sometimes, however, the inversion may not break at all. Under these conditions, vertical and horizontal movement of the air is very limited, causing pollutants in the air to accumulate up to several days with little dispersion.

3.0 MODELING DOMAIN

The first step of the Pb SIP modeling exercise is to determine the size of the modeling domain, which depends on the number of sources to explicitly model and size of the receptor network to account for the areas of impact. The modeling domain should at a minimum encompass the Hayden Pb NAA and include the sources thought most likely to cause or contribute to exceedances of the Pb NAAQS in and around the Hayden Pb NAA. In the modeling exercise, all modeled receptors should exhibit modeled attainment of the Pb NAAQS.

3.1 DETERMINING SOURCES TO EXPLICITLY MODEL

There are two key criteria for the determination of sources to explicitly model: whether sources could cause or contribute to exceedances of the Pb NAAQS, and whether the ambient impacts from sources could be represented via background concentrations.

Previous modeling efforts for the Hayden Pb NAA have established that Asarco's smelter is the only meaningful source of Pb emissions in the Hayden Pb NAA. Therefore, any other sources which may contribute to Pb levels in the Hayden Pb NAA are accounted for in the background Pb concentration (see Section 7.0).

3.2 RECEPTOR GRID

The modeling domain covers approximately 33 kilometers by 34 kilometers, centered on Asarco's facility. The modeling domain covers portions of Gila, Maricopa, Pinal and Graham Counties and encompasses the entire Hayden Pb NAA. Figure 3-1 presents the modeled receptors superimposed on a map of the Hayden Pb NAA, with Figure 3-2 providing a focused view of receptors near Asarco's facility.

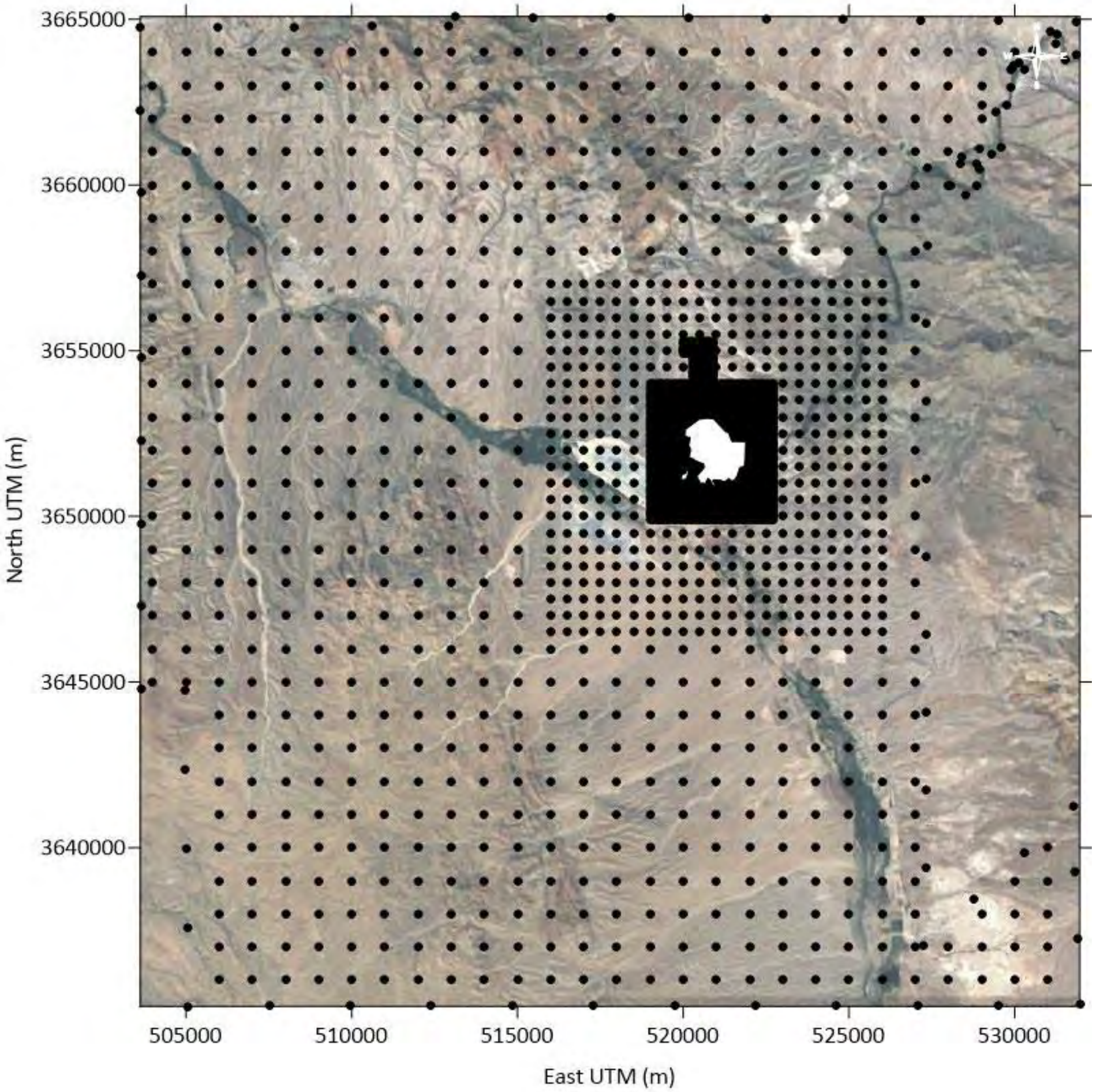


Figure 3-1
Modeled Receptors, Full Grid

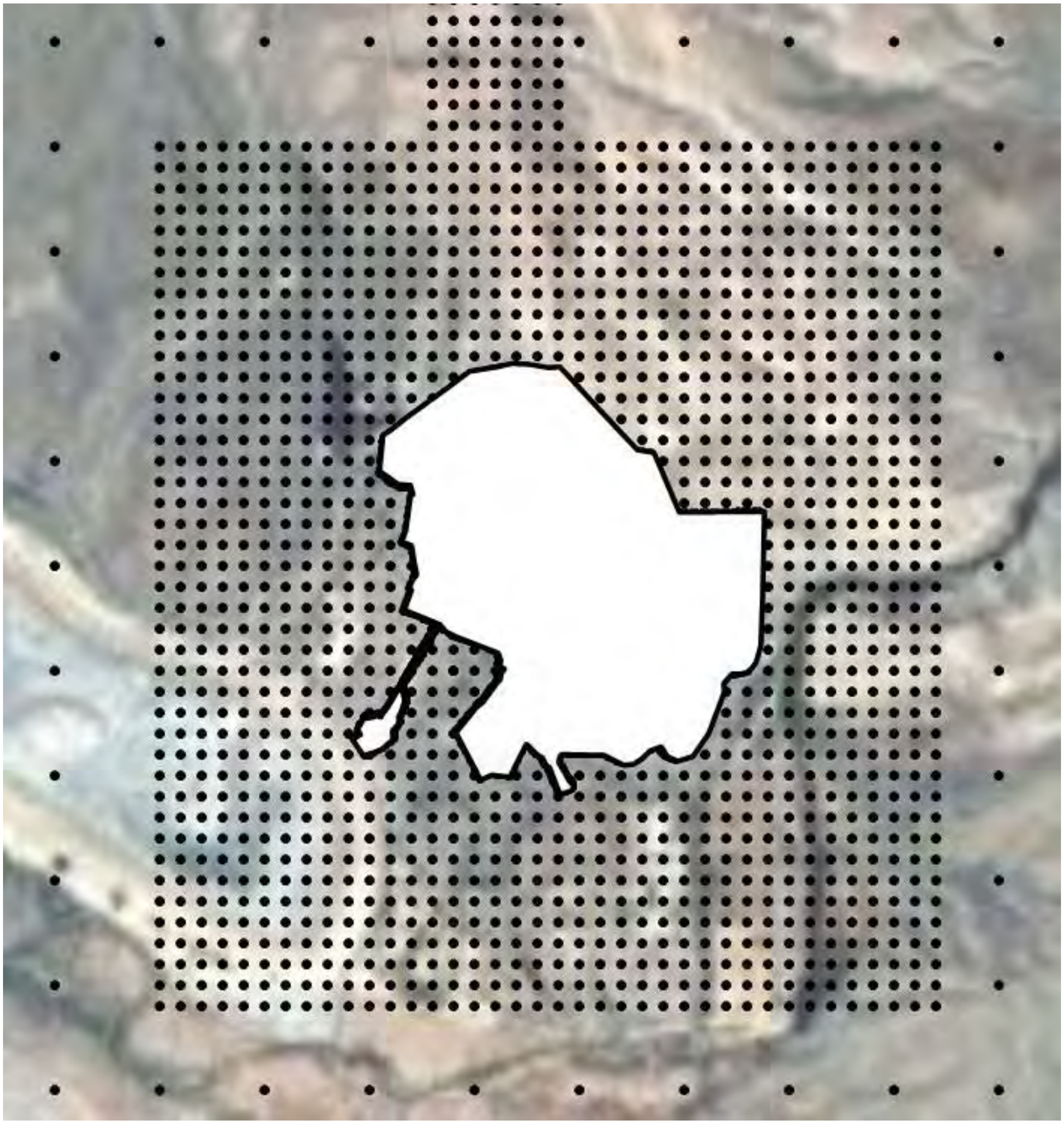


Figure 3-2
Modeled Receptors, Focused on Asarco's Facility

This Ambient Air Boundary (AAB) used for the Pb SIP modeling is the same as that used for the SO_2 SIP modeling, with one exception: the AAB used for the Pb SIP modeling encompasses an additional narrow area extending down to the crusher, near the rail loading, which is a source of fugitive dust that may contain Pb. The SO_2 SOP modeling over-conservatively treated this area as ambient air, even though it is a secure part of Asarco's property and operations at the facility. The AAB used for the Pb SIP modeling does not encompass the railcar unloading area that is located across Highway 177, even though that area too is a secure part of Asarco's property and operations. In this respect, the Pb SIP modeling is as over-conservative as the SO_2 SIP modeling, which also treated that area as ambient air.

The Pb SIP modeling receptor grid consists of 2,932 receptors, spaced as follows:

- Receptors along AAB at a spacing of 25 m
- Receptors between AAB 500 m and ~1500 m at a spacing of 100 m (including in area of elevated terrain to the north)
- Receptors between ~1500 m and ~5500 m at a spacing of 500 m
- Receptors between ~5500 m and Hayden Pb NAA boundary at a spacing of 1000 m
- Receptors along the Hayden Pb NAA boundary at a spacing of 2500 m

EPA's AERMAP software tool (version 18081) was used to estimate receptor elevations and hill heights. Four 1/3 arc-second USGS GeoTiff files were used as inputs to AERMAP. The datum for this AERMAP processing was 1983 North American Datum (NAD83).

4.0 MODEL SELECTION

As outlined in the EPA's Modeling Guidance for Nonattainment Areas, the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD), or one of the other preferred models in Appendix W, should be used for near-field dispersion unless use of an alternative model can be justified.

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) (version 22112) was used to predict ambient concentrations in simple, complex and intermediate terrain. AERMOD is the recommended sequential model in EPA's GAQM (40 CFR 51, Appendix W) for near-field analysis.

There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET (version 22112), a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP (version 18081), a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data. Other non- regulatory components of this system include: AERSURFACE (Version 20060), a surface characteristics preprocessor, and BPIPPRIM (version 04274), a multi-building dimensions program incorporating the Good Engineering Practice technical procedures for PRIME applications.

The regulatory default option was used. This option commands AERMOD to:

- Use the elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Use stack tip downwash (building downwash automatically overrides);
- Use the calms processing routines;
- Use buoyancy-induced dispersion;
- Use the missing meteorological data processing routines.

5.0 SOURCE INPUTS

This section discusses source characterization to develop appropriate source inputs for dispersion modeling. Section 5.1 provides an overview of Asarco's facility operations and Pb controls, Section 5.2 provides details on source configuration, source types and source release parameters, Section 5.3 discusses Good Engineering Practice (GEP) stack heights, and Section 5.4 provides details on urban/rural determination of the sources.

5.1 Asarco FACILITY OPERATIONS AND PB CONTROLS

The technologies that presently are used to capture and control particulate emissions, including Pb emissions, from the smelter process source operations at the Hayden smelter are as follows (including those implemented as part of the CRP):

- Double contact acid plant for handling flash furnace and converter process gases
- Furnace ventilation baghouse system
- Converter secondary baghouse system
- Converter tertiary gas system
- Anode process gas baghouse system

The three additional process emissions capture and control projects that are described in Asarco's petition are as follows:

- Anode secondary hood baghouse system
- Fuming ladle hood system
- Furnace uptake ventilation system

Various controls including wind fencing, water sprays, wet scrubbers, baghouses and enclosure are used on material handling and road sources. These are detailed in the current Class I Operating Permit 39948.

5.2 SOURCE CONFIGURATION, TYPES, AND RELEASE PARAMETERS

Pb emissions will be released to the atmosphere from seven primary locations/activities at Asarco's Hayden operations: the Main Smelter Stack, the Anode Furnace roof monitors, the Converter Aisle roof monitors, the Flash Furnace building roof monitors, outdoor slag pouring, miscellaneous material handling activities, and fugitive dust from roadways. Modeled emissions were taken from Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022, with some additional safety factors discussed herein. The locations of modeled sources are depicted in Figures 5-1 and 5-2 for the Camera Hill and Hayden Jail runs, respectively.

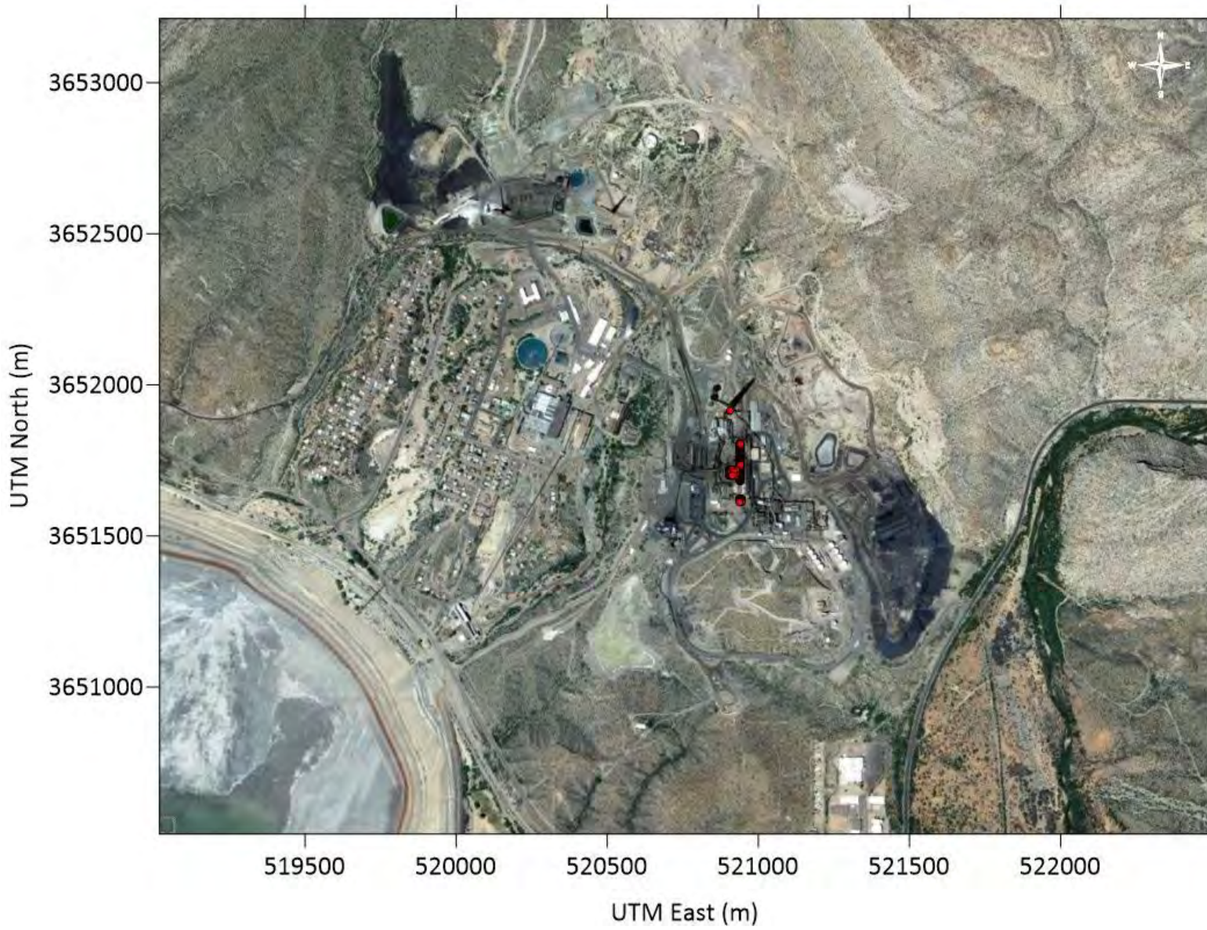


Figure 5-1
Modeled Emission Sources, Camera Hill

The sources modeled with the Camera Hill meteorological data include the Main Stack and the process fugitives (i.e., the Anode Furnace fugitives, the Flash Furnace fugitives, and the Converter Aisle fugitives).

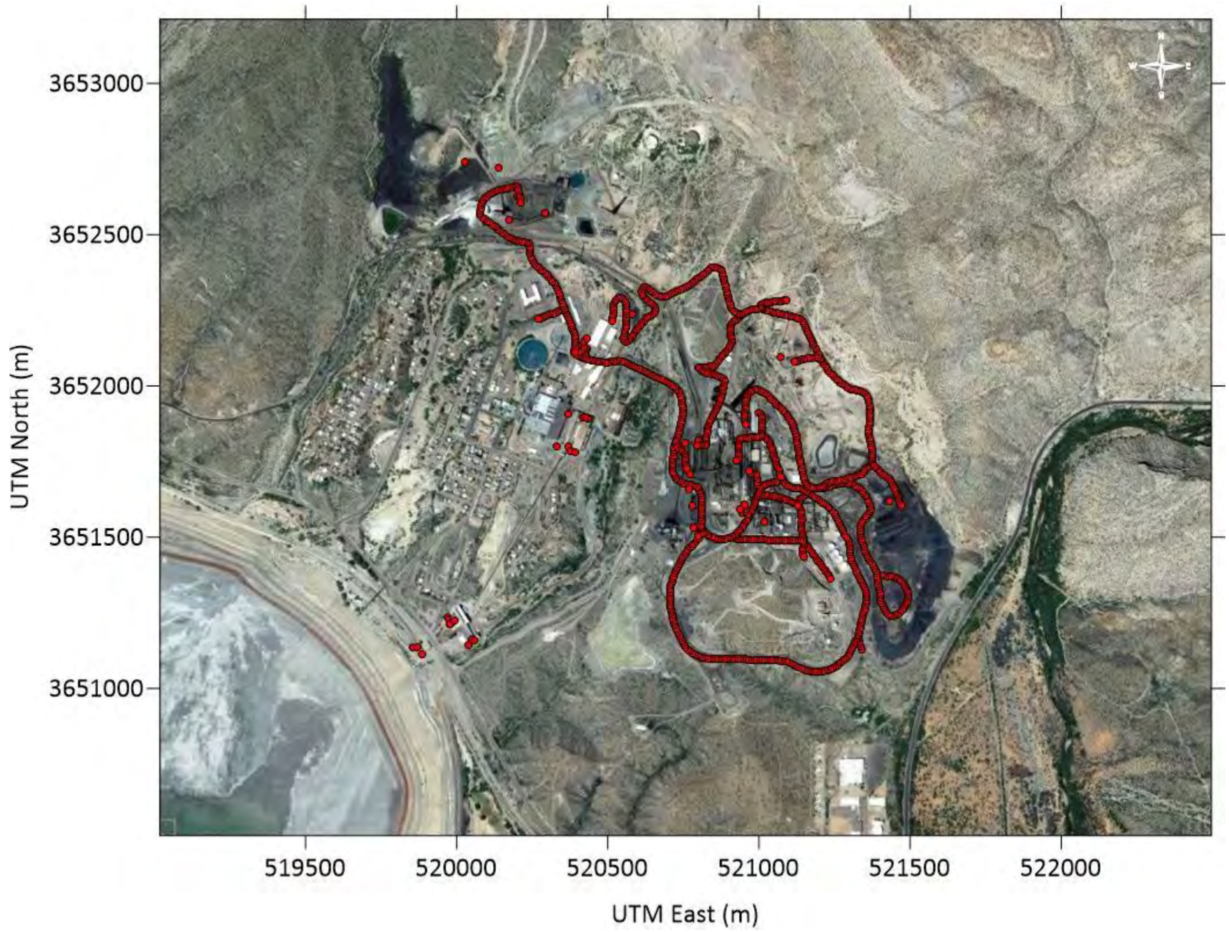


Figure 5-2
Modeled Emission Sources, Hayden Jail

The sources modeled with the Hayden Jail meteorological data include the following:

- Slag pouring
- Scrubbers associated with Concentrator Crushing
- Various material handling sources and storage piles
- Fugitive dust from road traffic
- Tailings ponds (not shown in Figure 5-2)

5.2.1 Point Sources

Point sources were used in the modeling to represent emissions from the Main Stack and Slag Pouring. Tables 5-1 and 5-2 presents the modeled point source characteristics for the Camera Hill and Hayden Jail runs, respectively.

Table 5-1 Modeled Point Source Characteristics, Camera Hill run

Source	UTM Coordinate (m)		Base Elev. (m)	Stack Height (m)	Exit Diam. (m)	Exit Vel. (m/s)	Exit Temp. (K)
	East	North					
Main Stack	520929.0	3651932.0	650.75	304.8	8.9	10.7	346.5

The modeled emission rate for the Main Stack was 0.683 lb/hr, the allowable emission rate under R-18-2-B1301(C).

Table 5-2 Modeled Point Source Characteristics, Hayden Jail run

Source	UTM Coordinate (m)		Base Elev. (m)	Stack Height (m)	Exit Diam. (m)	Exit Vel. (m/s)	Exit Temp. (K)
	East	North					
Slag Pouring	521458.0	3651636.0	626.9	0.0	13.3	1.5	1333.0

The modeled emission rate for the Slag Pouring was 0.012 lb/hr, taken from the Title V renewal application, reproduced in Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022.

5.2.2 Volume Sources, Non-Roads

Fugitive emissions from the Anode Furnace, Converter Aisle, and Flash Furnace Building were represented in the modeling by volume sources, as were emissions from a variety of material handling sources. Tables 5-3 and 5-4 present the modeled volume source characteristics for the Camera Hill and Hayden Jail runs, respectively. Safety factors were added to the g/s values in the Camera Hill run for added conservatism.

Table 5-3 Modeled Volume Source Characteristics, Camera Hill run

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate per Source (g/s)
AFW* AFE*	Anode Furnace: West, East	640.08	31.35[e]	0.7[a]	11.34[f]	3.75E-05
CES* CWS* CEN* CWN*	Converter Aisle: East South, West South, East North, West North	634.11	25.4 / 31.35[e]	0.7[a]	10.63 / 11.34[f]	1.02E-04

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate per Source (g/s)
FFS* FMW* FME* FFN*	Flash Furnace: South, Middle West, Middle East, North	635.86	43.67	0.7[a]	19.85[b]	5.82E-04
FFPH*	Flash Furnace: Penthouse	635.86	43.59	7.44[c]	20.7[d]	5.82E-04

a. Line source represented by adjacent volume sources; length of side 1.5 m
b. Elevated source on or adjacent to building; building height 42.67 m
c. Line source represented by adjacent volume sources; length of side 16 m
d. Elevated source on or adjacent to building; building height 44.5 m
e. Release height of 25.5 m for southern portion of Converter Aisle, 31.35 m for northern portion of Converter Aisle (including above Anode Furnace)
f. Elevated source on or adjacent to building; southern portion of Converter Aisle building height 22.86 m, northern portion of Converter Aisle (including above Anode Furnace) building height 24.38 m

The emissions for the Anode Furnace fugitives (0.029 lb/hr), the Converter Aisle fugitives (0.0711 lb/hr), and the Flash Furnace fugitives (0.226 lb/hr) and were evenly distributed amongst all volume sources.

Table 5-4 Modeled Volume Source Characteristics, Hayden Jail run

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate (g/s)
DUMPHOPPER	Unloading Materials to Ground Level Dump Hopper by a loader; Smelter, HP-5h; Unloading only	648.71	0	0.801	0.116	7.62E-06
FEEDTODRYERS	Loading out from Bedding Area to Surf-Lev Hopper and Belt to Dryers; Smelter, HP-5h; Loading only	646.72	0	0.801	0.116	1.52E-05
CONCTLOADIN	Copper concentrate transfer from semi-trucks to storage pile; Smelter, HP-6h; Unloading only	652.76	1.194	0.284	0.555	5.53E-06

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate (g/s)
CONCLOADOUT	Concentrate Loading into railcars by a loader; Smelter, HP-6h; Loading only	651.92	4.013	0.801	0.520	1.11E-05
RVRTLOADIN	Transfer of reverts to outdoor storage via MACK truck; Smelter, HP-21h; Unloading only	639.86	1.06	0.508	2.741	9.89E-05
RVRTLOADOUT	Loading out reverts from storage piles into trucks; Smelter, HP-21h; Loading only	639.86	2.591	0.801	0.319	7.91E-04
NRVRTLOADIN	Loading Reverts to the Storage Area via Trucks; Smelter, HP-22h; Unloading only	633.95	0.31	0.508	2.740	9.89E-05
NRVRTLOADOUT	Loading out the reverts into trucks by loader; Smelter, HP-22h; Loading only	633.95	3.261	0.801	0.319	1.98E-04
SMITHCO	Smith Co. Crushing and Screening	649.14	4.027	30.07	3.75	6.67E-04[a]
THIKENER	Thikener Project	638.00	15.837	1.843	7.376	3.83E-05
CDOPE_IN	Cold Dope Loading; Smelter, HP-70h; Loading only	634.19	1.1217	0.3	1.42	1.98E-04
CDOPEOUT	Cold Dope Unloading; Smelter, HP-70h; Unloading only	634.19	5.6884	0.3	1.32	3.96E-04
CFOF_NW	Concentrator, Fine Ore, Fugitves, northwest door with flaps, F21	639.47	2.9	1.93	8.279	3.26E-05 [a,b,c]
CFOF_NE	Concentrator, Fine Ore, Fugitves, northeast door with flaps, F21	637.95	2.9	1.93	8.279	3.26E-05 [a,b,c]
CFOFNTOP	Concentrator, Fine Ore, Fugitves, top on	638.56	13.5	1.302	8.279	3.26E-05 [a,b,c]

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate (g/s)
	north side (above doors), F21					
CFOF_SW	Concentrator, Fine Ore, Fugitves, southwest door with flaps, F21	638.56	2.9	1.93	8.279	3.26E-05 [a,b,c]
CFOF_SE	Concentrator, Fine Ore, Fugitves, southeast door with flaps, F21	637.34	2.9	1.93	8.279	3.26E-05 [a,b,c]
CRUF_NW	Concentrator, Rail Unloading, Fugitives, NW side, F21 & F31	601.68	4.65	5.419	5.488	1.55E-04 [a,b,d]
CRUF_SE	Concentrator, Rail Unloading, Fugitives, SE side, F21 & F31	601.98	4.65	5.419	5.488	1.55E-04 [a,b,d]
CCF	Crushing building fugitives, F22	599.51	7.62	15.24	15.24	5.14E-04[a,b]
CTUF_NE	Concentrator, Transfer House, Fugitives, northeast side, F23	600.76	9.7	0.419	5.674	2.45E-05[a,b,e]
CTUF_SW	Concentrator, Transfer House, Fugitives, southwest side, F23	601.37	9.7	0.419	5.674	2.45E-05 [a,b,e]
CSTDMT	Smelter - Concentrate Storage & Truck Dump - Transfer from truck to, F28	657.68	1.02	0.509	2.78	3.28E-06 [a,b,f]
CSTDLO	Smelter - Concentrate Storage & Truck Dump - Load out from pile, F28	657.68	2.59	0.799	0.32	3.28E-06 [a,b,f]
CONCSCRN	Concentrate Screen fugitives, F25	656.54	4.027	30.07	3.75	1.73E-06[a,b]
SLAGHNDL	Slag processing material handling, F32	651.05	1.016	0.508	2.741	1.06E-04[a]

Source ID	Description	Base Elev. (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)	Emission Rate (g/s)
b. Modeled g/s emission rate derived from tpy emission rate from Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022						
c. Assumes mean Pb content from Assays (see Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022)						
d. Emissions split evenly amongst five CFOF sources						
e. Emissions split evenly amongst two CRUF sources						
f. Emissions split evenly amongst two CTUF sources						
g. Emissions split evenly amongst two CSTD sources						

Supporting information regarding the derivation of these volume source characteristics is presented in Appendix A.

5.2.3 Volume Sources, Roads

Fugitive emissions from fugitive dust generated by road traffic was represented by 1112 volume sources along the various roadway paths in the Hayden Jail run. The following truck types were included in the calculation of fugitive road emissions:

- Concentrate
- Flux delivery to crusher
- Flux to storage
- Flux to bedding area
- H_2SO_4
- Slag to crusher
- Slag crusher to lumber spur
- Miscellaneous truck deliveries
- General traffic and warehouse
- Scrap handling forklift
- Water/sweeper
- Miscellaneous use forklift
- Storage pile loader
- Miscellaneous use loader
- Blister copper
- Slag hauler
- Flux, delivery to crusher

Modeled emissions were derived from the tpy emission rates from Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022.

The roadway paths modeled included 22 paved segments and 10 unpaved segments. Some of the segments only had one type of truck driving on them while some had multiple. The emission rate for each individual volume source was the sum of the source-specific emission rates for all types of truck driving at the location of that specific volume source.

Full details concerning the derivation of the volume source characteristics and modeled emission rates are provided in Appendix B.

5.2.4 AreaPoly Sources

Fugitive emissions from storage areas/piles were represented as AreaPoly sources in the Hayden Jail run. Table 5-5 presents the modeled AreaPoly source characteristics.

Table 5-5 Modeled AreaPoly Source Characteristics, Hayden Jail run

Source ID	Description	Base Elev. (m)	Release Height (m)	Number Vertices	Emission Rate (g/s)
BEDDING	Bedding Area Emission by Wind Erosion; Smelter, HP-5h; Wind erosion only	647.33	6.096	6	5.37E-06
CONCSTORAGE	Concentrate Storage Area; Smelter HP-6h; Wind erosion only	655.36	3.048	9	1.14E-04
SOUTHREVERT	Revert Pile Fines-South Storage; Smelter, HP-21h; Wind erosion only	645.09	2.134	6	6.93E-06
NORTHREVERT	Revert Coarse Storage-North; Smelter, HP-22h; Wind erosion only	633.98	1.295	4	2.12E-08
COLDDOPE	Cold Dope pile wind erosion; Smelter, HP-70h; Wind erosion only	634.19	3.048	4	1.30E-07
NORTHTAILIN	North Tailing, F26	585.84	0.5	31	2.66E-04 [a,b]
SOUTHTAILIN	South Tailing, F26	607.67	0.5	17	2.66E-04 [a,b]
c. Modeled g/s emission rate derived from tpy emission rate from Attachment 1-C of the Significant Permit Revision application submitted on December 16, 2022 d. Emissions split evenly amongst two TAILIN sources					

5.3 GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT

There are two definitions of Good Engineering Practice (GEP) stack height: (i) formula GEP stack height and (ii) regulatory GEP stack height. EPA requires sources to evaluate building downwash effects when a stack is less than formula GEP stack height (see Equation 5-1 below). Regulatory GEP stack height is either 65 meters or formula GEP stack height, whichever is greater. The EPA does not allow sources to take credit for ambient air concentrations that result from stacks that are higher than regulatory GEP stack height.

As discussed in the ADEQ's June 2002 "Final Hayden Sulfur Dioxide Assessment Nonattainment Area State Implementation and Maintenance Plan", the GEP height for Asarco's Main Stack was assessed in a fluid modeling study jointly conducted by North American Weather Consultants and Colorado State University, with that study concluding that the stack's 1,000-foot height meets GEP stack height requirements. EPA subsequently approved Arizona's SIP determination of GEP stack height. No structures have since been constructed at Asarco that would affect this determination. Asarco's main stack was modeled at its true height of 1,000 feet.

An analysis was conducted of the other point sources, with respect to GEP, in accordance with EPA's guidelines for air quality impact modeling. EPA's Building Profile Input Program for PRIME (BPIPPRM, version 04274; U.S. EPA, 2004a) was used to compute the formula GEP stack height and to generate wind- direction specific building profiles for each stack for the purpose of sequential modeling. For stacks constructed after January 12, 1979, EPA defined the Formula GEP stack height as:

$$HH_{GGGGGG} = HH_{BB} + 1.5LL_{BB}$$

Where:

H_{GEP} = GEP stack height;
H_B = Building height above stack base; and
L_B = Lesser of building's height or maximum projected width

Figure 5-3 presents a simplified layout of the point source modeled in the Camera Hill run while Figure 5- 4 presents a simplified layout of the point sources modeled in the Hayden Jail run.

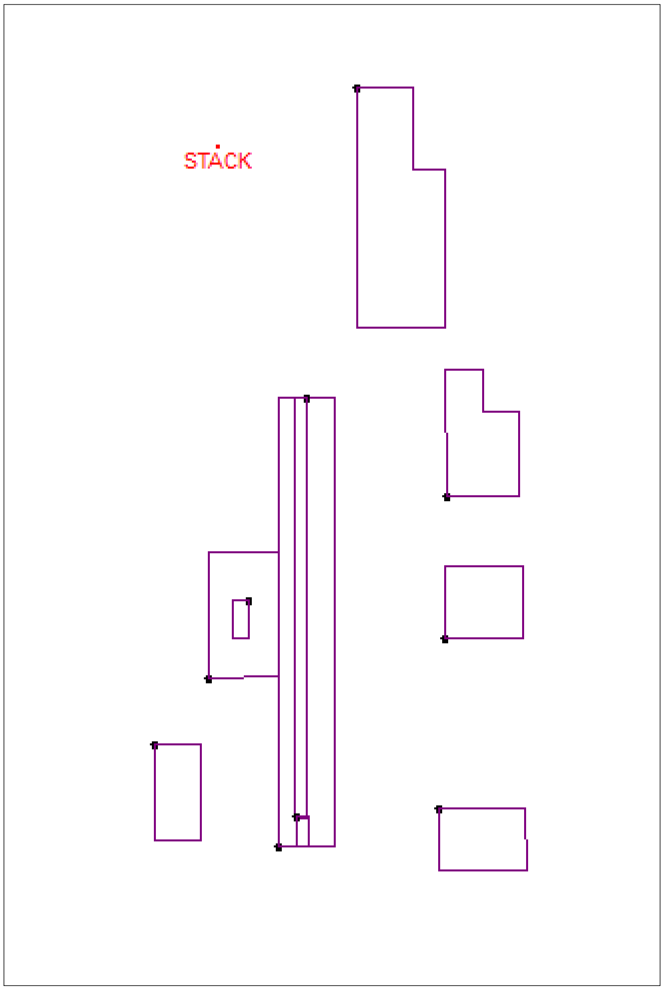


Figure 5-3
Simplified Facility Layout, Camera Hill point source

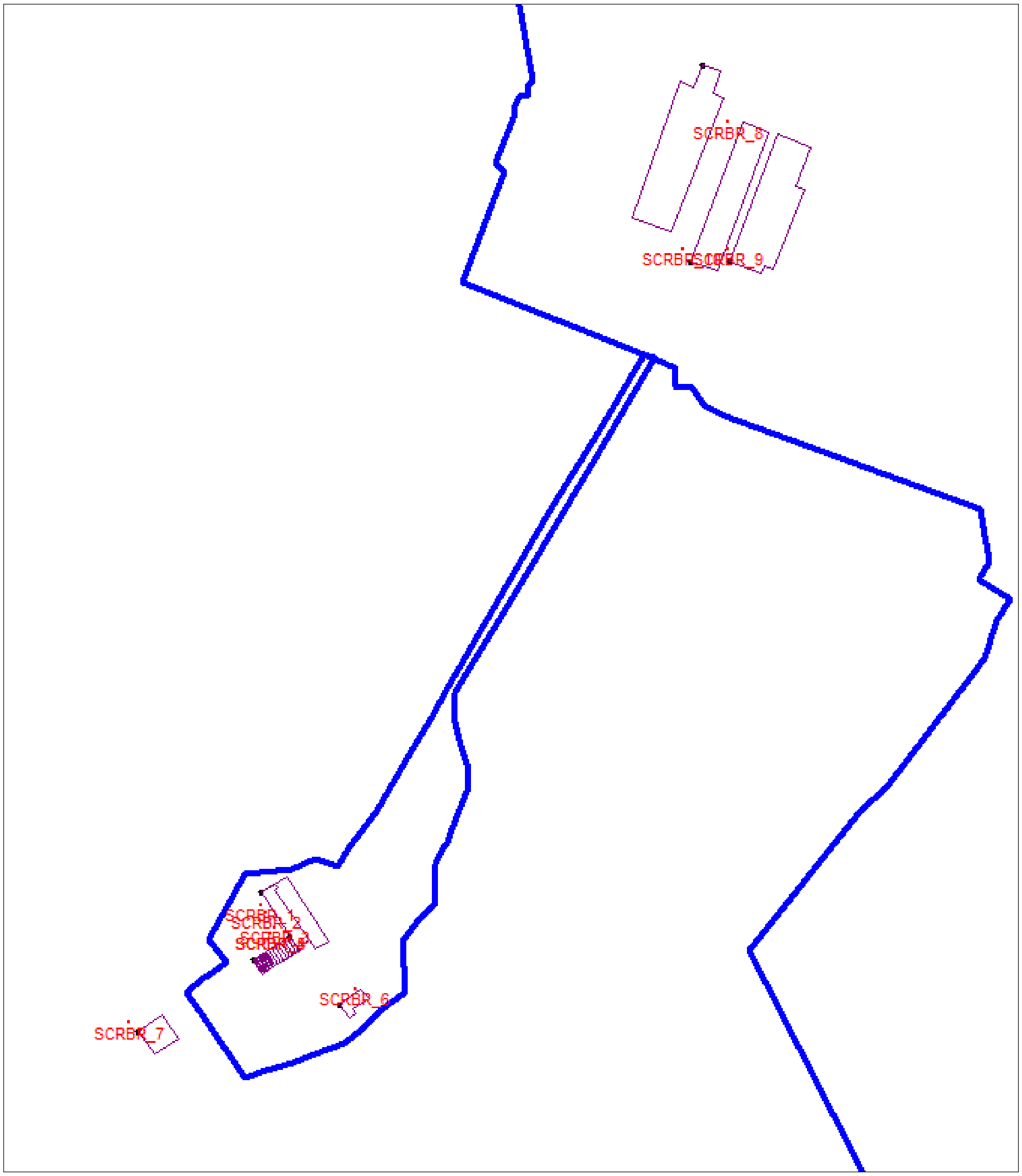


Figure 5-4
Simplified Facility Layout, Hayden Jail point sources

Pertinent input/output files for the BPIPPRIM analysis are being forwarded to ADEQ concurrent with the submission of this report.

5.4 URBAN/RURAL DETERMINATION

Dispersion coefficients for air quality modeling are selected based on the land use classification technique suggested by Auer, which is EPA's preferred method. The classification determination involves assessing land use by Auer's categories within a 3-kilometer radius of the proposed site. A source should select urban dispersion coefficients if greater than 50 percent of the area consists of urban land use types; otherwise, rural coefficients apply.

Following Section 3.7 of the ADEQ Modeling Guidelines, the land use of the area was classified using the land-use procedure set forth in EPA's "Guideline on Air Quality Models" (GAQM). This approach requires determining the amount of specific types of land use categories within a 3-km radius circle centered on the source; if the total land use (as defined by Auer) is classified as 50% or more "urban" then the area is designated as urban; otherwise it is designated as rural.

Land use (taken from the U.S. Geological Survey (USGS) National Land Cover Data (NLCD) 2016 archives) was examined for the 3-km radius circle, and totals of each land use category were calculated. These land use categories were then correlated to the categories as established by Auer, and the amount of urban and rural land use within 3 km of Asarco's facility was calculated. This area is depicted in Figure 5-5, while the results of the analysis are presented in Table 5-6.

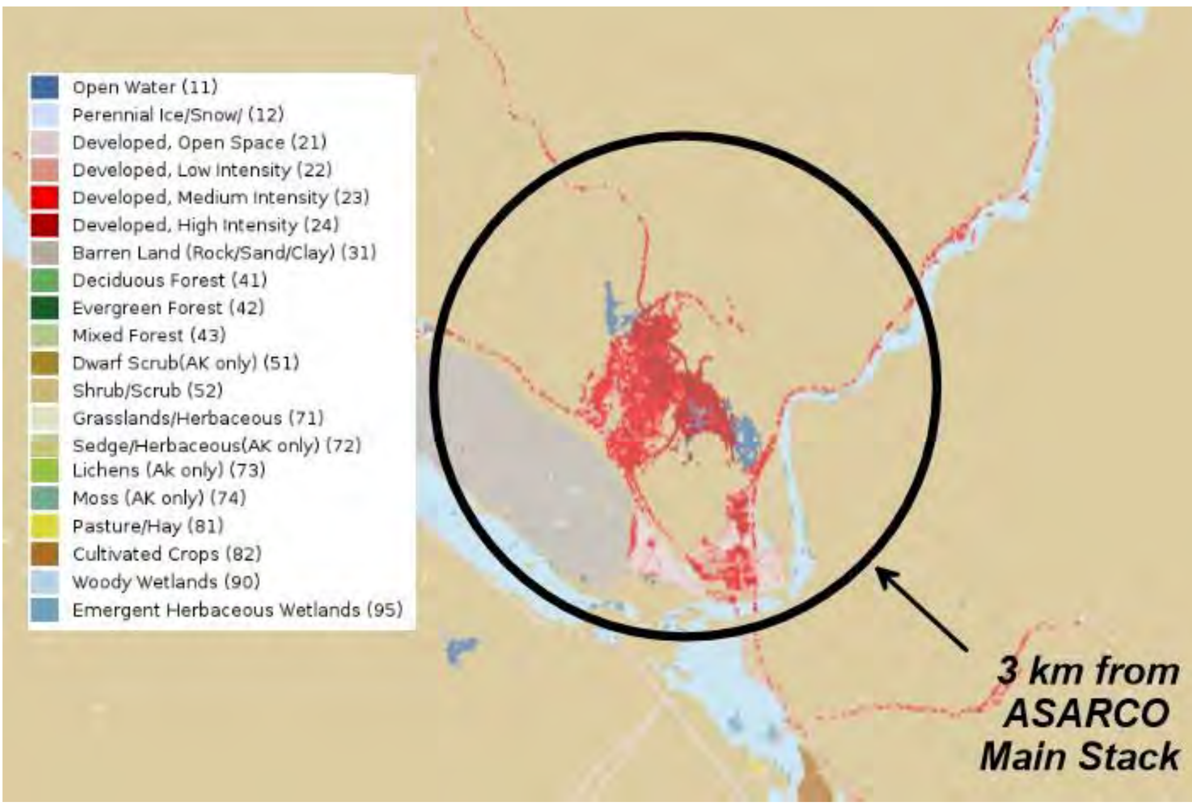


Figure 5-5
Land Use Near Asarco's Facility

Table 5-6 Land Use Analysis within 3 km of Asarco's Facility

2016 NLCD Land Use Category	Percent of Area within 3 km of Asarco's Facility	Rural/Urban
Open Water	0.0%	Rural
Perennial Ice/Snow	1.0%	Rural
Developed, Open Space	0.0%	Rural
Developed, Low Intensity	2.2%	Urban
Developed, Medium Intensity	3.3%	Urban
Developed, High Intensity	4.7%	Urban
Barren Land (Rock/Sand/Clay)	2.6%	Rural
Unconsolidated Shore	9.9%	Rural
Deciduous Forest	0.0%	Rural
Evergreen Forest	0.0%	Rural
Mixed Forest	0.0%	Rural
Dwarf Scrub	0.0%	Rural
Shrub/Scrub	0.0%	Rural
Grasslands/Herbaceous	67.6%	Rural
Sedge/Herbaceous	0.0%	Rural
Lichens	0.0%	Rural
Moss	0.0%	Rural
Pasture/Hay	0.0%	Rural
Cultivated Crops	0.0%	Rural
Woody Wetlands	0.0%	Rural
Palustrine Forested Wetland	8.2%	Rural
Palustrine Scrub/Shrub Wetland	0.0%	Rural
Estuarine Forested Wetland	0.0%	Rural
Estuarine Scrub/Shrub Wetland	0.0%	Rural
Emergent Herbaceous Wetland	0.0%	Rural
Palustrine Emergent Wetland (Pe	0.4%	Rural
Estuarine Emergent Wetland	0.0%	Rural
Palustrine Aquatic Bed	0.0%	Rural
Estuarine Aquatic Bed	0.0%	Rural

For the purposes of the Auer Method, the following 2016 NLCD land use categories were assumed to be "urban":

- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity

As shown in Table 5-4, these three land use categories comprise 10.2% of the land use within 3 km of Asarco's facility; accordingly, the sum of the "rural" categories is 89.8%. Therefore, the area within 3 km of Asarco's facility is defined as "rural" and identified as such in the AERMOD input.

Pertinent input/output files for the AERSURFACE analysis used in the urban/rural determination are being forwarded to ADEQ concurrent with the submission of this report.

6.0 METEOROLOGICAL DATA

As has been done historically by ADEQ in its Pb modeling for the Hayden Pb NAA, the modeling analysis comprised of two separate model runs—one using meteorological data from the Camera Hill station (for the "elevated" sources) and one using meteorological data from the Hayden Jail station (for the "low- level" sources). The development of each set of meteorological data is detailed below.

The meteorological data used in the modeling were from the year 2020, which is the most recent complete year of data available. (During 2021 the solar radiation sensor at the Camera Hill station failed an audit and was replaced, leading to less than the minimum 90% data completeness requirement for regulatory modeling purposes.)

6.1 CAMERA HILL DATA

6.1.1 AERMET

EPA's AERMET tool (version 22112) was used to process meteorological data for use with AERMOD. AERMET merges National Weather Service (NWS) surface observations with NWS upper air observations and performs calculations of meteorological parameters required by AERMOD. Surface observations from on-site instruments can optionally be included. The latter can be useful because the data are more relevant to the site being modeled and in cases where on-site data are collected at multiple elevations above ground, AERMET can construct a more accurate vertical profile of meteorological data. In addition to the meteorological observations, AERMET further requires the inclusion of the characteristics of land use surfaces determined using EPA's AERSURFACE tool.

The data inputs to AERMET are described below. AERMET input/output files are being forwarded to ADEQ concurrent with the submission of this report.

6.1.2 Surface Observations

The Camera Hill meteorological monitor is located approximately 0.35 kilometers south of the smelter building, on Camera Hill. Figure 6-1 shows the location of the tower.

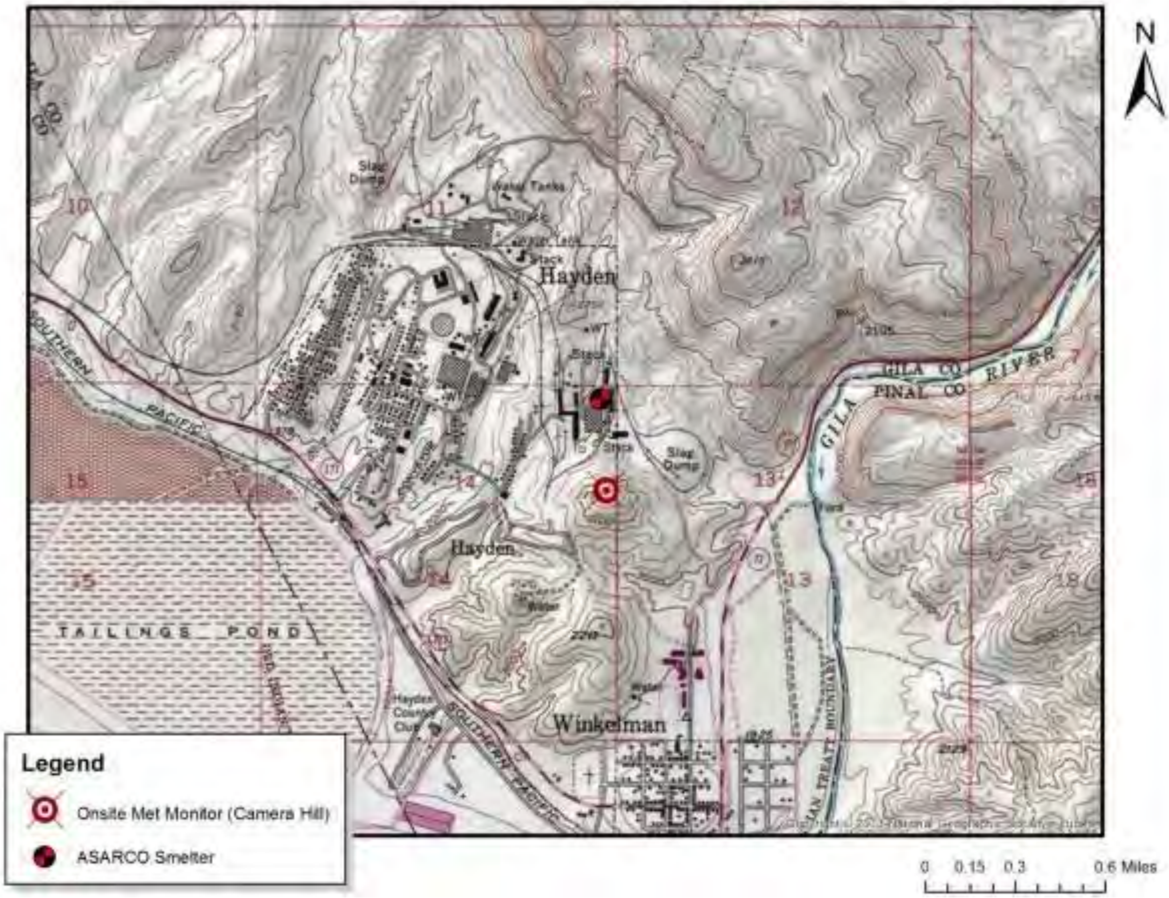


Figure 6-1
Camera Hill Onsite Meteorological Station

6.1.3 Upper Air Observations

Upper air data were taken from the Tucson International Airport (WBAN 23160) in Tucson, Arizona.

6.1.4 AERSURFACE

EPA's AERSURFACE tool (version 20060) was used to calculate the surface roughness length, albedo and Bowen ratio inputs required by AERMET. EPA developed AERSURFACE to identify these parameters within a defined radius from a specified point. In this case, BSM input the UTM coordinates of the Camera Hill station to AERSURFACE along with a 1-kilometer radius per EPA guidance. BSM used land cover, tree canopy, and impervious surface information for the year 2016 as inputs to AERSURFACE. BSM calculated the parameters for twelve compass sectors of 30° each, and by month. BSM assigned the seasonal categories as follows per ADEQ guidance:

> Late autumn after frost and harvest, or winter with no snow: December, January, February, March;

- Winter with continuous snow on the ground: none;
- Transitional spring (partial green coverage, short annuals): April, May, June;
- Midsummer with lush vegetation: July, August, September; and
- Autumn with un-harvested cropland: October, November.

Per an August 16, 2022 email from Feng Mao (ADEQ) to Bill Jones (BSM), the model assumed dry surface moisture conditions for 2020.

Pertinent input/output files for the AERSURFACE analysis used in the determination of moisture conditions for each of the modeled years are being forwarded to ADEQ concurrent with the submission of this report.

6.1.5 Processed Data Completeness

The most recent years of data from the Camera Hill station were reviewed to determine which were eligible for use in regulatory modeling. Table 6-1 presents the results of this analysis for the years of data proposed for use in the modeling.

Table 6-1 Camera Hill Data Completeness Analysis

Year	Quarter	Percentage of Missing Data by Variable				
		Wind Direction	Wind Speed	Temperature (2 m)	Temperature (10 m)	Sigma Theta
2020	1	0.1%	0.1%	0.1%	0.1%	0.1%
	2	0.0%	0.0%	0.0%	0.0%	0.0%
	3	0.1%	0.1%	0.1%	0.1%	0.1%
	4	0.0%	0.0%	0.0%	0.0%	0.0%

As can be seen, the meteorological data used in this analysis meet the completeness requirement as stipulated in Section 5.3.2 of EPA's "Meteorological Monitoring Guidance for Regulatory Applications."[2]

6.2 HAYDEN JAIL DATA

6.2.1 AERMET

Consistent with the processing of the Camera Hill meteorological data, AERMET (version 22112) was used to process meteorological data for the Hayden Jail meteorological data.

The data inputs to AERMET are described below. AERMET input/output files are being forwarded to ADEQ concurrent with the submission of this report.

[2] Meteorological Monitoring Guidance for Regulatory Applications. United States Environmental Protection Agency. EPA-454/R-99-005. February 2000.

6.2.2 Surface Observations

The Hayden Jail meteorological monitor is located approximately 1 kilometer west of the smelter building. It measures temperature at 2.1 m and winds at 10 m. It is located at an elevation of approximately 2043 feet, which is representative of the elevation above sea level of most low-level sources (e.g., not the Main Stack). Figure 6-2 shows the location of the tower.

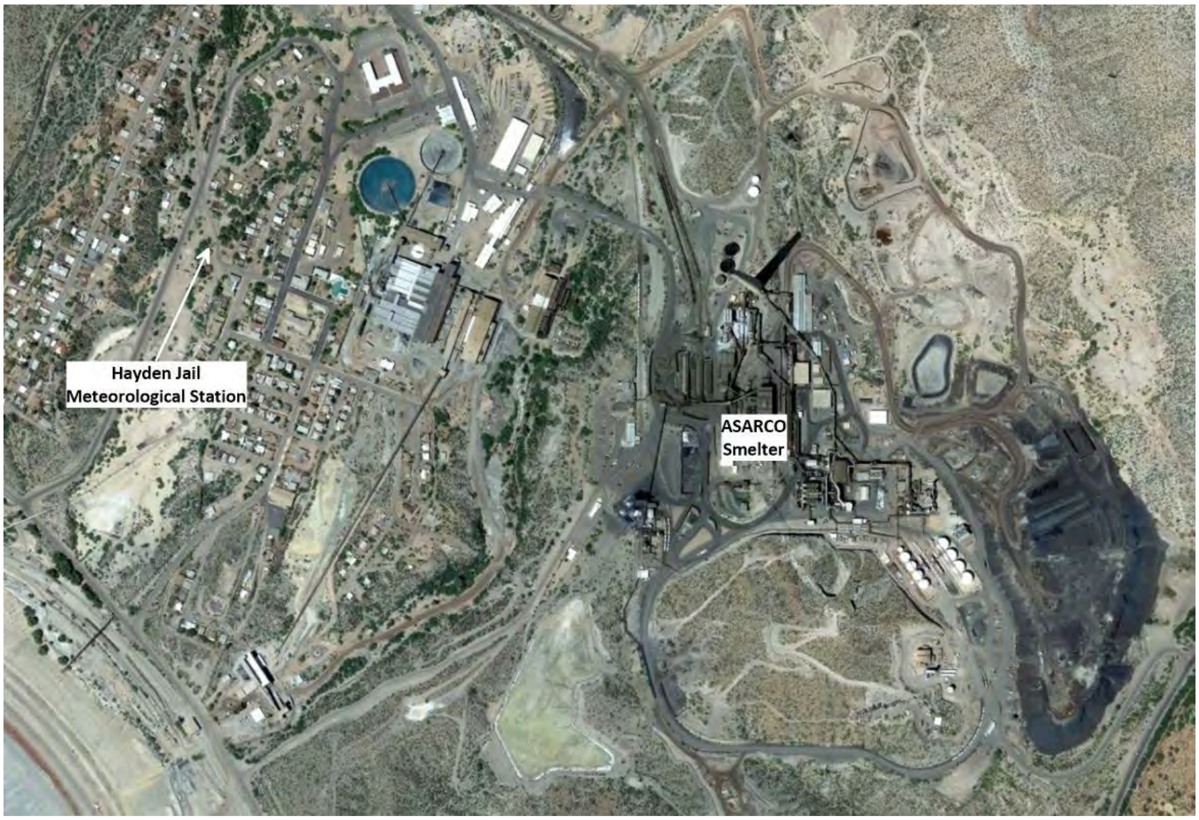


Figure 6-2
Hayden Jail Meteorological Station

Because the Hayden Jail only records temperature at one level, cloud cover is necessary to facilitate the calculation of the boundary layer parameters used by AERMOD. Per a November 28, 2022 email from Kamran Khan (ADEQ) to Bill Jones (BSM), the model employed cloud cover data from the Safford Regional Airport (WBAN 93084) in Safford, Arizona.

6.2.3 Upper Air Observations

Upper air data were taken from the Tucson International Airport (WBAN 23160) in Tucson, Arizona.

6.2.4 AERSURFACE

Consistent with the processing of the Camera Hill meteorological data, AERSURFACE (version 20060) was used to process meteorological data for the Hayden Jail meteorological data.

BSM input the UTM coordinates of the Hayden Jail meteorological tower to AERSURFACE along with a 1-kilometer radius per EPA guidance. BSM acquired land cover, tree canopy, and impervious surface information for the year 2016 as inputs to AERSURFACE. BSM calculated the parameters for twelve compass sectors of 30° each, and by month. BSM assigned the seasonal categories as follows per ADEQ guidance:

- Late autumn after frost and harvest, or winter with no snow: December, January, February, March;
- Winter with continuous snow on the ground: none;
- Transitional spring (partial green coverage, short annuals): April, May, June;
- Midsummer with lush vegetation: July, August, September; and
- Autumn with un-harvested cropland: October, November.

Per an August 16, 2022 email from Feng Mao (ADEQ) to Bill Jones (BSM), the model assumed dry surface moisture conditions for 2020.

Pertinent input/output files for the AERSURFACE analysis used in the determination of moisture conditions for each of the modeled years are being forwarded to ADEQ concurrent with the submission of this report.

6.2.5 Processed Data Completeness

The most recent years of data from the Camera Hill station were reviewed to determine which were eligible for use in regulatory modeling. Table 6-2 presents the results of this analysis for the years of data proposed for use in the modeling.

Table 6-2 Hayden Jail Data Completeness Analysis

Year	Quarter	Percentage of Missing Data by Variable		
		Wind Direction	Wind Speed	Temperature (2.1 m)
2020	1	0.0%	0.0%	0.0%
	2	0.0%	0.0%	0.0%
	3	0.9%	0.0%	0.0%
	4	0.0%	0.0%	0.0%

As can be seen, the meteorological data used in this analysis meet the completeness requirement as stipulated in Section 5.3.2 of EPA's "Meteorological Monitoring Guidance for Regulatory Applications."[3]

[3] Meteorological Monitoring Guidance for Regulatory Applications. United States Environmental Protection Agency. EPA-454/R-99-005. February 2000.

7.0 BACKGROUND AIR QUALITY

The smelter has been temporarily shut down since October 2019. Therefore, the background ambient air concentration of Pb that BSM used in the modeling analysis is derived from ambient air monitoring data that were generated from November 2019 through September 2022.

Ambient air monitoring data were generated by two state and local air monitoring stations in the Hayden Pb NAA—the one at Globe Highway to the east of the slag dump along Highway 77 and the one at Hillcrest in the town of Hayden. During November 2019 through September 2002, the data from the Hillcrest monitor had higher concentrations of Pb than the data from the Globe Highway monitor. Therefore, to be conservative, BSM's modeling analysis used a background concentration of Pb that has been calculated using the data from the Hillcrest monitor.

The location of the Hillcrest monitor is shown in Figure 7-1. The monitor is nearly surrounded by Asarco's facility and is typically in the pathway of wind blowing from sources of fugitive dust within the facility— including dust occasionally generated by road traffic and residual material management operations at the facility—from practically all points of the compass. Nonetheless, pursuant to § 8.3.2(c)(i) of Appendix W of 40 CFR Part 51, the monitoring data used to calculate the background concentration of Pb employed in the modeling analysis excluded data generated when wind was blowing from a 90-degree arc relative to the monitor; specifically, when wind was blowing from 16 to 106 degrees relative to the monitor, as shown in Figure 7-2.

Hayden Jail meteorological data were examined and each day with at least one hour of wind blowing from within this sector was identified. If a Pb monitor value was from one of those days, it was excluded from the calculation of the background concentration. In the absence of Hayden Jail meteorological data for 2022, for the sake of conservatism all the monitor values in 2022 were included in the calculation.

This procedure resulted in 39 3-month rolling averages from November 2019 through September 2022. (There were four 3-month rolling periods in 2021 that had no eligible Pb monitor values to calculate a 3- month rolling average.) The average of all these was 0.010 µg/m^3. This is the value that was used in as the background concentration for the Pb SIP modeling.

Full details concerning the calculation of the Pb background concentration are provided in Appendix C.

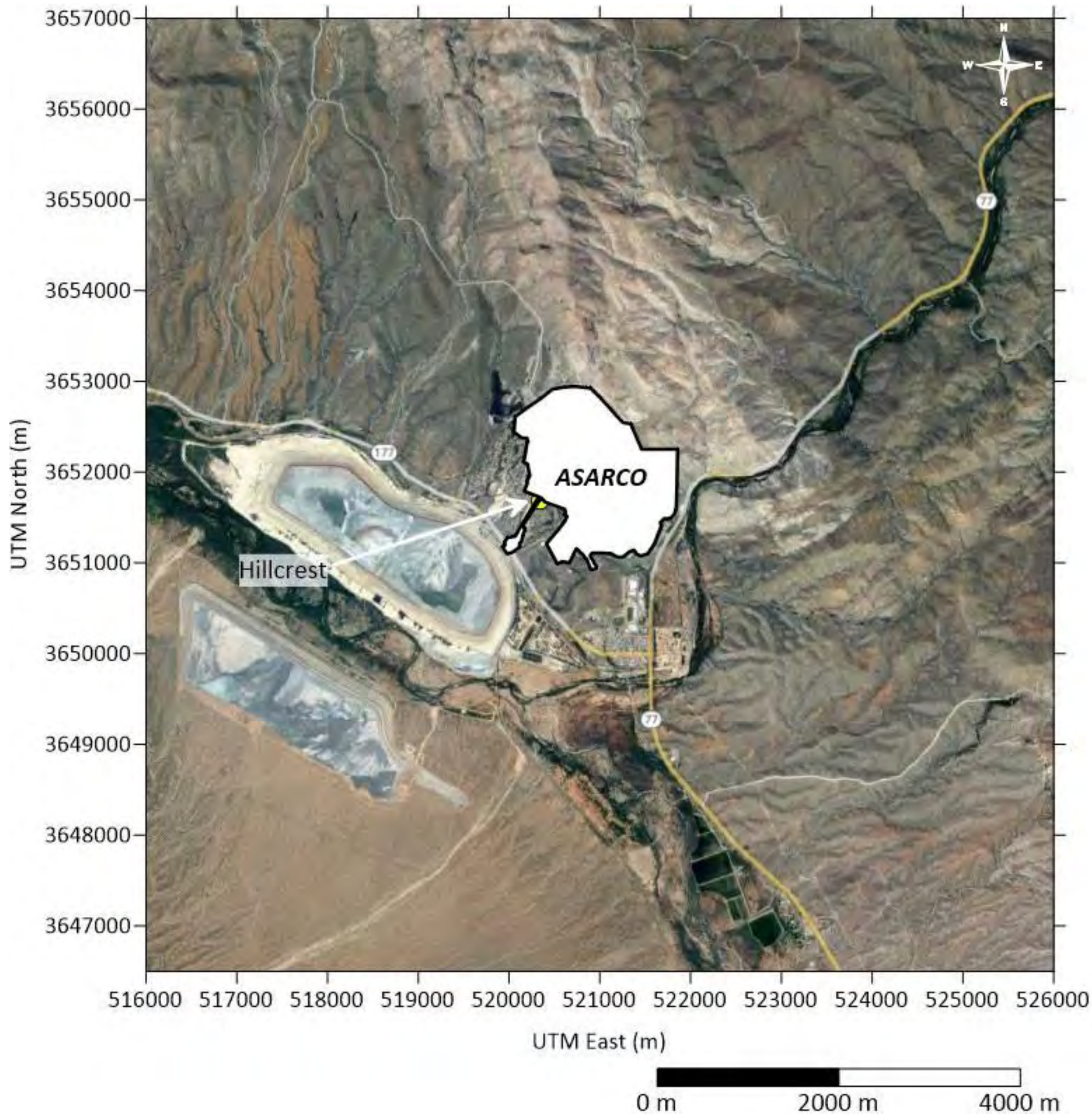


Figure 7-1 Hillcrest monitor

Figure 7-2 Hillcrest Exclusion Radials

8.0 MODELING RESULTS

As noted previously, the Pb SIP modeling was conducted by executing two separate model runs—one using the Camera Hill meteorological data (for “elevated” sources) and one using the Hayden Jail meteorological data (for “low level” sources). The results of those two runs were combined using the LEADPOST post-processor.

The results of the modeling analysis are summarized in Table 8-1 below.

Table 8-1. Modeling Results, Pb NAAQS

Highest 3-Month Concentration (μg/m^3)	Background Concentration (μg/m^3)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)
0.134[a]	0.013	0.147	0.15
a. Highest 3-Month Concentration predicted to occur at (521358.8 m, 3651137.8 m)			

Figure 8-1 below illustrates the Highest 3-Month predicted concentrations.

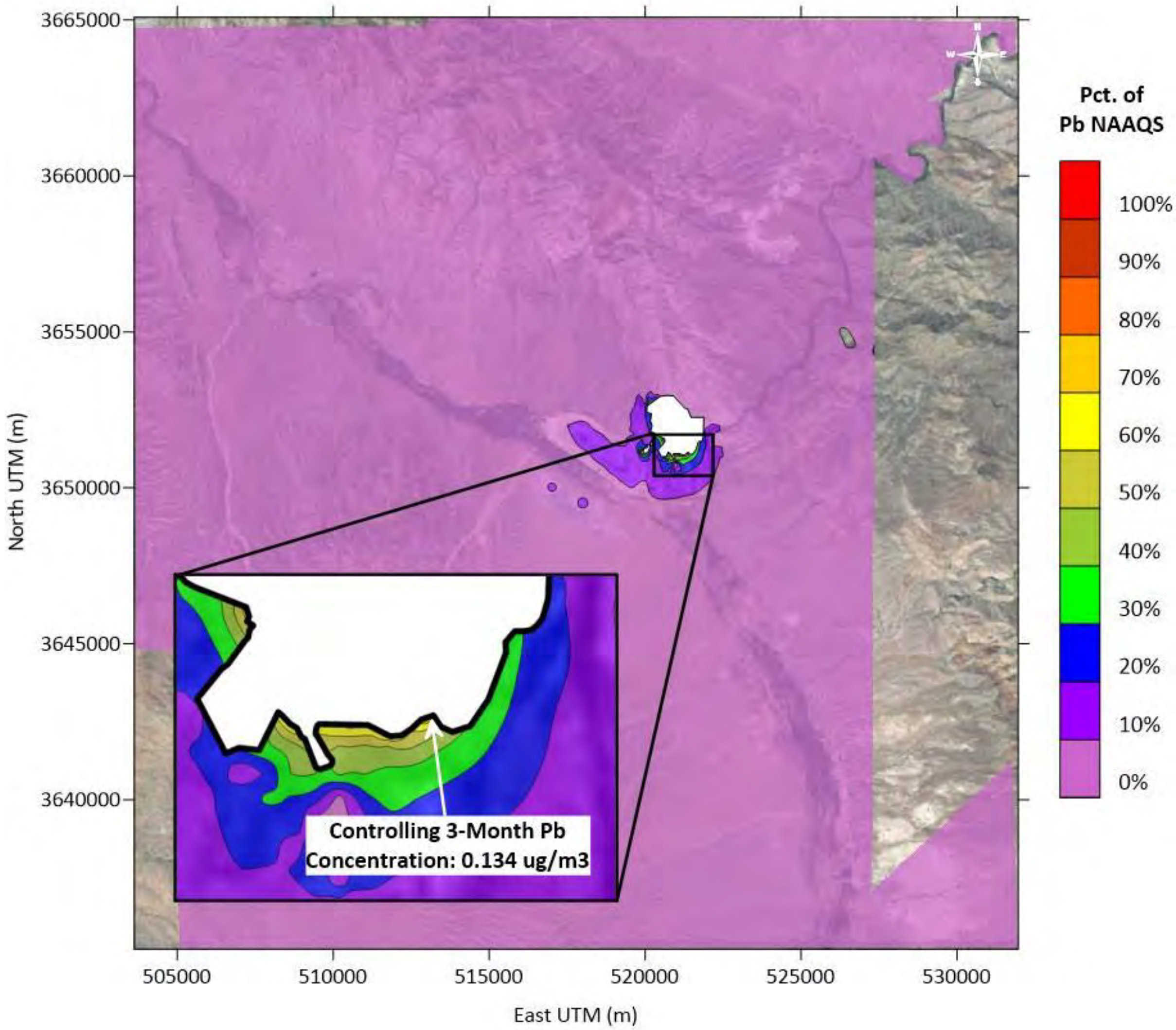


Figure 8-1
Highest 3-Month Pb Concentrations

As shown above, the controlling Pb concentration is below the Pb NAAQS of 0.15 µg/m^3. It is predicted to occur along the southern side of the Asarco AAB, to the south of Camera Hill. Modeled Pb concentrations decrease very rapidly with distance from Asarco.

AERMOD input/output files for the Pb NAAQS modeling are being forwarded to ADEQ concurrent with the submission of this report.

Appendix I: Appendices to Modeling Report

Appendix A
Volume Source Supporting Information
(Non-Roads)

Volume Source Parameters (non-roads)

Source ID	Type Volume Source	Dimensions (m)		Sigma y (m)	Sigma z (m)
		Width	Length		
DUMPHOPPER	Single	3.444	0.250	0.801	0.116
FEEDTODRYERS	Single	3.444	0.250	0.801	0.116
CONCTLOADIN	Single	1.219	1.193	0.284	0.555
CONCLOADOUT	Single	3.444	1.118	0.801	0.520
RVRTLOADOUT	Single	3.444	0.686	0.801	0.319
NRVRTLOADIN	Single	2.185	5.891	0.508	2.740
NRVRTLOADOUT	Single	3.444	0.686	0.801	0.319
SMITHCO	Single	129.300	8.063	30.070	3.750
THIKENER	Single	7.925	15.858	1.843	7.376
CDOPE_IN	Single	1.290	3.053	0.300	1.420
CDOPEOUT	Single	1.290	2.838	0.300	1.320
CFOF_NW	Single	8.299	17.800	1.930	8.279
CFOF_NE	Single	8.299	17.800	1.930	8.279
CFOFNTOP	Single	5.599	17.800	1.302	8.279
CFOF_SW	Single	8.299	17.800	1.930	8.279
CFOF_SE	Single	8.299	17.800	1.930	8.279
CRUF_NW	Single	23.302	11.799	5.419	5.488
CRUF_SE	Single	23.302	11.799	5.419	5.488
CCF	Single	65.532	32.766	15.240	15.240
CTUF_NE	Single	1.802	12.199	0.419	5.674
CTUF_SW	Single	1.802	12.199	0.419	5.674
CSTDMT	Single	2.189	5.977	0.509	2.780
CSTDLO	Single	3.436	0.688	0.799	0.320
CONCSCRN	Single	129.301	8.063	30.070	3.750
SLAGHNDL	Single	2.184	5.893	0.508	2.741

Note: dimensions based on 2015 ADEQ PM_{10} modeling and 2017 Site Visit

Appendix B
Volume Source Supporting Information
(Roads)

ASARCO Roads
Volume Sources

Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Initial Vert. Dimension (m)	Pb (g/s)
P1_0057	521362.77	3651147.79	635.36	2.55	4.19	2.37	7.28758E-06
P1_0058	521360.037	3651156.26	636.05	2.55	4.19	2.37	7.28758E-06
P1_0059	521358.15	3651165.06	636.54	2.55	4.19	2.37	7.28758E-06
P1_0060	521356.263	3651173.86	636.91	2.55	4.19	2.37	7.28758E-06
P1_0061	521354.376	3651182.66	637.12	2.55	4.19	2.37	7.28758E-06
P1_0062	521352.929	3651189.41	637.3	2.55	4.19	2.37	7.28758E-06
P2_0001	521351.2352	3651184.973	637.41	2.55	4.19	2.37	0.000002784
P2_0002	521346.9556	3651177.056	637.77	2.55	4.19	2.37	0.000002784
P2_0003	521342.6759	3651169.139	638.11	2.55	4.19	2.37	0.000002784
P2_0004	521338.3963	3651161.221	638.44	2.55	4.19	2.37	0.000002784
P2_0005	521334.1167	3651153.304	638.68	2.55	4.19	2.37	0.000002784
P2_0006	521329.8371	3651145.386	638.79	2.55	4.19	2.37	0.000002784
P2_0007	521325.5575	3651137.469	638.9	2.55	4.19	2.37	0.000002784
P2_0008	521321.2778	3651129.552	638.77	2.55	4.19	2.37	0.000002784
P2_0009	521316.9982	3651121.634	638.72	2.55	4.19	2.37	0.000002784
P2_0010	521311.1405	3651115.102	639.15	2.55	4.19	2.37	0.000002784
P2_0011	521303.8435	3651109.834	639.96	2.55	4.19	2.37	0.000002784
P2_0012	521296.5466	3651104.566	640.8	2.55	4.19	2.37	0.000002784
P2_0013	521289.2497	3651099.298	641.44	2.55	4.19	2.37	0.000002784
P2_0014	521281.9528	3651094.029	641.3	2.55	4.19	2.37	0.000002784
P2_0015	521274.6559	3651088.761	640.79	2.55	4.19	2.37	0.000002784
P2_0016	521267.3522	3651083.506	640.19	2.55	4.19	2.37	0.000002784
P2_0017	521258.7389	3651080.896	640.25	2.55	4.19	2.37	0.000002784
P2_0018	521250.1257	3651078.286	639.6	2.55	4.19	2.37	0.000002784
P2_0019	521241.5124	3651075.676	638.97	2.55	4.19	2.37	0.000002784
P2_0020	521232.6201	3651074.592	638.72	2.55	4.19	2.37	0.000002784
P2_0021	521223.6407	3651073.983	638.47	2.55	4.19	2.37	0.000002784
P2_0022	521214.6614	3651073.374	638.23	2.55	4.19	2.37	0.000002784
P2_0023	521205.713	3651073.503	638.4	2.55	4.19	2.37	0.000002784
P2_0024	521196.8166	3651074.864	638.06	2.55	4.19	2.37	0.000002784
P2_0025	521187.9201	3651076.225	637.15	2.55	4.19	2.37	0.000002784
P2_0026	521179.1992	3651078.177	635.56	2.55	4.19	2.37	0.000002784
P2_0027	521171.0027	3651081.894	633.39	2.55	4.19	2.37	0.000002784
P2_0028	521162.8062	3651085.612	631.26	2.55	4.19	2.37	0.000002784
P2_0029	521154.6688	3651089.448	631.07	2.55	4.19	2.37	0.000002784
P2_0030	521146.7619	3651093.746	632.98	2.55	4.19	2.37	0.000002784
P2_0031	521138.7868	3651097.895	634.79	2.55	4.19	2.37	0.000002784
P2_0032	521130.337	3651100.993	636.13	2.55	4.19	2.37	0.000002784
P2_0033	521121.8872	3651104.092	637.25	2.55	4.19	2.37	0.000002784
P2_0034	521113.3172	3651106.72	638.18	2.55	4.19	2.37	0.000002784
P2_0035	521104.4173	3651108.059	638.77	2.55	4.19	2.37	0.000002784
P2_0036	521095.5174	3651109.397	639.19	2.55	4.19	2.37	0.000002784
P2_0037	521086.6102	3651110.653	639.51	2.55	4.19	2.37	0.000002784
P2_0038	521077.6134	3651110.893	639.5	2.55	4.19	2.37	0.000002784
P2_0039	521068.6166	3651111.134	639.39	2.55	4.19	2.37	0.000002784
P2_0040	521059.6198	3651111.374	639.19	2.55	4.19	2.37	0.000002784
P2_0041	521050.623	3651111.614	638.57	2.55	4.19	2.37	0.000002784
P2_0042	521041.6262	3651111.855	637.67	2.55	4.19	2.37	0.000002784
P2_0043	521032.6294	3651112.095	636.52	2.55	4.19	2.37	0.000002784
P2_0044	521023.6326	3651112.335	635.52	2.55	4.19	2.37	0.000002784
P2_0045	521014.6358	3651112.576	635.47	2.55	4.19	2.37	0.000002784
P2_0046	521005.6388	3651112.808	636.6	2.55	4.19	2.37	0.000002784
P2_0047	520996.6408	3651112.997	637.77	2.55	4.19	2.37	0.000002784
P2_0048	520987.6428	3651113.186	638.55	2.55	4.19	2.37	0.000002784
P2_0049	520978.6448	3651113.375	638.68	2.55	4.19	2.37	0.000002784
P2_0050	520969.6468	3651113.564	638.11	2.55	4.19	2.37	0.000002784
P2_0051	520960.6488	3651113.754	636.9	2.55	4.19	2.37	0.000002784
P2_0052	520951.6508	3651113.943	635.51	2.55	4.19	2.37	0.000002784
P2_0053	520942.6528	3651114.132	634.89	2.55	4.19	2.37	0.000002784

P2_0054	520933.6548	3651114.321	635.31	2.55	4.19	2.37	0.000002784
P2_0055	520924.6567	3651114.51	635.33	2.55	4.19	2.37	0.000002784
P2_0056	520915.6573	3651114.527	634.97	2.55	4.19	2.37	0.000002784
P2_0057	520906.6575	3651114.483	635.91	2.55	4.19	2.37	0.000002784
P2_0058	520897.6576	3651114.439	638.17	2.55	4.19	2.37	0.000002784
P2_0059	520888.6577	3651114.395	640.62	2.55	4.19	2.37	0.000002784
P2_0060	520879.6578	3651114.351	642.34	2.55	4.19	2.37	0.000002784
P2_0061	520870.6758	3651114.683	643.86	2.55	4.19	2.37	0.000002784
P2_0062	520861.7208	3651115.582	645.4	2.55	4.19	2.37	0.000002784
P2_0063	520852.7659	3651116.481	646.66	2.55	4.19	2.37	0.000002784
P2_0064	520843.8109	3651117.38	647.32	2.55	4.19	2.37	0.000002784
P2_0065	520835.3104	3651120.276	647.43	2.55	4.19	2.37	0.000002784
P2_0066	520826.8489	3651123.342	646.8	2.55	4.19	2.37	0.000002784
P2_0067	520818.3873	3651126.408	645.65	2.55	4.19	2.37	0.000002784
P2_0068	520810.3654	3651130.334	644.31	2.55	4.19	2.37	0.000002784
P2_0069	520802.9241	3651135.397	642.77	2.55	4.19	2.37	0.000002784
P2_0070	520795.4828	3651140.459	641.69	2.55	4.19	2.37	0.000002784
P2_0071	520788.7819	3651146.394	640.88	2.55	4.19	2.37	0.000002784
P2_0072	520782.575	3651152.911	640.63	2.55	4.19	2.37	0.000002784
P2_0073	520776.3681	3651159.429	640.35	2.55	4.19	2.37	0.000002784
P2_0074	520771.9887	3651167.198	639.97	2.55	4.19	2.37	0.000002784
P2_0075	520768.1544	3651175.34	639.35	2.55	4.19	2.37	0.000002784
P2_0076	520764.3201	3651183.482	638.64	2.55	4.19	2.37	0.000002784
P2_0077	520760.4858	3651191.625	637.87	2.55	4.19	2.37	0.000002784
P2_0078	520756.8322	3651199.848	636.98	2.55	4.19	2.37	0.000002784
P2_0079	520753.3173	3651208.133	636.39	2.55	4.19	2.37	0.000002784
P2_0080	520749.8024	3651216.418	636.33	2.55	4.19	2.37	0.000002784
P2_0081	520746.2875	3651224.704	636.79	2.55	4.19	2.37	0.000002784
P2_0082	520743.4793	3651233.211	637.37	2.55	4.19	2.37	0.000002784
P2_0083	520741.6322	3651242.019	637.82	2.55	4.19	2.37	0.000002784
P2_0084	520739.7851	3651250.827	638.08	2.55	4.19	2.37	0.000002784
P2_0085	520737.938	3651259.636	637.97	2.55	4.19	2.37	0.000002784
P2_0086	520736.091	3651268.444	637.48	2.55	4.19	2.37	0.000002784
P3_0001	520735.248	3651275.2	637.15	2.55	4.19	2.37	6.20536E-06
P3_0002	520732.824	3651283.87	636.85	2.55	4.19	2.37	6.20536E-06
P3_0003	520730.4	3651292.54	637.35	2.55	4.19	2.37	6.20536E-06
P3_0004	520729.534	3651301.44	637.94	2.55	4.19	2.37	6.20536E-06
P3_0005	520729.277	3651310.44	638.25	2.55	4.19	2.37	6.20536E-06
P3_0006	520729.02	3651319.43	638.36	2.55	4.19	2.37	6.20536E-06
P3_0007	520729.02	3651328.42	638.32	2.55	4.19	2.37	6.20536E-06
P3_0008	520729.976	3651337.37	638.09	2.55	4.19	2.37	6.20536E-06
P3_0009	520730.932	3651346.32	637.54	2.55	4.19	2.37	6.20536E-06
P3_0010	520731.888	3651355.27	636.87	2.55	4.19	2.37	6.20536E-06
P3_0011	520734.26	3651363.91	636.29	2.55	4.19	2.37	6.20536E-06
P3_0012	520737.031	3651372.48	635.73	2.55	4.19	2.37	6.20536E-06
P3_0013	520739.802	3651381.04	635.12	2.55	4.19	2.37	6.20536E-06
P3_0014	520742.572	3651389.6	634.58	2.55	4.19	2.37	6.20536E-06
P3_0015	520746.048	3651397.88	634.36	2.55	4.19	2.37	6.20536E-06
P3_0016	520749.985	3651405.98	634.29	2.55	4.19	2.37	6.20536E-06
P3_0017	520753.921	3651414.07	634.55	2.55	4.19	2.37	6.20536E-06
P3_0018	520757.858	3651422.16	634.9	2.55	4.19	2.37	6.20536E-06
P3_0019	520761.795	3651430.26	635.19	2.55	4.19	2.37	6.20536E-06
P3_0020	520766.073	3651438.17	635.58	2.55	4.19	2.37	6.20536E-06
P3_0021	520770.358	3651446.09	636.05	2.55	4.19	2.37	6.20536E-06
P3_0022	520774.642	3651454	636.74	2.55	4.19	2.37	6.20536E-06
P3_0023	520779.038	3651461.85	637.55	2.55	4.19	2.37	6.20536E-06
P3_0024	520784.427	3651469.05	638.45	2.55	4.19	2.37	6.20536E-06
P3_0025	520789.816	3651476.26	639.23	2.55	4.19	2.37	6.20536E-06
P3_0026	520795.632	3651483.08	639.8	2.55	4.19	2.37	6.20536E-06
P3_0027	520802.278	3651489.15	640.35	2.55	4.19	2.37	6.20536E-06
P3_0028	520808.924	3651495.22	640.5	2.55	4.19	2.37	6.20536E-06
P3_0029	520815.058	3651501.77	640.3	2.55	4.19	2.37	6.20536E-06
P3_0030	520820.603	3651508.85	639.75	2.55	4.19	2.37	6.20536E-06
P3_0031	520826.149	3651515.94	639.16	2.55	4.19	2.37	6.20536E-06
P3_0032	520828.416	3651524.43	638.7	2.55	4.19	2.37	6.20536E-06

P3_0033	520829.718	3651533.34	638.34	2.55	4.19	2.37	6.20536E-06
P3_0034	520831.019	3651542.24	638.09	2.55	4.19	2.37	6.20536E-06
P3_0035	520832.248	3651550.65	637.89	2.55	4.19	2.37	6.20536E-06
P4_0001	521354.554	3651194.1	637.16	2.55	4.19	2.37	8.54724E-06
P4_0002	521355.963	3651202.98	636.95	2.55	4.19	2.37	8.54724E-06
P4_0003	521357.371	3651211.87	636.69	2.55	4.19	2.37	8.54724E-06
P4_0004	521358.78	3651220.76	636.33	2.55	4.19	2.37	8.54724E-06
P4_0005	521360.188	3651229.65	635.79	2.55	4.19	2.37	8.54724E-06
P4_0006	521362.557	3651238.33	635.03	2.55	4.19	2.37	8.54724E-06
P4_0007	521364.955	3651247.01	634.14	2.55	4.19	2.37	8.54724E-06
P4_0008	521367.353	3651255.68	632.91	2.55	4.19	2.37	8.54724E-06
P4_0009	521369.751	3651264.36	630.85	2.55	4.19	2.37	8.54724E-06
P4_0010	521372.04	3651273.06	628.48	2.55	4.19	2.37	8.54724E-06
P4_0011	521374.259	3651281.78	626.63	2.55	4.19	2.37	8.54724E-06
P4_0012	521376.478	3651290.5	624.82	2.55	4.19	2.37	8.54724E-06
P4_0013	521378.682	3651299.23	623.16	2.55	4.19	2.37	8.54724E-06
P4_0014	521378.67	3651308.23	623.39	2.55	4.19	2.37	8.54724E-06
P4_0015	521378.658	3651317.23	625.41	2.55	4.19	2.37	8.54724E-06
P4_0016	521378.312	3651326.22	626.07	2.55	4.19	2.37	8.54724E-06
P4_0017	521377.95	3651335.21	626.8	2.55	4.19	2.37	8.54724E-06
P4_0018	521375.704	3651343.8	627.21	2.55	4.19	2.37	8.54724E-06
P4_0019	521372.33	3651352.15	628.07	2.55	4.19	2.37	8.54724E-06
P4_0020	521368.864	3651360.45	628.95	2.55	4.19	2.37	8.54724E-06
P4_0021	521365.059	3651368.6	630.01	2.55	4.19	2.37	8.54724E-06
P4_0022	521361.253	3651376.76	630.8	2.55	4.19	2.37	8.54724E-06
P4_0023	521357.164	3651384.77	631.44	2.55	4.19	2.37	8.54724E-06
P4_0024	521352.921	3651392.71	631.66	2.55	4.19	2.37	8.54724E-06
P4_0025	521348.677	3651400.65	631.51	2.55	4.19	2.37	8.54724E-06
P4_0026	521344.47	3651408.6	631.13	2.55	4.19	2.37	8.54724E-06
P4_0027	521340.406	3651416.63	630.89	2.55	4.19	2.37	8.54724E-06
P4_0028	521336.342	3651424.66	630.56	2.55	4.19	2.37	8.54724E-06
P4_0029	521332.847	3651432.92	630.22	2.55	4.19	2.37	8.54724E-06
P4_0030	521330.199	3651441.53	629.99	2.55	4.19	2.37	8.54724E-06
P4_0031	521328.026	3651450.22	629.83	2.55	4.19	2.37	8.54724E-06
P4_0032	521327.285	3651459.19	629.73	2.55	4.19	2.37	8.54724E-06
P4_0033	521326.544	3651468.16	629.64	2.55	4.19	2.37	8.54724E-06
P4_0034	521325.852	3651477.13	629.6	2.55	4.19	2.37	8.54724E-06
P4_0035	521325.161	3651486.1	629.59	2.55	4.19	2.37	8.54724E-06
P4_0036	521323.156	3651494.81	629.59	2.55	4.19	2.37	8.54724E-06
P4_0037	521320.269	3651503.33	629.6	2.55	4.19	2.37	8.54724E-06
P4_0038	521316.629	3651511.54	629.62	2.55	4.19	2.37	8.54724E-06
P4_0039	521312.543	3651519.56	629.65	2.55	4.19	2.37	8.54724E-06
P4_0040	521308.457	3651527.58	629.69	2.55	4.19	2.37	8.54724E-06
P4_0041	521304.373	3651535.6	629.72	2.55	4.19	2.37	8.54724E-06
P4_0042	521300.294	3651543.62	629.72	2.55	4.19	2.37	8.54724E-06
P4_0043	521296.216	3651551.64	629.73	2.55	4.19	2.37	8.54724E-06
P4_0044	521292.137	3651559.67	629.74	2.55	4.19	2.37	8.54724E-06
P4_0045	521288.063	3651567.69	629.74	2.55	4.19	2.37	8.54724E-06
P4_0046	521283.99	3651575.72	629.74	2.55	4.19	2.37	8.54724E-06
P4_0047	521279.916	3651583.74	629.74	2.55	4.19	2.37	8.54724E-06
P4_0048	521275.293	3651591.44	629.74	2.55	4.19	2.37	8.54724E-06
P4_0049	521270.217	3651598.87	629.74	2.55	4.19	2.37	8.54724E-06
P4_0050	521265.141	3651606.31	629.74	2.55	4.19	2.37	8.54724E-06
P4_0051	521258.605	3651612.44	629.74	2.55	4.19	2.37	8.54724E-06
P4_0052	521251.792	3651618.32	629.74	2.55	4.19	2.37	8.54724E-06
P4_0053	521244.874	3651624.06	629.74	2.55	4.19	2.37	8.54724E-06
P4_0054	521237.608	3651629.38	629.74	2.55	4.19	2.37	8.54724E-06
P4_0055	521230.342	3651634.69	629.74	2.55	4.19	2.37	8.54724E-06
P4_0056	521222.926	3651639.78	629.74	2.55	4.19	2.37	8.54724E-06
P4_0057	521215.488	3651644.85	629.74	2.55	4.19	2.37	8.54724E-06
P4_0058	521208.138	3651650.04	629.74	2.55	4.19	2.37	8.54724E-06
P4_0059	521201.078	3651655.62	629.74	2.55	4.19	2.37	8.54724E-06
P4_0060	521193.37	3651660.16	629.74	2.55	4.19	2.37	8.54724E-06
P4_0061	521185.255	3651664.05	629.74	2.55	4.19	2.37	8.54724E-06
P5_0001	521182.505	3651661.93	629.74	2.55	4.19	2.37	9.61348E-07

P5_0002	521176.127	3651655.58	629.74	2.55	4.19	2.37	9.61348E-07
P5_0003	521169.549	3651649.45	629.74	2.55	4.19	2.37	9.61348E-07
P5_0004	521162.71	3651643.6	629.74	2.55	4.19	2.37	9.61348E-07
P5_0005	521156.909	3651637.19	629.74	2.55	4.19	2.37	9.61348E-07
P5_0006	521155.807	3651628.26	629.74	2.55	4.19	2.37	9.61348E-07
P5_0007	521155.812	3651619.53	629.74	2.55	4.19	2.37	9.61348E-07
P5_0008	521160.021	3651611.58	629.74	2.55	4.19	2.37	9.61348E-07
P5_0009	521162.926	3651603.19	629.74	2.55	4.19	2.37	9.61348E-07
P5_0010	521164.286	3651594.29	629.74	2.55	4.19	2.37	9.61348E-07
P5_0011	521165.645	3651585.4	629.74	2.55	4.19	2.37	9.61348E-07
P5_0012	521166.715	3651576.48	629.74	2.55	4.19	2.37	9.61348E-07
P5_0013	521166.381	3651567.49	629.75	2.55	4.19	2.37	9.61348E-07
P5_0014	521166.047	3651558.5	629.75	2.55	4.19	2.37	9.61348E-07
P5_0015	521165.713	3651549.5	629.72	2.55	4.19	2.37	9.61348E-07
P5_0016	521165.432	3651540.51	629.66	2.55	4.19	2.37	9.61348E-07
P5_0017	521167.117	3651531.67	629.61	2.55	4.19	2.37	9.61348E-07
P5_0018	521168.802	3651522.83	629.57	2.55	4.19	2.37	9.61348E-07
P5_0019	521170.863	3651514.08	629.61	2.55	4.19	2.37	9.61348E-07
P5_0020	521173.536	3651505.49	629.72	2.55	4.19	2.37	9.61348E-07
P5_0021	521176.67	3651497.13	629.86	2.55	4.19	2.37	9.61348E-07
P5_0022	521182.024	3651489.9	629.98	2.55	4.19	2.37	9.61348E-07
P5_0023	521187.379	3651482.66	630.41	2.55	4.19	2.37	9.61348E-07
P5_0024	521192.733	3651475.43	631.25	2.55	4.19	2.37	9.61348E-07
P5_0025	521198.088	3651468.19	632.36	2.55	4.19	2.37	9.61348E-07
P5_0026	521203.442	3651460.96	633.11	2.55	4.19	2.37	9.61348E-07
P5_0027	521208.797	3651453.73	633.95	2.55	4.19	2.37	9.61348E-07
P5_0028	521214.151	3651446.49	635.24	2.55	4.19	2.37	9.61348E-07
P5_0029	521219.506	3651439.26	637.31	2.55	4.19	2.37	9.61348E-07
P5_0030	521224.86	3651432.02	638.67	2.55	4.19	2.37	9.61348E-07
P5_0031	521230.215	3651424.79	639.48	2.55	4.19	2.37	9.61348E-07
P5_0032	521235.569	3651417.56	640	2.55	4.19	2.37	9.61348E-07
P5_0033	521240.924	3651410.32	640.29	2.55	4.19	2.37	9.61348E-07
P5_0034	521246.278	3651403.09	640.71	2.55	4.19	2.37	9.61348E-07
P5_0035	521251.633	3651395.85	641.23	2.55	4.19	2.37	9.61348E-07
P5_0036	521256.987	3651388.62	641.96	2.55	4.19	2.37	9.61348E-07
P5_0037	521262.342	3651381.39	642.24	2.55	4.19	2.37	9.61348E-07
P6_0001	521172.566	3651497.24	629.86	2.55	4.19	2.37	2.58244E-07
P6_0002	521171.478	3651488.3	630.1	2.55	4.19	2.37	2.58244E-07
P6_0003	521170.39	3651479.37	630.96	2.55	4.19	2.37	2.58244E-07
P6_0004	521169.302	3651470.44	632.87	2.55	4.19	2.37	2.58244E-07
P6_0005	521169.763	3651461.49	634.64	2.55	4.19	2.37	2.58244E-07
P6_0006	521170.753	3651452.55	636.47	2.55	4.19	2.37	2.58244E-07
P7_0001	521168.901	3651504.07	629.74	2.55	4.19	2.37	4.20868E-06
P7_0002	521160.039	3651505.44	629.72	2.55	4.19	2.37	4.20868E-06
P7_0003	521151.064	3651506.11	629.74	2.55	4.19	2.37	4.20868E-06
P7_0004	521142.084	3651506.68	630.25	2.55	4.19	2.37	4.20868E-06
P7_0005	521133.086	3651506.87	632.06	2.55	4.19	2.37	4.20868E-06
P7_0006	521124.088	3651507.05	634.53	2.55	4.19	2.37	4.20868E-06
P7_0007	521115.09	3651507.24	637.75	2.55	4.19	2.37	4.20868E-06
P7_0008	521106.092	3651507.43	641.27	2.55	4.19	2.37	4.20868E-06
P7_0009	521097.094	3651507.62	644.52	2.55	4.19	2.37	4.20868E-06
P7_0010	521088.096	3651507.8	646.55	2.55	4.19	2.37	4.20868E-06
P7_0011	521079.097	3651507.99	647.24	2.55	4.19	2.37	4.20868E-06
P7_0012	521070.099	3651508.18	647.13	2.55	4.19	2.37	4.20868E-06
P7_0013	521061.101	3651508.37	646.5	2.55	4.19	2.37	4.20868E-06
P7_0014	521052.103	3651508.56	645.88	2.55	4.19	2.37	4.20868E-06
P7_0015	521043.105	3651508.74	645.62	2.55	4.19	2.37	4.20868E-06
P7_0016	521034.107	3651508.93	645.95	2.55	4.19	2.37	4.20868E-06
P7_0017	521025.109	3651509.12	647.16	2.55	4.19	2.37	4.20868E-06
P7_0018	521016.111	3651509.31	648.79	2.55	4.19	2.37	4.20868E-06
P7_0019	521007.113	3651509.49	649.86	2.55	4.19	2.37	4.20868E-06
P7_0020	520998.121	3651509.84	649.96	2.55	4.19	2.37	4.20868E-06
P7_0021	520989.133	3651510.3	649.27	2.55	4.19	2.37	4.20868E-06
P7_0022	520980.146	3651510.8	647.56	2.55	4.19	2.37	4.20868E-06
P7_0023	520971.163	3651511.35	644.21	2.55	4.19	2.37	4.20868E-06

P7_0024	520962.172	3651511.72	639.97	2.55	4.19	2.37	4.20868E-06
P7_0025	520953.176	3651511.98	636.46	2.55	4.19	2.37	4.20868E-06
P7_0026	520944.721	3651514.62	634.57	2.55	4.19	2.37	4.20868E-06
P7_0027	520939.2	3651517.86	634.13	2.55	4.19	2.37	4.20868E-06
P8_0001	521023.42	3651930.25	641.31	2.55	4.19	2.37	3.21233E-06
P8_0002	521031.312	3651926.48	640.4	2.55	4.19	2.37	3.21233E-06
P8_0003	521032.823	3651918.09	639.7	2.55	4.19	2.37	3.21233E-06
P8_0004	521033.025	3651909.09	638.91	2.55	4.19	2.37	3.21233E-06
P8_0005	521033.227	3651900.1	638.33	2.55	4.19	2.37	3.21233E-06
P8_0006	521033.429	3651891.1	637.55	2.55	4.19	2.37	3.21233E-06
P8_0007	521033.631	3651882.1	636.83	2.55	4.19	2.37	3.21233E-06
P8_0008	521033.833	3651873.1	636.25	2.55	4.19	2.37	3.21233E-06
P8_0009	521034.035	3651864.1	635.68	2.55	4.19	2.37	3.21233E-06
P8_0010	521035.458	3651855.53	635.13	2.55	4.19	2.37	3.21233E-06
P8_0011	521041.924	3651849.5	634.7	2.55	4.19	2.37	3.21233E-06
P8_0012	521049.269	3651844.42	634.36	2.55	4.19	2.37	3.21233E-06
P8_0013	521054.941	3651837.44	634.22	2.55	4.19	2.37	3.21233E-06
P8_0014	521060.111	3651830.18	633.98	2.55	4.19	2.37	3.21233E-06
P8_0015	521062.857	3651821.61	633.94	2.55	4.19	2.37	3.21233E-06
P8_0016	521065.602	3651813.04	633.94	2.55	4.19	2.37	3.21233E-06
P8_0017	521068.348	3651804.46	633.94	2.55	4.19	2.37	3.21233E-06
P8_0018	521071.093	3651795.89	633.94	2.55	4.19	2.37	3.21233E-06
P8_0019	521073.839	3651787.32	633.94	2.55	4.19	2.37	3.21233E-06
P8_0020	521076.584	3651778.75	633.94	2.55	4.19	2.37	3.21233E-06
P8_0021	521079.33	3651770.18	633.94	2.55	4.19	2.37	3.21233E-06
P8_0022	521082.075	3651761.61	633.94	2.55	4.19	2.37	3.21233E-06
P8_0023	521084.821	3651753.04	633.94	2.55	4.19	2.37	3.21233E-06
P8_0024	521087.566	3651744.47	633.93	2.55	4.19	2.37	3.21233E-06
P8_0025	521090.312	3651735.9	633.9	2.55	4.19	2.37	3.21233E-06
P8_0026	521093.057	3651727.33	633.59	2.55	4.19	2.37	3.21233E-06
P8_0027	521094.827	3651718.64	633.27	2.55	4.19	2.37	3.21233E-06
P8_0028	521093.889	3651709.76	632.91	2.55	4.19	2.37	7.61543E-06
P8_0029	521087.491	3651703.43	632.86	2.55	4.19	2.37	7.61543E-06
P8_0030	521079.279	3651700.3	633.06	2.55	4.19	2.37	7.61543E-06
P8_0031	521070.565	3651698.05	633.27	2.55	4.19	2.37	7.61543E-06
P8_0032	521061.884	3651695.68	633.48	2.55	4.19	2.37	7.61543E-06
P8_0033	521053.234	3651693.19	633.7	2.55	4.19	2.37	7.61543E-06
P8_0034	521044.584	3651690.7	633.94	2.55	4.19	2.37	7.61543E-06
P8_0035	521036.804	3651686.23	634.11	2.55	4.19	2.37	7.61543E-06
P8_0036	521031.936	3651679.08	634.1	2.55	4.19	2.37	7.61543E-06
P8_0037	521028.295	3651670.85	634.04	2.55	4.19	2.37	7.61543E-06
P8_0038	521024.654	3651662.62	634	2.55	4.19	2.37	7.61543E-06
P8_0039	521020.461	3651654.66	634.11	2.55	4.19	2.37	7.61543E-06
P8_0040	521016.087	3651646.79	634.26	2.55	4.19	2.37	7.61543E-06
P8_0041	521012.446	3651638.59	634.36	2.55	4.19	2.37	7.61543E-06
P8_0042	521009.255	3651630.17	634.44	2.55	4.19	2.37	7.61543E-06
P8_0043	521006.065	3651621.76	634.5	2.55	4.19	2.37	7.61543E-06
P8_0044	521002.874	3651613.34	634.43	2.55	4.19	2.37	7.61543E-06
P8_0045	520999.159	3651605.15	634.49	2.55	4.19	2.37	7.61543E-06
P8_0046	520995.21	3651597.07	634.36	2.55	4.19	2.37	7.61543E-06
P8_0047	520991.215	3651589	634.04	2.55	4.19	2.37	7.61543E-06
P8_0048	520986.802	3651581.16	633.94	2.55	4.19	2.37	7.61543E-06
P8_0049	520982.39	3651573.31	633.94	2.55	4.19	2.37	7.61543E-06
P8_0050	520977.887	3651565.52	633.97	2.55	4.19	2.37	7.61543E-06
P8_0051	520973.225	3651557.82	634.11	2.55	4.19	2.37	7.61543E-06
P8_0052	520968.271	3651550.33	634.12	2.55	4.19	2.37	7.61543E-06
P8_0053	520962.796	3651543.18	634.54	2.55	4.19	2.37	7.61543E-06
P8_0054	520957.322	3651536.04	634.6	2.55	4.19	2.37	7.61543E-06
P8_0055	520951.431	3651529.29	634.19	2.55	4.19	2.37	7.61543E-06
P8_0056	520944.522	3651523.53	634.03	2.55	4.19	2.37	7.61543E-06
P8_0057	520939.411	3651519.26	634.07	2.55	4.19	2.37	7.61543E-06
P9_0001	521031.575	3651851.55	635.12	2.55	4.19	2.37	2.58244E-07
P9_0002	521023.179	3651848.75	635.42	2.55	4.19	2.37	2.58244E-07
P9_0003	521014.198	3651848.17	635.9	2.55	4.19	2.37	2.58244E-07
P9_0004	521005.217	3651847.59	636.2	2.55	4.19	2.37	2.58244E-07

P9_0005	520996.287	3651846.53	636.81	2.55	4.19	2.37	2.58244E-07
P9_0006	520987.393	3651845.15	637.8	2.55	4.19	2.37	2.58244E-07
P9_0007	520978.451	3651844.18	638.99	2.55	4.19	2.37	2.58244E-07
P9_0008	520969.482	3651843.44	640.72	2.55	4.19	2.37	2.58244E-07
P9_0009	520962.111	3651838.88	641.76	2.55	4.19	2.37	2.58244E-07
P9_0010	520958.717	3651830.69	641.5	2.55	4.19	2.37	2.58244E-07
P9_0011	520958.244	3651821.7	640.01	2.55	4.19	2.37	2.58244E-07
P9_0012	520957.771	3651812.71	638.12	2.55	4.19	2.37	2.58244E-07
P9_0013	520957.298	3651803.72	636.2	2.55	4.19	2.37	2.58244E-07
P9_0014	520956.825	3651794.73	634.75	2.55	4.19	2.37	2.58244E-07
P9_0015	520956.352	3651785.75	634.03	2.55	4.19	2.37	2.58244E-07
P9_0016	520955.878	3651776.76	633.94	2.55	4.19	2.37	2.58244E-07
P9_0017	520951.244	3651770.97	633.95	2.55	4.19	2.37	2.58244E-07
P10_0001	521028.449	3651676.41	634.11	2.55	4.19	2.37	2.58244E-07
P10_0002	521025.871	3651684.92	634.23	2.55	4.19	2.37	2.58244E-07
P10_0003	521019.969	3651691.69	634.26	2.55	4.19	2.37	2.58244E-07
P10_0004	521018.217	3651700.52	634.27	2.55	4.19	2.37	2.58244E-07
P10_0005	521016.988	3651709.42	634.27	2.55	4.19	2.37	2.58244E-07
P10_0006	521016.36	3651718.4	634.25	2.55	4.19	2.37	2.58244E-07
P10_0007	521013.05	3651725.95	634.24	2.55	4.19	2.37	2.58244E-07
P10_0008	521005.099	3651729.88	634.26	2.55	4.19	2.37	2.58244E-07
P10_0009	520996.173	3651730.5	634.54	2.55	4.19	2.37	2.58244E-07
P11_0001	521028.355	3651659.23	633.95	2.55	4.19	2.37	2.58244E-07
P11_0002	521037.245	3651657.83	633.81	2.55	4.19	2.37	2.58244E-07
P11_0003	521046.134	3651656.43	633.53	2.55	4.19	2.37	2.58244E-07
P11_0004	521055.033	3651655.08	633.12	2.55	4.19	2.37	2.58244E-07
P11_0005	521063.935	3651653.75	632.72	2.55	4.19	2.37	2.58244E-07
P11_0006	521072.837	3651652.43	632.18	2.55	4.19	2.37	2.58244E-07
P11_0007	521081.793	3651651.54	631.72	2.55	4.19	2.37	2.58244E-07
P11_0008	521090.554	3651649.72	631.28	2.55	4.19	2.37	2.58244E-07
P11_0009	521099.123	3651646.96	630.65	2.55	4.19	2.37	2.58244E-07
P11_0010	521107.692	3651644.21	629.97	2.55	4.19	2.37	2.58244E-07
P11_0011	521116.164	3651641.18	629.76	2.55	4.19	2.37	2.58244E-07
P11_0012	521124.597	3651638.04	629.74	2.55	4.19	2.37	2.58244E-07
P11_0013	521132.806	3651634.4	629.74	2.55	4.19	2.37	2.58244E-07
P11_0014	521140.707	3651630.09	629.74	2.55	4.19	2.37	2.58244E-07
P11_0015	521148.295	3651625.29	629.74	2.55	4.19	2.37	2.58244E-07
P11_0016	521154.637	3651620.69	629.74	2.55	4.19	2.37	2.58244E-07
P12_0001	520989.062	3651596.72	634.25	2.55	4.19	2.37	2.58244E-07
P12_0002	520981.624	3651601.66	634.2	2.55	4.19	2.37	2.58244E-07
P12_0003	520978.483	3651610.09	634.37	2.55	4.19	2.37	2.58244E-07
P12_0004	520977.071	3651618.98	634.47	2.55	4.19	2.37	2.58244E-07
P12_0005	520975.999	3651625.73	634.55	2.55	4.19	2.37	2.58244E-07
P13_0001	520936.244	3651517.73	634.07	2.55	4.19	2.37	9.16783E-06
P13_0002	520927.587	3651515.27	634.11	2.55	4.19	2.37	9.16783E-06
P13_0003	520918.91	3651512.88	634.16	2.55	4.19	2.37	9.16783E-06
P13_0004	520910.152	3651510.81	634.2	2.55	4.19	2.37	9.16783E-06
P13_0005	520901.394	3651508.74	634.24	2.55	4.19	2.37	9.16783E-06
P13_0006	520892.432	3651509.11	634.24	2.55	4.19	2.37	9.16783E-06
P13_0007	520883.633	3651510.43	634.27	2.55	4.19	2.37	9.16783E-06
P13_0008	520875.442	3651514.16	634.36	2.55	4.19	2.37	9.16783E-06
P13_0009	520867.25	3651517.89	634.95	2.55	4.19	2.37	9.16783E-06
P13_0010	520859.385	3651522.17	635.77	2.55	4.19	2.37	9.16783E-06
P13_0011	520852.1	3651527.46	636.46	2.55	4.19	2.37	9.16783E-06
P13_0012	520844.814	3651532.74	637.08	2.55	4.19	2.37	9.16783E-06
P13_0013	520839.201	3651539.72	637.39	2.55	4.19	2.37	9.16783E-06
P13_0014	520833.831	3651546.94	637.81	2.55	4.19	2.37	9.16783E-06
P13_0015	520833.375	3651555.79	637.76	2.55	4.19	2.37	9.16783E-06
P13_0016	520833.368	3651564.79	637.73	2.55	4.19	2.37	4.76473E-06
P13_0017	520833.37	3651573.79	637.8	2.55	4.19	2.37	4.76473E-06
P13_0018	520833.373	3651582.79	637.93	2.55	4.19	2.37	4.76473E-06
P13_0019	520833.375	3651591.79	638.13	2.55	4.19	2.37	4.76473E-06
P13_0020	520833.378	3651600.79	638.5	2.55	4.19	2.37	4.76473E-06
P13_0021	520833.381	3651609.79	639.04	2.55	4.19	2.37	4.76473E-06
P13_0022	520833.383	3651618.79	639.64	2.55	4.19	2.37	4.76473E-06

P13_0023	520833.386	3651627.79	640.29	2.55	4.19	2.37	4.76473E-06
P13_0024	520833.388	3651636.79	640.96	2.55	4.19	2.37	4.76473E-06
P13_0025	520833.391	3651645.79	641.64	2.55	4.19	2.37	4.76473E-06
P13_0026	520833.393	3651654.79	642.36	2.55	4.19	2.37	4.76473E-06
P13_0027	520831.296	3651663.45	643.16	2.55	4.19	2.37	4.76473E-06
P13_0028	520828.332	3651671.94	644.02	2.55	4.19	2.37	4.76473E-06
P13_0029	520824.259	3651679.97	644.88	2.55	4.19	2.37	4.76473E-06
P13_0030	520817.287	3651684.71	645.49	2.55	4.19	2.37	4.76473E-06
P13_0031	520808.815	3651687.74	645.81	2.55	4.19	2.37	4.76473E-06
P13_0032	520800.285	3651690.58	645.93	2.55	4.19	2.37	4.76473E-06
P13_0033	520791.501	3651692.54	645.97	2.55	4.19	2.37	4.76473E-06
P13_0034	520782.718	3651694.5	646.03	2.55	4.19	2.37	4.76473E-06
P13_0035	520773.935	3651696.47	646.08	2.55	4.19	2.37	4.76473E-06
P13_0036	520766.166	3651700.88	646.26	2.55	4.19	2.37	4.76473E-06
P13_0037	520758.571	3651705.71	646.43	2.55	4.19	2.37	4.76473E-06
P13_0038	520751.391	3651710.93	646.57	2.55	4.19	2.37	4.76473E-06
P13_0039	520746.991	3651718.78	646.66	2.55	4.19	2.37	4.76473E-06
P13_0040	520742.59	3651726.63	646.63	2.55	4.19	2.37	4.76473E-06
P13_0041	520739.122	3651734.77	646.64	2.55	4.19	2.37	4.76473E-06
P13_0042	520738.263	3651743.73	646.68	2.55	4.19	2.37	4.76473E-06
P13_0043	520737.404	3651752.69	646.72	2.55	4.19	2.37	4.76473E-06
P13_0044	520737.006	3651761.64	646.6	2.55	4.19	2.37	4.76473E-06
P13_0045	520738.186	3651770.56	646.5	2.55	4.19	2.37	4.76473E-06
P13_0046	520739.367	3651779.48	646.59	2.55	4.19	2.37	4.76473E-06
P13_0047	520740.547	3651788.41	646.85	2.55	4.19	2.37	4.76473E-06
P13_0048	520740.714	3651797.4	647.02	2.55	4.19	2.37	4.76473E-06
P13_0049	520740.722	3651806.4	647.2	2.55	4.19	2.37	4.76473E-06
P13_0050	520742.827	3651815.02	646.95	2.55	4.19	2.37	4.76473E-06
P13_0051	520745.93	3651823.47	646.33	2.55	4.19	2.37	4.76473E-06
P13_0052	520748.24	3651829.76	645.76	2.55	4.19	2.37	4.76473E-06
P14_0001	520839.167	3651531.16	637.66	2.55	4.19	2.37	2.16726E-06
P14_0002	520830.956	3651527.63	638.42	2.55	4.19	2.37	2.16726E-06
P14_0003	520823.495	3651522.6	639.07	2.55	4.19	2.37	2.16726E-06
P15_0001	520829.357	3651552.52	638	2.55	4.19	2.37	2.16726E-06
P15_0002	520820.569	3651553.87	638.33	2.55	4.19	2.37	2.16726E-06
P15_0003	520812.118	3651550.78	638.63	2.55	4.19	2.37	2.16726E-06
P15_0004	520806.284	3651548.64	638.79	2.55	4.19	2.37	2.16726E-06
P16_0001	520750.238	3651834.57	645.38	2.55	4.19	2.37	3.65583E-06
P16_0002	520753.222	3651843.06	644.79	2.55	4.19	2.37	3.65583E-06
P16_0003	520756.206	3651851.55	644.38	2.55	4.19	2.37	3.65583E-06
P16_0004	520759.19	3651860.05	644.25	2.55	4.19	2.37	3.65583E-06
P16_0005	520761.585	3651868.7	644.02	2.55	4.19	2.37	3.65583E-06
P16_0006	520763.481	3651877.5	643.93	2.55	4.19	2.37	3.65583E-06
P16_0007	520765.377	3651886.3	643.89	2.55	4.19	2.37	3.65583E-06
P16_0008	520767.273	3651895.1	643.78	2.55	4.19	2.37	3.65583E-06
P16_0009	520768.78	3651903.96	643.65	2.55	4.19	2.37	3.65583E-06
P16_0010	520770.06	3651912.87	643.47	2.55	4.19	2.37	3.65583E-06
P16_0011	520771.339	3651921.78	643.23	2.55	4.19	2.37	3.65583E-06
P16_0012	520771.682	3651930.76	642.81	2.55	4.19	2.37	3.65583E-06
P16_0013	520771.708	3651939.76	642.87	2.55	4.19	2.37	3.65583E-06
P16_0014	520771.735	3651948.76	643.11	2.55	4.19	2.37	3.65583E-06
P16_0015	520770.867	3651957.68	643.39	2.55	4.19	2.37	3.65583E-06
P16_0016	520769.325	3651966.55	643.24	2.55	4.19	2.37	3.65583E-06
P16_0017	520767.782	3651975.42	642.94	2.55	4.19	2.37	3.65583E-06
P16_0018	520765.754	3651984.14	642.55	2.55	4.19	2.37	3.65583E-06
P16_0019	520762.294	3651992.45	642.03	2.55	4.19	2.37	3.65583E-06
P16_0020	520758.434	3652000.48	641.91	2.55	4.19	2.37	3.65583E-06
P16_0021	520751.815	3652006.58	642.12	2.55	4.19	2.37	3.65583E-06
P16_0022	520745.196	3652012.67	642.54	2.55	4.19	2.37	3.65583E-06
P16_0023	520738.322	3652018.43	642.89	2.55	4.19	2.37	3.65583E-06
P16_0024	520730.585	3652023.03	642.33	2.55	4.19	2.37	3.65583E-06
P16_0025	520722.848	3652027.63	641.16	2.55	4.19	2.37	3.65583E-06
P16_0026	520714.974	3652031.97	639.43	2.55	4.19	2.37	3.65583E-06
P16_0027	520706.839	3652035.82	637.51	2.55	4.19	2.37	3.65583E-06
P16_0028	520698.703	3652039.66	636.07	2.55	4.19	2.37	3.65583E-06

P16_0029	520690.567	3652043.51	635.12	2.55	4.19	2.37	3.65583E-06
P16_0030	520682.433	3652047.36	634.42	2.55	4.19	2.37	3.65583E-06
P16_0031	520674.3	3652051.22	634.15	2.55	4.19	2.37	3.65583E-06
P16_0032	520666.167	3652055.07	633.94	2.55	4.19	2.37	3.65583E-06
P16_0033	520658.034	3652058.93	633.66	2.55	4.19	2.37	3.65583E-06
P16_0034	520649.901	3652062.78	633.64	2.55	4.19	2.37	3.65583E-06
P16_0035	520641.768	3652066.63	633.66	2.55	4.19	2.37	3.65583E-06
P16_0036	520633.635	3652070.49	633.76	2.55	4.19	2.37	3.65583E-06
P16_0037	520625.502	3652074.34	633.95	2.55	4.19	2.37	3.65583E-06
P16_0038	520617.369	3652078.2	634.2	2.55	4.19	2.37	3.65583E-06
P16_0039	520609.236	3652082.05	634.7	2.55	4.19	2.37	3.65583E-06
P16_0040	520601.103	3652085.9	635.5	2.55	4.19	2.37	3.65583E-06
P16_0041	520592.97	3652089.76	636.6	2.55	4.19	2.37	3.65583E-06
P16_0042	520584.837	3652093.61	637.91	2.55	4.19	2.37	3.65583E-06
P16_0043	520576.607	3652097.19	639.14	2.55	4.19	2.37	3.65583E-06
P16_0044	520567.826	3652099.16	639.87	2.55	4.19	2.37	3.65583E-06
P16_0045	520558.981	3652099.94	640.25	2.55	4.19	2.37	3.65583E-06
P16_0046	520550.038	3652098.92	640.25	2.55	4.19	2.37	3.65583E-06
P16_0047	520541.096	3652097.9	640.18	2.55	4.19	2.37	3.65583E-06
P16_0048	520532.189	3652096.61	640.08	2.55	4.19	2.37	3.65583E-06
P16_0049	520523.282	3652095.32	640.02	2.55	4.19	2.37	3.65583E-06
P16_0050	520514.339	3652095.36	640.08	2.55	4.19	2.37	3.65583E-06
P16_0051	520505.375	3652096.16	640.15	2.55	4.19	2.37	3.65583E-06
P16_0052	520496.411	3652096.97	640.22	2.55	4.19	2.37	3.65583E-06
P16_0053	520487.553	3652098.56	640.3	2.55	4.19	2.37	3.65583E-06
P16_0054	520478.695	3652100.15	640.4	2.55	4.19	2.37	3.65583E-06
P16_0055	520469.837	3652101.74	640.32	2.55	4.19	2.37	3.65583E-06
P16_0056	520461.143	3652103.9	640.38	2.55	4.19	2.37	3.65583E-06
P16_0057	520452.792	3652107.26	640.52	2.55	4.19	2.37	3.65583E-06
P16_0058	520444.442	3652110.62	640.61	2.55	4.19	2.37	3.65583E-06
P16_0059	520436.143	3652114.1	640.65	2.55	4.19	2.37	3.65583E-06
P16_0060	520427.903	3652117.72	640.66	2.55	4.19	2.37	3.65583E-06
P16_0061	520419.664	3652121.34	640.72	2.55	4.19	2.37	3.65583E-06
P16_0062	520412.899	3652127.26	640.85	2.55	4.19	2.37	3.65583E-06
P16_0063	520413.456	3652135.7	641.28	2.55	4.19	2.37	3.65583E-06
P16_0064	520414.976	3652143.55	641.88	2.55	4.19	2.37	3.65583E-06
P17_0001	520419.517	3652144.51	642.01	2.55	4.19	2.37	7.86827E-07
P17_0002	520427.858	3652147.75	642.3	2.55	4.19	2.37	7.86827E-07
P17_0003	520435.305	3652152.81	642.78	2.55	4.19	2.37	7.86827E-07
P17_0004	520441.683	3652159.02	643.3	2.55	4.19	2.37	7.86827E-07
P17_0005	520447.291	3652166.06	643.74	2.55	4.19	2.37	7.86827E-07
P17_0006	520452.898	3652173.09	644.04	2.55	4.19	2.37	7.86827E-07
P18_0001	520415.733	3652148.46	642.14	2.55	4.19	2.37	2.31067E-06
P18_0002	520416.331	3652157.44	642.54	2.55	4.19	2.37	2.31067E-06
P18_0003	520416.928	3652166.42	643.03	2.55	4.19	2.37	2.31067E-06
P18_0004	520417.526	3652175.4	643.6	2.55	4.19	2.37	2.31067E-06
P18_0005	520416.053	3652184.07	643.68	2.55	4.19	2.37	2.31067E-06
P18_0006	520412.842	3652192.48	643.97	2.55	4.19	2.37	2.31067E-06
P18_0007	520409.63	3652200.88	644.2	2.55	4.19	2.37	2.31067E-06
P18_0008	520406.418	3652209.29	644.37	2.55	4.19	2.37	2.31067E-06
P18_0009	520403.206	3652217.7	644.63	2.55	4.19	2.37	2.31067E-06
P18_0010	520399.995	3652226.11	644.97	2.55	4.19	2.37	2.31067E-06
P18_0011	520396.783	3652234.51	645.15	2.55	4.19	2.37	2.31067E-06
P18_0012	520393.571	3652242.92	645.3	2.55	4.19	2.37	2.31067E-06
P18_0013	520390.359	3652251.33	645.46	2.55	4.19	2.37	2.31067E-06
P18_0014	520386.467	3652259.44	645.58	2.55	4.19	2.37	2.31067E-06
P18_0015	520382.955	3652267.72	645.71	2.55	4.19	2.37	2.31067E-06
P18_0016	520375.759	3652267.98	645.58	2.55	4.19	2.37	2.31067E-06
P18_0017	520367.159	3652265.32	645.41	2.55	4.19	2.37	2.31067E-06
P18_0018	520358.57	3652262.64	645.13	2.55	4.19	2.37	2.31067E-06
P18_0019	520350.109	3652259.57	644.64	2.55	4.19	2.37	2.31067E-06
P18_0020	520341.648	3652256.5	644.32	2.55	4.19	2.37	2.31067E-06
P18_0021	520333.187	3652253.43	643.99	2.55	4.19	2.37	2.31067E-06
P18_0022	520324.726	3652250.36	643.5	2.55	4.19	2.37	2.31067E-06
P18_0023	520316.265	3652247.3	643.06	2.55	4.19	2.37	2.31067E-06

P18_0024	520307.804	3652244.23	642.49	2.55	4.19	2.37	2.31067E-06
P18_0025	520299.343	3652241.16	641.84	2.55	4.19	2.37	2.31067E-06
P18_0026	520294.83	3652239.52	641.52	2.55	4.19	2.37	2.31067E-06
P19_0001	520379.9745	3652274.686	645.77	2.55	4.19	2.37	1.48857E-06
P19_0002	520376.9554	3652283.165	645.99	2.55	4.19	2.37	1.48857E-06
P19_0003	520373.9364	3652291.643	646.22	2.55	4.19	2.37	1.48857E-06
P19_0004	520370.9174	3652300.122	646.32	2.55	4.19	2.37	1.48857E-06
P19_0005	520367.8983	3652308.6	646.43	2.55	4.19	2.37	1.48857E-06
P19_0006	520364.8793	3652317.079	646.44	2.55	4.19	2.37	1.48857E-06
P19_0007	520361.8603	3652325.557	646.44	2.55	4.19	2.37	1.48857E-06
P19_0008	520358.8412	3652334.036	646.58	2.55	4.19	2.37	1.48857E-06
P19_0009	520355.8222	3652342.514	646.73	2.55	4.19	2.37	1.48857E-06
P19_0010	520352.5388	3652350.836	646.74	2.55	4.19	2.37	1.48857E-06
P19_0011	520346.5511	3652357.555	646.74	2.55	4.19	2.37	1.48857E-06
P19_0012	520340.5633	3652364.275	646.65	2.55	4.19	2.37	1.48857E-06
P19_0013	520334.5756	3652370.994	646.37	2.55	4.19	2.37	1.48857E-06
P19_0014	520328.5879	3652377.713	646.21	2.55	4.19	2.37	1.48857E-06
P19_0015	520322.6002	3652384.432	646.04	2.55	4.19	2.37	1.48857E-06
P19_0016	520316.2631	3652390.795	645.85	2.55	4.19	2.37	1.48857E-06
P19_0017	520309.434	3652396.657	645.66	2.55	4.19	2.37	1.48857E-06
P19_0018	520302.605	3652402.52	645.56	2.55	4.19	2.37	1.48857E-06
P19_0019	520295.7759	3652408.382	645.45	2.55	4.19	2.37	1.48857E-06
P19_0020	520288.9469	3652414.244	645.23	2.55	4.19	2.37	1.48857E-06
P19_0021	520283.2925	3652421.037	645.19	2.55	4.19	2.37	1.48857E-06
P19_0022	520279.1407	3652429.022	645.32	2.55	4.19	2.37	1.48857E-06
P19_0023	520274.9889	3652437.008	645.43	2.55	4.19	2.37	1.48857E-06
P19_0024	520270.8371	3652444.993	645.53	2.55	4.19	2.37	1.48857E-06
P19_0025	520266.6852	3652452.978	645.55	2.55	4.19	2.37	1.48857E-06
P19_0026	520264.6606	3652461.483	645.67	2.55	4.19	2.37	1.48857E-06
P19_0027	520264.6638	3652470.483	645.93	2.55	4.19	2.37	1.48857E-06
P19_0028	520264.6669	3652479.483	646.2	2.55	4.19	2.37	1.48857E-06
P19_0029	520264.4757	3652488.329	646.47	2.55	4.19	2.37	1.48857E-06
P19_0030	520255.7165	3652490.397	646.52	2.55	4.19	2.37	1.48857E-06
P19_0031	520246.9572	3652492.464	646.57	2.55	4.19	2.37	1.48857E-06
P19_0032	520238.198	3652494.532	646.49	2.55	4.19	2.37	1.48857E-06
P19_0033	520229.4387	3652496.6	646.4	2.55	4.19	2.37	1.48857E-06
P19_0034	520220.6795	3652498.668	646.38	2.55	4.19	2.37	1.48857E-06
P19_0035	520211.9202	3652500.735	646.35	2.55	4.19	2.37	1.48857E-06
P19_0036	520203.2754	3652503.044	646.2	2.55	4.19	2.37	1.48857E-06
P19_0037	520196.1356	3652508.523	646.17	2.55	4.19	2.37	1.48857E-06
P19_0038	520188.9957	3652514.003	646.29	2.55	4.19	2.37	1.48857E-06
P19_0039	520181.8558	3652519.482	646.69	2.55	4.19	2.37	1.48857E-06
P19_0040	520174.7159	3652524.961	647.21	2.55	4.19	2.37	1.48857E-06
P19_0041	520167.5761	3652530.441	647.77	2.55	4.19	2.37	1.48857E-06
P19_0042	520160.4362	3652535.92	648.35	2.55	4.19	2.37	1.48857E-06
P19_0043	520153.2963	3652541.399	648.8	2.55	4.19	2.37	1.48857E-06
P19_0044	520146.1565	3652546.878	649.2	2.55	4.19	2.37	1.48857E-06
P19_0045	520139.0166	3652552.358	649.59	2.55	4.19	2.37	1.48857E-06
P19_0046	520131.8767	3652557.837	649.79	2.55	4.19	2.37	1.48857E-06
P19_0047	520124.7369	3652563.316	649.73	2.55	4.19	2.37	1.48857E-06
P19_0048	520117.597	3652568.795	649.44	2.55	4.19	2.37	1.48857E-06
P19_0049	520110.4571	3652574.275	648.84	2.55	4.19	2.37	1.48857E-06
P19_0050	520103.3173	3652579.754	647.89	2.55	4.19	2.37	1.48857E-06
P19_0051	520101.9978	3652587.803	647.38	2.55	4.19	2.37	1.48857E-06
P19_0052	520102.7576	3652596.771	647.37	2.55	4.19	2.37	1.48857E-06
P19_0053	520103.8696	3652605.676	646.98	2.55	4.19	2.37	1.48857E-06
P19_0054	520106.2768	3652614.348	646.26	2.55	4.19	2.37	1.48857E-06
P19_0055	520108.6839	3652623.02	645.6	2.55	4.19	2.37	1.48857E-06
P19_0056	520112.537	3652630.948	645.32	2.55	4.19	2.37	1.48857E-06
P19_0057	520118.2001	3652637.943	645.59	2.55	4.19	2.37	1.48857E-06
P19_0058	520124.592	3652644.185	646.33	2.55	4.19	2.37	1.48857E-06
P19_0059	520131.7663	3652649.619	647.31	2.55	4.19	2.37	1.48857E-06
P19_0060	520139.4327	3652654.288	648.32	2.55	4.19	2.37	1.48857E-06
P19_0061	520147.352	3652658.564	648.99	2.55	4.19	2.37	1.48857E-06
P19_0062	520155.2713	3652662.84	649.31	2.55	4.19	2.37	1.48857E-06

P19_0063	520163.8248	3652665.347	649.99	2.55	4.19	2.37	1.48857E-06
P19_0064	520172.6571	3652667.076	650.53	2.55	4.19	2.37	1.48857E-06
P19_0065	520181.4895	3652668.805	651.05	2.55	4.19	2.37	1.48857E-06
P19_0066	520190.3218	3652670.534	651.6	2.55	4.19	2.37	1.48857E-06
P19_0067	520199.1541	3652672.264	652.09	2.55	4.19	2.37	1.48857E-06
P19_0068	520207.9864	3652673.993	652.52	2.55	4.19	2.37	1.48857E-06
P19_0069	520216.8188	3652675.722	653.07	2.55	4.19	2.37	1.48857E-06
P19_0070	520225.6511	3652677.451	653.42	2.55	4.19	2.37	1.48857E-06
P19_0071	520227.9248	3652669.51	653.46	2.55	4.19	2.37	1.48857E-06
P19_0072	520229.5847	3652660.665	653.29	2.55	4.19	2.37	1.48857E-06
P19_0073	520231.2446	3652651.819	653.08	2.55	4.19	2.37	1.48857E-06
P19_0074	520232.9045	3652642.974	652.82	2.55	4.19	2.37	1.48857E-06
P19_0075	520234.5644	3652634.128	652.5	2.55	4.19	2.37	1.48857E-06
P19_0076	520236.2243	3652625.282	652.12	2.55	4.19	2.37	1.48857E-06
P20_0001	520751.873	3651831.55	645.85	2.55	4.19	2.37	5.46648E-06
P20_0002	520753.725	3651822.74	646.73	2.55	4.19	2.37	5.46648E-06
P20_0003	520755.577	3651813.93	647.19	2.55	4.19	2.37	5.46648E-06
P20_0004	520761.739	3651807.63	647.32	2.55	4.19	2.37	5.46648E-06
P20_0005	520768.475	3651801.66	647.28	2.55	4.19	2.37	5.46648E-06
P20_0006	520775.211	3651795.7	647.1	2.55	4.19	2.37	5.46648E-06
P20_0007	520780.085	3651788.78	647.04	2.55	4.19	2.37	5.46648E-06
P20_0008	520780.955	3651779.82	647	2.55	4.19	2.37	5.46648E-06
P20_0009	520781.826	3651770.86	646.86	2.55	4.19	2.37	5.46648E-06
P20_0010	520782.696	3651761.9	646.73	2.55	4.19	2.37	5.46648E-06
P20_0011	520783.567	3651752.95	646.69	2.55	4.19	2.37	5.46648E-06
P20_0012	520784.386	3651744.52	646.64	2.55	4.19	2.37	5.46648E-06
P21_0001	521181.109	3651667.6	629.74	2.55	4.19	2.37	4.43837E-06
P21_0002	521173.946	3651673.05	629.74	2.55	4.19	2.37	4.43837E-06
P21_0003	521165.408	3651675.56	629.74	2.55	4.19	2.37	4.43837E-06
P21_0004	521156.635	3651677.57	629.74	2.55	4.19	2.37	4.43837E-06
P21_0005	521147.851	3651679.52	629.74	2.55	4.19	2.37	4.43837E-06
P21_0006	521138.944	3651680.81	629.8	2.55	4.19	2.37	4.43837E-06
P21_0007	521130.26	3651682.72	630.02	2.55	4.19	2.37	4.43837E-06
P21_0008	521122.603	3651687.45	630.68	2.55	4.19	2.37	4.43837E-06
P21_0009	521115.075	3651692.36	631.53	2.55	4.19	2.37	4.43837E-06
P21_0010	521108.024	3651697.95	632.06	2.55	4.19	2.37	4.43837E-06
P21_0011	521102.225	3651704.58	632.41	2.55	4.19	2.37	4.43837E-06
P21_0012	521098.069	3651712.56	632.96	2.55	4.19	2.37	4.43837E-06
P21_0013	521095.42	3651717.65	633.22	2.55	4.19	2.37	4.43837E-06
P22_0001	520450.786	3652113.96	640.91	2.55	4.19	2.37	3.52742E-08
P22_0002	520450.645	3652122.96	641.54	2.55	4.19	2.37	3.52742E-08
P22_0003	520450.583	3652131.96	642.02	2.55	4.19	2.37	3.52742E-08
P22_0004	520453.21	3652140.56	642.58	2.55	4.19	2.37	3.52742E-08
P22_0005	520449.458	3652143.38	642.64	2.55	4.19	2.37	3.52742E-08
P22_0006	520442.12	3652138.17	642.22	2.55	4.19	2.37	3.52742E-08
P22_0007	520434.267	3652133.82	641.87	2.55	4.19	2.37	3.52742E-08
P22_0008	520426.028	3652130.29	641.36	2.55	4.19	2.37	3.52742E-08
P22_0009	520417.341	3652127.94	641	2.55	4.19	2.37	3.52742E-08
U1_0001	521438.107	3651390.24	622.1	2.55	4.19	2.37	2.39441E-06
U1_0002	521447.038	3651389.13	619.81	2.55	4.19	2.37	2.39441E-06
U1_0003	521455.97	3651388.02	616.6	2.55	4.19	2.37	2.39441E-06
U1_0004	521464.902	3651386.92	612.87	2.55	4.19	2.37	2.39441E-06
U1_0005	521473.833	3651385.81	609.62	2.55	4.19	2.37	2.39441E-06
U1_0006	521481.641	3651381.74	607.93	2.55	4.19	2.37	2.39441E-06
U1_0007	521489.059	3651376.64	607.43	2.55	4.19	2.37	2.39441E-06
U1_0008	521496.476	3651371.55	607.19	2.55	4.19	2.37	2.39441E-06
U1_0009	521503.894	3651366.45	607.29	2.55	4.19	2.37	2.39441E-06
U1_0010	521507.096	3651358.07	607.65	2.55	4.19	2.37	2.39441E-06
U1_0011	521510.217	3651349.63	607.86	2.55	4.19	2.37	2.39441E-06
U1_0012	521513.339	3651341.19	608.13	2.55	4.19	2.37	2.39441E-06
U1_0013	521515.954	3651332.61	608.46	2.55	4.19	2.37	2.39441E-06
U1_0014	521517.65	3651323.77	609.21	2.55	4.19	2.37	2.39441E-06
U1_0015	521516.881	3651314.89	611.29	2.55	4.19	2.37	2.39441E-06
U1_0016	521515.475	3651306	614.39	2.55	4.19	2.37	2.39441E-06
U1_0017	521512.094	3651297.83	616.21	2.55	4.19	2.37	2.39441E-06

U1_0018	521507.443	3651290.13	617.92	2.55	4.19	2.37	2.39441E-06
U1_0019	521502.792	3651282.42	619.47	2.55	4.19	2.37	2.39441E-06
U1_0020	521497.9	3651274.91	620.92	2.55	4.19	2.37	2.39441E-06
U1_0021	521491.447	3651268.63	621.97	2.55	4.19	2.37	2.39441E-06
U1_0022	521484.993	3651262.36	623.15	2.55	4.19	2.37	2.39441E-06
U1_0023	521476.754	3651259.75	623.94	2.55	4.19	2.37	2.39441E-06
U1_0024	521467.838	3651258.52	624.82	2.55	4.19	2.37	2.39441E-06
U1_0025	521458.923	3651257.29	625.52	2.55	4.19	2.37	2.39441E-06
U1_0026	521451.871	3651262.29	625.39	2.55	4.19	2.37	2.39441E-06
U1_0027	521445.094	3651268.21	625.09	2.55	4.19	2.37	2.39441E-06
U1_0028	521439.476	3651274.95	624.43	2.55	4.19	2.37	2.39441E-06
U1_0029	521436.206	3651283.33	620.94	2.55	4.19	2.37	2.39441E-06
U1_0030	521432.935	3651291.72	617.41	2.55	4.19	2.37	2.39441E-06
U1_0031	521429.665	3651300.1	614.26	2.55	4.19	2.37	2.39441E-06
U1_0032	521427.454	3651308.76	612.38	2.55	4.19	2.37	2.39441E-06
U1_0033	521426.229	3651317.68	610.95	2.55	4.19	2.37	2.39441E-06
U1_0034	521425.005	3651326.6	610.02	2.55	4.19	2.37	2.39441E-06
U1_0035	521423.78	3651335.51	610.5	2.55	4.19	2.37	2.39441E-06
U1_0036	521422.556	3651344.43	612.88	2.55	4.19	2.37	2.39441E-06
U1_0037	521421.2	3651353.32	615.76	2.55	4.19	2.37	2.39441E-06
U1_0038	521419.546	3651362.17	618.66	2.55	4.19	2.37	2.39441E-06
U1_0039	521417.891	3651371.02	621.37	2.55	4.19	2.37	2.39441E-06
U1_0040	521416.237	3651379.86	623.85	2.55	4.19	2.37	2.39441E-06
U1_0041	521414.583	3651388.71	625.95	2.55	4.19	2.37	2.39441E-06
U1_0042	521412.929	3651397.56	627.4	2.55	4.19	2.37	2.39441E-06
U1_0043	521409.736	3651405.87	628.56	2.55	4.19	2.37	2.39441E-06
U1_0044	521405.51	3651413.81	629.48	2.55	4.19	2.37	2.39441E-06
U1_0045	521401.285	3651421.76	630.18	2.55	4.19	2.37	2.39441E-06
U1_0046	521397.059	3651429.7	630.59	2.55	4.19	2.37	2.39441E-06
U1_0047	521392.833	3651437.65	631.04	2.55	4.19	2.37	2.39441E-06
U1_0048	521388.608	3651445.6	631.21	2.55	4.19	2.37	2.39441E-06
U1_0049	521384.382	3651453.54	631.2	2.55	4.19	2.37	2.39441E-06
U1_0050	521380.157	3651461.49	631.05	2.55	4.19	2.37	2.39441E-06
U1_0051	521375.931	3651469.44	630.87	2.55	4.19	2.37	2.39441E-06
U1_0052	521372.298	3651477.61	630.64	2.55	4.19	2.37	2.39441E-06
U1_0053	521370.012	3651486.32	630.47	2.55	4.19	2.37	2.39441E-06
U1_0054	521367.725	3651495.02	630.42	2.55	4.19	2.37	2.39441E-06
U1_0055	521365.439	3651503.73	630.22	2.55	4.19	2.37	2.39441E-06
U1_0056	521363.153	3651512.43	629.92	2.55	4.19	2.37	2.39441E-06
U1_0057	521360.866	3651521.14	629.76	2.55	4.19	2.37	2.39441E-06
U1_0058	521359.873	3651530.05	629.74	2.55	4.19	2.37	2.39441E-06
U1_0059	521359.382	3651539.03	629.74	2.55	4.19	2.37	2.39441E-06
U1_0060	521358.891	3651548.02	629.74	2.55	4.19	2.37	2.39441E-06
U1_0061	521359.411	3651556.71	629.74	2.55	4.19	2.37	2.39441E-06
U1_0062	521364.674	3651564.01	629.74	2.55	4.19	2.37	2.39441E-06
U1_0063	521369.937	3651571.31	629.74	2.55	4.19	2.37	2.39441E-06
U1_0064	521375.199	3651578.61	629.74	2.55	4.19	2.37	2.39441E-06
U1_0065	521380.368	3651585.98	629.74	2.55	4.19	2.37	2.39441E-06
U1_0066	521385.464	3651593.4	629.74	2.55	4.19	2.37	2.39441E-06
U1_0067	521390.559	3651600.82	629.74	2.55	4.19	2.37	2.39441E-06
U1_0068	521393.397	3651608.77	629.74	2.55	4.19	2.37	2.39441E-06
U1_0069	521392.167	3651617.68	629.78	2.55	4.19	2.37	2.39441E-06
U1_0070	521390.937	3651626.6	629.86	2.55	4.19	2.37	2.39441E-06
U1_0071	521388.118	3651635	629.86	2.55	4.19	2.37	2.39441E-06
U1_0072	521383.911	3651642.96	629.74	2.55	4.19	2.37	2.39441E-06
U1_0073	521379.703	3651650.91	629.81	2.55	4.19	2.37	2.39441E-06
U1_0074	521374.508	3651658.2	629.75	2.55	4.19	2.37	2.39441E-06
U1_0075	521368.622	3651665	629.74	2.55	4.19	2.37	2.39441E-06
U1_0076	521362.736	3651671.81	629.74	2.55	4.19	2.37	2.39441E-06
U1_0077	521356.645	3651678.39	629.74	2.55	4.19	2.37	2.39441E-06
U1_0078	521349.118	3651683.32	629.74	2.55	4.19	2.37	2.39441E-06
U1_0079	521341.591	3651688.26	629.74	2.55	4.19	2.37	2.39441E-06
U1_0080	521334.064	3651693.19	629.74	2.55	4.19	2.37	2.39441E-06
U1_0081	521325.34	3651694.99	629.74	2.55	4.19	2.37	2.39441E-06
U1_0082	521316.44	3651696.33	629.74	2.55	4.19	2.37	2.39441E-06

U1_0083	521307.553	3651697.15	629.74	2.55	4.19	2.37	2.39441E-06
U1_0084	521298.728	3651695.39	629.74	2.55	4.19	2.37	2.39441E-06
U1_0085	521289.902	3651693.62	629.74	2.55	4.19	2.37	2.39441E-06
U1_0086	521281.077	3651691.86	629.74	2.55	4.19	2.37	2.39441E-06
U1_0087	521272.359	3651689.64	629.74	2.55	4.19	2.37	2.39441E-06
U1_0088	521263.678	3651687.26	629.74	2.55	4.19	2.37	2.39441E-06
U1_0089	521254.997	3651684.89	629.74	2.55	4.19	2.37	2.39441E-06
U1_0090	521246.315	3651682.51	629.74	2.55	4.19	2.37	2.39441E-06
U1_0091	521237.505	3651680.88	629.74	2.55	4.19	2.37	2.39441E-06
U1_0092	521228.534	3651680.16	629.74	2.55	4.19	2.37	2.39441E-06
U1_0093	521219.562	3651679.45	629.74	2.55	4.19	2.37	2.39441E-06
U1_0094	521210.591	3651678.73	629.74	2.55	4.19	2.37	2.39441E-06
U1_0095	521202.096	3651681.35	629.74	2.55	4.19	2.37	2.39441E-06
U1_0096	521193.686	3651684.55	629.74	2.55	4.19	2.37	2.39441E-06
U1_0097	521185.275	3651687.76	629.74	2.55	4.19	2.37	2.39441E-06
U1_0098	521179.915	3651694.71	629.74	2.55	4.19	2.37	2.39441E-06
U1_0099	521175.067	3651702.29	629.74	2.55	4.19	2.37	2.39441E-06
U1_0100	521172.689	3651710.87	629.89	2.55	4.19	2.37	2.39441E-06
U1_0101	521170.909	3651719.69	630.55	2.55	4.19	2.37	2.39441E-06
U1_0102	521169.129	3651728.52	631.68	2.55	4.19	2.37	2.39441E-06
U1_0103	521167.349	3651737.34	632.86	2.55	4.19	2.37	2.39441E-06
U1_0104	521165.57	3651746.16	633.81	2.55	4.19	2.37	2.39441E-06
U1_0105	521163.79	3651754.98	634.38	2.55	4.19	2.37	2.39441E-06
U1_0106	521162.01	3651763.81	634.81	2.55	4.19	2.37	2.39441E-06
U1_0107	521160.23	3651772.63	635.1	2.55	4.19	2.37	2.39441E-06
U1_0108	521158.45	3651781.45	635.24	2.55	4.19	2.37	2.39441E-06
U1_0109	521157.007	3651790.33	635.3	2.55	4.19	2.37	2.39441E-06
U1_0110	521155.676	3651799.23	635.37	2.55	4.19	2.37	2.39441E-06
U1_0111	521154.344	3651808.13	635.3	2.55	4.19	2.37	2.39441E-06
U1_0112	521153.013	3651817.03	635.23	2.55	4.19	2.37	2.39441E-06
U1_0113	521151.682	3651825.94	635.16	2.55	4.19	2.37	2.39441E-06
U1_0114	521150.351	3651834.84	635.09	2.55	4.19	2.37	2.39441E-06
U1_0115	521149.019	3651843.74	634.97	2.55	4.19	2.37	2.39441E-06
U1_0116	521147.688	3651852.64	634.97	2.55	4.19	2.37	2.39441E-06
U1_0117	521145.785	3651861.39	635.09	2.55	4.19	2.37	2.39441E-06
U1_0118	521142.685	3651869.84	635.1	2.55	4.19	2.37	2.39441E-06
U1_0119	521139.585	3651878.29	635.48	2.55	4.19	2.37	2.39441E-06
U1_0120	521136.484	3651886.74	636.13	2.55	4.19	2.37	2.39441E-06
U1_0121	521133.384	3651895.19	637.11	2.55	4.19	2.37	2.39441E-06
U1_0122	521129.323	3651903.13	638.22	2.55	4.19	2.37	2.39441E-06
U1_0123	521124.115	3651910.47	639.28	2.55	4.19	2.37	2.39441E-06
U1_0124	521118.907	3651917.81	640.67	2.55	4.19	2.37	2.39441E-06
U1_0125	521113.7	3651925.15	641.8	2.55	4.19	2.37	2.39441E-06
U1_0126	521107.761	3651931.87	642.36	2.55	4.19	2.37	2.39441E-06
U1_0127	521101.33	3651938.17	642.89	2.55	4.19	2.37	2.39441E-06
U1_0128	521094.9	3651944.46	643.27	2.55	4.19	2.37	2.39441E-06
U1_0129	521088.469	3651950.76	643.54	2.55	4.19	2.37	2.39441E-06
U1_0130	521082.039	3651957.06	643.64	2.55	4.19	2.37	2.39441E-06
U1_0131	521075.608	3651963.35	643.74	2.55	4.19	2.37	2.39441E-06
U1_0132	521069.178	3651969.65	643.72	2.55	4.19	2.37	2.39441E-06
U1_0133	521062.747	3651975.95	643.78	2.55	4.19	2.37	2.39441E-06
U1_0134	521056.317	3651982.24	643.89	2.55	4.19	2.37	2.39441E-06
U1_0135	521049.886	3651988.54	643.9	2.55	4.19	2.37	2.39441E-06
U1_0136	521043.237	3651994.54	643.85	2.55	4.19	2.37	2.39441E-06
U1_0137	521035.259	3651998.7	643.78	2.55	4.19	2.37	2.39441E-06
U1_0138	521027.281	3652002.87	643.78	2.55	4.19	2.37	2.39441E-06
U1_0139	521018.911	3652004.97	643.75	2.55	4.19	2.37	2.39441E-06
U1_0140	521009.962	3652004.02	643.84	2.55	4.19	2.37	2.39441E-06
U1_0141	521001.012	3652003.06	644.21	2.55	4.19	2.37	2.39441E-06
U1_0142	520994.168	3651997.72	644.73	2.55	4.19	2.37	2.39441E-06
U1_0143	520987.818	3651991.34	645.3	2.55	4.19	2.37	2.39441E-06
U1_0144	520984.045	3651983.65	645.73	2.55	4.19	2.37	2.39441E-06
U1_0145	520982.624	3651974.76	646.03	2.55	4.19	2.37	2.39441E-06
U1_0146	520981.202	3651965.87	646.24	2.55	4.19	2.37	2.39441E-06
U1_0147	520980.293	3651956.93	646.33	2.55	4.19	2.37	2.39441E-06

U1_0148	520979.684	3651947.95	646.38	2.55	4.19	2.37	2.39441E-06
U1_0149	520979.075	3651938.97	646.44	2.55	4.19	2.37	2.39441E-06
U1_0150	520978.467	3651929.99	646.53	2.55	4.19	2.37	2.39441E-06
U1_0151	520977.858	3651921.01	646.33	2.55	4.19	2.37	2.39441E-06
U1_0152	520977.25	3651912.03	646.11	2.55	4.19	2.37	2.39441E-06
U1_0153	520977.962	3651903.22	645.76	2.55	4.19	2.37	2.39441E-06
U1_0154	520980.819	3651894.69	644.96	2.55	4.19	2.37	2.39441E-06
U1_0155	520982.264	3651890.37	644.5	2.55	4.19	2.37	2.39441E-06
U2_0001	521230.365	3651682.61	629.74	2.55	4.19	2.37	6.93341E-06
U2_0002	521237.169	3651688.5	629.74	2.55	4.19	2.37	6.93341E-06
U2_0003	521243.972	3651694.39	629.74	2.55	4.19	2.37	6.93341E-06
U2_0004	521252.14	3651697.47	629.74	2.55	4.19	2.37	6.93341E-06
U2_0005	521260.979	3651699.16	629.74	2.55	4.19	2.37	6.93341E-06
U2_0006	521269.819	3651700.85	629.74	2.55	4.19	2.37	6.93341E-06
U2_0007	521278.658	3651702.54	629.74	2.55	4.19	2.37	6.93341E-06
U2_0008	521287.498	3651704.24	629.74	2.55	4.19	2.37	6.93341E-06
U2_0009	521296.337	3651705.93	629.74	2.55	4.19	2.37	6.93341E-06
U2_0010	521305.177	3651707.62	629.74	2.55	4.19	2.37	6.93341E-06
U2_0011	521313.818	3651710.09	629.74	2.55	4.19	2.37	6.93341E-06
U2_0012	521322.394	3651712.82	629.74	2.55	4.19	2.37	6.93341E-06
U2_0013	521330.969	3651715.55	629.74	2.55	4.19	2.37	6.93341E-06
U2_0014	521339.545	3651718.28	629.74	2.55	4.19	2.37	6.93341E-06
U2_0015	521348.121	3651721.02	629.86	2.55	4.19	2.37	6.93341E-06
U2_0016	521356.697	3651723.75	630.76	2.55	4.19	2.37	6.93341E-06
U2_0017	521364.882	3651727.09	632.57	2.55	4.19	2.37	6.93341E-06
U2_0018	521370.98	3651733.71	634.18	2.55	4.19	2.37	6.93341E-06
U2_0019	521377.078	3651740.33	635.07	2.55	4.19	2.37	6.93341E-06
U2_0020	521383.176	3651746.95	635.89	2.55	4.19	2.37	6.93341E-06
U2_0021	521389.274	3651753.57	636.83	2.55	4.19	2.37	6.93341E-06
U2_0022	521395.373	3651760.19	637.9	2.55	4.19	2.37	6.93341E-06
U3_0001	521218.003	3652126.54	660.12	2.55	4.19	2.37	1.12371E-05
U3_0002	521213.491	3652134.33	659.47	2.55	4.19	2.37	1.12371E-05
U3_0003	521208.979	3652142.12	659.22	2.55	4.19	2.37	1.12371E-05
U3_0004	521204.467	3652149.91	659.91	2.55	4.19	2.37	1.12371E-05
U3_0005	521201.149	3652158.27	661.76	2.55	4.19	2.37	1.12371E-05
U3_0006	521197.862	3652166.65	664.61	2.55	4.19	2.37	1.12371E-05
U3_0007	521194.576	3652175.03	666.82	2.55	4.19	2.37	1.12371E-05
U3_0008	521190.767	3652183.16	667.79	2.55	4.19	2.37	1.12371E-05
U3_0009	521186.5	3652191.09	667.38	2.55	4.19	2.37	1.12371E-05
U3_0010	521182.233	3652199.01	665.75	2.55	4.19	2.37	1.12371E-05
U3_0011	521178.78	3652207.31	663.53	2.55	4.19	2.37	1.12371E-05
U3_0012	521175.593	3652215.72	660.93	2.55	4.19	2.37	1.12371E-05
U3_0013	521171.833	3652223.87	659.3	2.55	4.19	2.37	1.12371E-05
U3_0014	521167.016	3652231.42	659.14	2.55	4.19	2.37	1.12371E-05
U3_0015	521160.92	3652238.05	660.73	2.55	4.19	2.37	1.12371E-05
U3_0016	521152.757	3652241.31	662.68	2.55	4.19	2.37	1.12371E-05
U3_0017	521144.1	3652243.77	664.16	2.55	4.19	2.37	1.12371E-05
U3_0018	521135.433	3652246.19	665.12	2.55	4.19	2.37	1.12371E-05
U3_0019	521126.75	3652248.56	665.79	2.55	4.19	2.37	1.12371E-05
U3_0020	521118.067	3652250.93	666.3	2.55	4.19	2.37	1.12371E-05
U3_0021	521109.373	3652253.24	667.03	2.55	4.19	2.37	1.12371E-05
U3_0022	521100.511	3652254.82	667.98	2.55	4.19	2.37	1.12371E-05
U3_0023	521091.649	3652256.39	668.92	2.55	4.19	2.37	1.12371E-05
U3_0024	521082.788	3652257.96	669.5	2.55	4.19	2.37	1.12371E-05
U3_0025	521074.13	3652260.35	669.68	2.55	4.19	2.37	1.12371E-05
U3_0026	521065.568	3652263.12	669.35	2.55	4.19	2.37	1.12371E-05
U3_0027	521057.006	3652265.9	668.49	2.55	4.19	2.37	1.12371E-05
U3_0028	521048.402	3652268.53	667.11	2.55	4.19	2.37	1.12371E-05
U3_0029	521039.791	3652271.15	665.6	2.55	4.19	2.37	1.12371E-05
U3_0030	521032.609	3652273.43	664.13	2.55	4.19	2.37	1.12371E-05
U4_0001	520962.759	3652248.38	659.82	2.55	4.19	2.37	2.53031E-06
U4_0002	520956.018	3652242.42	661.48	2.55	4.19	2.37	2.53031E-06
U4_0003	520949.277	3652236.45	663.13	2.55	4.19	2.37	2.53031E-06
U4_0004	520942.536	3652230.49	664.78	2.55	4.19	2.37	2.53031E-06
U4_0005	520935.795	3652224.53	666.55	2.55	4.19	2.37	2.53031E-06

U4_0006	520929.833	3652218.24	668.38	2.55	4.19	2.37	2.53031E-06
U4_0007	520930.358	3652209.26	668.67	2.55	4.19	2.37	2.53031E-06
U4_0008	520930.882	3652200.27	668.93	2.55	4.19	2.37	2.53031E-06
U4_0009	520931.407	3652191.29	669.13	2.55	4.19	2.37	2.53031E-06
U4_0010	520931.932	3652182.3	669.31	2.55	4.19	2.37	2.53031E-06
U4_0011	520932.456	3652173.32	669.32	2.55	4.19	2.37	2.53031E-06
U4_0012	520932.981	3652164.33	668.98	2.55	4.19	2.37	2.53031E-06
U4_0013	520929.803	3652156.05	669.48	2.55	4.19	2.37	2.53031E-06
U4_0014	520926.035	3652147.87	669.28	2.55	4.19	2.37	2.53031E-06
U4_0015	520921.51	3652140.18	668.44	2.55	4.19	2.37	2.53031E-06
U4_0016	520915.777	3652133.24	667.46	2.55	4.19	2.37	2.53031E-06
U4_0017	520910.043	3652126.3	666.02	2.55	4.19	2.37	2.53031E-06
U4_0018	520904.309	3652119.37	664.38	2.55	4.19	2.37	2.53031E-06
U4_0019	520898.762	3652112.28	662.35	2.55	4.19	2.37	2.53031E-06
U4_0020	520893.264	3652105.15	660.34	2.55	4.19	2.37	2.53031E-06
U4_0021	520887.765	3652098.03	658.98	2.55	4.19	2.37	2.53031E-06
U4_0022	520882.059	3652091.07	658.08	2.55	4.19	2.37	2.53031E-06
U4_0023	520876.348	3652084.11	657.74	2.55	4.19	2.37	2.53031E-06
U4_0024	520867.718	3652082.32	657.74	2.55	4.19	2.37	2.53031E-06
U4_0025	520858.813	3652081.02	657.74	2.55	4.19	2.37	2.53031E-06
U4_0026	520849.848	3652080.35	657.74	2.55	4.19	2.37	2.53031E-06
U4_0027	520840.856	3652079.96	657.74	2.55	4.19	2.37	2.53031E-06
U4_0028	520831.866	3652079.54	657.72	2.55	4.19	2.37	2.53031E-06
U4_0029	520822.899	3652078.77	657.94	2.55	4.19	2.37	2.53031E-06
U4_0030	520827.156	3652073.62	657.74	2.55	4.19	2.37	2.53031E-06
U4_0031	520833.885	3652067.64	657.87	2.55	4.19	2.37	2.53031E-06
U4_0032	520840.728	3652061.9	658.16	2.55	4.19	2.37	2.53031E-06
U4_0033	520849.597	3652060.37	658.38	2.55	4.19	2.37	2.53031E-06
U4_0034	520858.466	3652058.84	658.42	2.55	4.19	2.37	2.53031E-06
U4_0035	520867.334	3652057.31	658.37	2.55	4.19	2.37	2.53031E-06
U4_0036	520876.023	3652055.08	658.29	2.55	4.19	2.37	2.53031E-06
U4_0037	520884.508	3652052.08	658.25	2.55	4.19	2.37	2.53031E-06
U4_0038	520892.992	3652049.08	658.12	2.55	4.19	2.37	2.53031E-06
U4_0039	520901.195	3652045.41	657.91	2.55	4.19	2.37	2.53031E-06
U4_0040	520906.804	3652039.08	657.6	2.55	4.19	2.37	2.53031E-06
U4_0041	520910.419	3652030.84	657.14	2.55	4.19	2.37	2.53031E-06
U4_0042	520908.609	3652022.04	656.85	2.55	4.19	2.37	2.53031E-06
U4_0043	520906.738	3652013.24	656.61	2.55	4.19	2.37	2.53031E-06
U4_0044	520904.867	3652004.43	656.53	2.55	4.19	2.37	2.53031E-06
U4_0045	520902.995	3651995.63	656.39	2.55	4.19	2.37	2.53031E-06
U4_0046	520901.124	3651986.83	656.21	2.55	4.19	2.37	2.53031E-06
U4_0047	520899.119	3651978.06	656.01	2.55	4.19	2.37	2.53031E-06
U4_0048	520895.964	3651969.63	656.08	2.55	4.19	2.37	2.53031E-06
U4_0049	520892.808	3651961.21	656.31	2.55	4.19	2.37	2.53031E-06
U4_0050	520889.652	3651952.78	656.42	2.55	4.19	2.37	2.53031E-06
U4_0051	520886.063	3651944.53	656.34	2.55	4.19	2.37	2.53031E-06
U4_0052	520882.34	3651936.33	656.22	2.55	4.19	2.37	2.53031E-06
U4_0053	520878.616	3651928.14	656.06	2.55	4.19	2.37	2.53031E-06
U4_0054	520874.359	3651920.22	655.92	2.55	4.19	2.37	2.53031E-06
U4_0055	520869.908	3651912.4	655.35	2.55	4.19	2.37	2.53031E-06
U4_0056	520865.456	3651904.57	654.84	2.55	4.19	2.37	2.53031E-06
U4_0057	520861.126	3651896.69	654.23	2.55	4.19	2.37	2.53031E-06
U4_0058	520857.064	3651888.66	653.5	2.55	4.19	2.37	2.53031E-06
U4_0059	520853.364	3651880.52	652.93	2.55	4.19	2.37	2.53031E-06
U4_0060	520852.719	3651871.55	652.02	2.55	4.19	2.37	2.53031E-06
U4_0061	520852.075	3651862.57	651.25	2.55	4.19	2.37	2.53031E-06
U4_0062	520851.43	3651853.59	650.63	2.55	4.19	2.37	2.53031E-06
U4_0063	520850.785	3651844.62	650.13	2.55	4.19	2.37	2.53031E-06
U4_0064	520850.141	3651835.64	649.71	2.55	4.19	2.37	2.53031E-06
U4_0065	520849.496	3651826.66	649.17	2.55	4.19	2.37	2.53031E-06
U4_0066	520844.689	3651822.02	648.87	2.55	4.19	2.37	2.53031E-06
U4_0067	520835.694	3651821.74	648.7	2.55	4.19	2.37	2.53031E-06
U4_0068	520826.698	3651821.46	648.43	2.55	4.19	2.37	2.53031E-06
U4_0069	520818.366	3651821.19	648.13	2.55	4.19	2.37	2.53031E-06
U5_0001	521398.497	3651765.62	638.87	2.55	4.19	2.37	1.31098E-05

U5_0002	521399.5	3651774.57	640.24	2.55	4.19	2.37	1.31098E-05
U5_0003	521400.504	3651783.51	641.79	2.55	4.19	2.37	1.31098E-05
U5_0004	521399.949	3651792.42	643.1	2.55	4.19	2.37	1.31098E-05
U5_0005	521398.535	3651801.31	644.07	2.55	4.19	2.37	1.31098E-05
U5_0006	521397.122	3651810.19	644.91	2.55	4.19	2.37	1.31098E-05
U5_0007	521395.549	3651819.05	645.53	2.55	4.19	2.37	1.31098E-05
U5_0008	521393.762	3651827.87	646.02	2.55	4.19	2.37	1.31098E-05
U5_0009	521391.975	3651836.7	646.26	2.55	4.19	2.37	1.31098E-05
U5_0010	521390.417	3651845.56	646.36	2.55	4.19	2.37	1.31098E-05
U5_0011	521389.167	3651854.47	646.61	2.55	4.19	2.37	1.31098E-05
U5_0012	521387.916	3651863.38	646.8	2.55	4.19	2.37	1.31098E-05
U5_0013	521388.176	3651872.32	646.72	2.55	4.19	2.37	1.31098E-05
U5_0014	521389.096	3651881.27	645.78	2.55	4.19	2.37	1.31098E-05
U5_0015	521390.017	3651890.23	643.48	2.55	4.19	2.37	1.31098E-05
U5_0016	521390.45	3651899.21	642.15	2.55	4.19	2.37	1.31098E-05
U5_0017	521390.725	3651908.21	642.8	2.55	4.19	2.37	1.31098E-05
U5_0018	521391.001	3651917.2	644.74	2.55	4.19	2.37	1.31098E-05
U5_0019	521390.952	3651926.2	646.51	2.55	4.19	2.37	1.31098E-05
U5_0020	521390.887	3651935.2	647.43	2.55	4.19	2.37	1.31098E-05
U5_0021	521390.776	3651944.2	648.07	2.55	4.19	2.37	1.31098E-05
U5_0022	521390.636	3651953.2	649.76	2.55	4.19	2.37	1.31098E-05
U5_0023	521388.847	3651961.96	651.74	2.55	4.19	2.37	1.31098E-05
U5_0024	521386.368	3651970.61	653.67	2.55	4.19	2.37	1.31098E-05
U5_0025	521383.247	3651979.03	655.28	2.55	4.19	2.37	1.31098E-05
U5_0026	521379.724	3651987.31	657.13	2.55	4.19	2.37	1.31098E-05
U5_0027	521373.552	3651992.96	658.95	2.55	4.19	2.37	1.31098E-05
U5_0028	521365.292	3651996.53	662.65	2.55	4.19	2.37	1.31098E-05
U5_0029	521357.031	3652000.11	665.6	2.55	4.19	2.37	1.31098E-05
U5_0030	521348.638	3652003.25	666.2	2.55	4.19	2.37	1.31098E-05
U5_0031	521339.809	3652005	664.69	2.55	4.19	2.37	1.31098E-05
U5_0032	521330.98	3652006.74	662.69	2.55	4.19	2.37	1.31098E-05
U5_0033	521322.603	3652009.63	661.08	2.55	4.19	2.37	1.31098E-05
U5_0034	521314.991	3652014.43	659.84	2.55	4.19	2.37	1.31098E-05
U5_0035	521307.378	3652019.23	657.87	2.55	4.19	2.37	1.31098E-05
U5_0036	521299.766	3652024.03	656.81	2.55	4.19	2.37	1.31098E-05
U5_0037	521292.669	3652029.53	656.65	2.55	4.19	2.37	1.31098E-05
U5_0038	521285.859	3652035.41	656.86	2.55	4.19	2.37	1.31098E-05
U5_0039	521279.049	3652041.3	657.04	2.55	4.19	2.37	1.31098E-05
U5_0040	521272.411	3652047.36	657.53	2.55	4.19	2.37	1.31098E-05
U5_0041	521266.355	3652054.01	658.5	2.55	4.19	2.37	1.31098E-05
U5_0042	521260.299	3652060.67	659.42	2.55	4.19	2.37	1.31098E-05
U5_0043	521254.635	3652067.64	660.04	2.55	4.19	2.37	1.31098E-05
U5_0044	521249.605	3652075.1	660	2.55	4.19	2.37	1.31098E-05
U5_0045	521244.575	3652082.56	659.75	2.55	4.19	2.37	1.31098E-05
U5_0046	521239.431	3652089.95	659.63	2.55	4.19	2.37	1.31098E-05
U5_0047	521234.283	3652097.33	659.8	2.55	4.19	2.37	1.31098E-05
U5_0048	521229.566	3652104.97	660.36	2.55	4.19	2.37	1.31098E-05
U5_0049	521225.472	3652112.99	660.52	2.55	4.19	2.37	1.31098E-05
U5_0050	521221.379	3652121	660.42	2.55	4.19	2.37	1.31098E-05
U6_0001	521225.486	3652107.14	660.27	2.55	4.19	2.37	1.05795E-05
U6_0002	521217.457	3652111.21	659.86	2.55	4.19	2.37	1.05795E-05
U6_0003	521208.979	3652112.36	659.17	2.55	4.19	2.37	1.05795E-05
U6_0004	521200.099	3652110.89	658.39	2.55	4.19	2.37	1.05795E-05
U6_0005	521191.219	3652109.42	657.57	2.55	4.19	2.37	1.05795E-05
U6_0006	521182.339	3652107.96	656.69	2.55	4.19	2.37	1.05795E-05
U6_0007	521173.492	3652106.34	656.03	2.55	4.19	2.37	1.05795E-05
U6_0008	521164.806	3652103.99	655.36	2.55	4.19	2.37	1.05795E-05
U6_0009	521156.119	3652101.63	654.7	2.55	4.19	2.37	1.05795E-05
U6_0010	521147.433	3652099.28	654.15	2.55	4.19	2.37	1.05795E-05
U6_0011	521142.53	3652097.95	653.83	2.55	4.19	2.37	1.05795E-05
U7_0001	521401.051	3651757.46	637.82	2.55	4.19	2.37	6.17642E-06
U7_0002	521406.856	3651750.61	637.24	2.55	4.19	2.37	6.17642E-06
U7_0003	521413.696	3651744.76	636.74	2.55	4.19	2.37	6.17642E-06
U7_0004	521420.537	3651738.91	636.49	2.55	4.19	2.37	6.17642E-06
U7_0005	521427.377	3651733.06	636.09	2.55	4.19	2.37	6.17642E-06

U7_0006	521434.218	3651727.21	635.5	2.55	4.19	2.37	6.17642E-06
U7_0007	521441.058	3651721.36	634.97	2.55	4.19	2.37	6.17642E-06
U7_0008	521447.899	3651715.52	634.2	2.55	4.19	2.37	6.17642E-06
U7_0009	521454.601	3651709.54	632.83	2.55	4.19	2.37	6.17642E-06
U7_0010	521459.858	3651702.24	630.82	2.55	4.19	2.37	6.17642E-06
U7_0011	521465.114	3651694.93	628.3	2.55	4.19	2.37	6.17642E-06
U7_0012	521468.806	3651686.77	626.49	2.55	4.19	2.37	6.17642E-06
U7_0013	521472.1	3651678.4	625.02	2.55	4.19	2.37	6.17642E-06
U7_0014	521475.395	3651670.02	624.14	2.55	4.19	2.37	6.17642E-06
U7_0015	521478.689	3651661.64	623.73	2.55	4.19	2.37	6.17642E-06
U7_0016	521481.983	3651653.27	623.6	2.55	4.19	2.37	6.17642E-06
U7_0017	521485.278	3651644.89	623.72	2.55	4.19	2.37	6.17642E-06
U7_0018	521488.572	3651636.52	623.67	2.55	4.19	2.37	6.17642E-06
U7_0019	521491.866	3651628.14	623.3	2.55	4.19	2.37	6.17642E-06
U7_0020	521494.65	3651621.07	623.02	2.55	4.19	2.37	6.17642E-06
U8_0001	521029.748	3652278.02	663.86	2.55	4.19	2.37	5.06063E-06
U8_0002	521030.272	3652285.75	664.79	2.55	4.19	2.37	5.06063E-06
U8_0003	521037.236	3652290.32	667.18	2.55	4.19	2.37	5.06063E-06
U8_0004	521045.934	3652292.64	669.56	2.55	4.19	2.37	5.06063E-06
U8_0005	521054.861	3652293.74	671.38	2.55	4.19	2.37	5.06063E-06
U8_0006	521063.802	3652294.77	672.99	2.55	4.19	2.37	5.06063E-06
U8_0007	521072.743	3652295.8	674.26	2.55	4.19	2.37	5.06063E-06
U8_0008	521081.684	3652296.82	675.11	2.55	4.19	2.37	5.06063E-06
U8_0009	521090.625	3652297.85	675.72	2.55	4.19	2.37	5.06063E-06
U8_0010	521099.566	3652298.88	676.25	2.55	4.19	2.37	5.06063E-06
U8_0011	521108.507	3652299.91	676.64	2.55	4.19	2.37	5.06063E-06
U8_0012	521113.083	3652300.44	676.86	2.55	4.19	2.37	5.06063E-06
U9_0001	521027.463	3652272.52	662.78	2.55	4.19	2.37	8.70674E-06
U9_0002	521018.478	3652272.01	660.65	2.55	4.19	2.37	8.70674E-06
U9_0003	521009.493	3652271.49	659.3	2.55	4.19	2.37	8.70674E-06
U9_0004	521000.508	3652270.97	658.61	2.55	4.19	2.37	8.70674E-06
U9_0005	520992.469	3652267.59	658.09	2.55	4.19	2.37	8.70674E-06
U9_0006	520984.945	3652262.65	657.75	2.55	4.19	2.37	8.70674E-06
U9_0007	520977.42	3652257.72	657.81	2.55	4.19	2.37	8.70674E-06
U9_0008	520969.895	3652252.78	658.61	2.55	4.19	2.37	8.70674E-06
U10_0001	520964.969	3652254.94	659.3	2.55	4.19	2.37	6.17642E-06
U10_0002	520955.969	3652254.88	661.39	2.55	4.19	2.37	6.17642E-06
U10_0003	520947.812	3652257.86	664.21	2.55	4.19	2.37	6.17642E-06
U10_0004	520940.265	3652262.7	667.6	2.55	4.19	2.37	6.17642E-06
U10_0005	520934.616	3652269.71	670.66	2.55	4.19	2.37	6.17642E-06
U10_0006	520930.805	3652277.63	672.22	2.55	4.19	2.37	6.17642E-06
U10_0007	520928.618	3652286.36	673.22	2.55	4.19	2.37	6.17642E-06
U10_0008	520926.431	3652295.09	673.9	2.55	4.19	2.37	6.17642E-06
U10_0009	520924.244	3652303.82	674.08	2.55	4.19	2.37	6.17642E-06
U10_0010	520922.057	3652312.55	674.06	2.55	4.19	2.37	6.17642E-06
U10_0011	520919.869	3652321.28	673.94	2.55	4.19	2.37	6.17642E-06
U10_0012	520917.682	3652330.01	673.73	2.55	4.19	2.37	6.17642E-06
U10_0013	520915.495	3652338.74	673.46	2.55	4.19	2.37	6.17642E-06
U10_0014	520913.308	3652347.47	673.31	2.55	4.19	2.37	6.17642E-06
U10_0015	520911.121	3652356.2	673.37	2.55	4.19	2.37	6.17642E-06
U10_0016	520908.934	3652364.93	673.53	2.55	4.19	2.37	6.17642E-06
U10_0017	520906.746	3652373.66	673.73	2.55	4.19	2.37	6.17642E-06
U10_0018	520904.559	3652382.39	673.85	2.55	4.19	2.37	6.17642E-06
U10_0019	520902.372	3652391.12	673.78	2.55	4.19	2.37	6.17642E-06
U10_0020	520899.107	3652399.2	673.61	2.55	4.19	2.37	6.17642E-06
U10_0021	520892.326	3652405.11	672.71	2.55	4.19	2.37	6.17642E-06
U10_0022	520884.326	3652409.08	670.96	2.55	4.19	2.37	6.17642E-06
U10_0023	520875.499	3652408.62	668.32	2.55	4.19	2.37	6.17642E-06
U10_0024	520866.575	3652407.46	665.04	2.55	4.19	2.37	6.17642E-06
U10_0025	520859.289	3652402.43	662.74	2.55	4.19	2.37	6.17642E-06
U10_0026	520852.256	3652396.82	660.4	2.55	4.19	2.37	6.17642E-06
U10_0027	520845.223	3652391.2	658.41	2.55	4.19	2.37	6.17642E-06
U10_0028	520838.19	3652385.59	657.3	2.55	4.19	2.37	6.17642E-06
U10_0029	520831.157	3652379.97	656.86	2.55	4.19	2.37	6.17642E-06
U10_0030	520824.124	3652374.36	657.04	2.55	4.19	2.37	6.17642E-06

U10_0031	520817.091	3652368.74	657.84	2.55	4.19	2.37	6.17642E-06
U10_0032	520810.058	3652363.12	658.97	2.55	4.19	2.37	6.17642E-06
U10_0033	520803.025	3652357.51	659.73	2.55	4.19	2.37	6.17642E-06
U10_0034	520795.934	3652351.98	660.11	2.55	4.19	2.37	6.17642E-06
U10_0035	520787.867	3652347.99	659.87	2.55	4.19	2.37	6.17642E-06
U10_0036	520779.801	3652344	659.51	2.55	4.19	2.37	6.17642E-06
U10_0037	520771.734	3652340.01	659.12	2.55	4.19	2.37	6.17642E-06
U10_0038	520763.668	3652336.02	657.3	2.55	4.19	2.37	6.17642E-06
U10_0039	520755.601	3652332.03	654.53	2.55	4.19	2.37	6.17642E-06
U10_0040	520747.535	3652328.04	651.55	2.55	4.19	2.37	6.17642E-06
U10_0041	520739.468	3652324.04	649.36	2.55	4.19	2.37	6.17642E-06
U10_0042	520731.402	3652320.05	648	2.55	4.19	2.37	6.17642E-06
U10_0043	520723.336	3652316.06	647.23	2.55	4.19	2.37	6.17642E-06
U10_0044	520714.588	3652314.34	646.79	2.55	4.19	2.37	6.17642E-06
U10_0045	520705.656	3652313.24	646.5	2.55	4.19	2.37	6.17642E-06
U10_0046	520696.847	3652312.73	646.44	2.55	4.19	2.37	6.17642E-06
U10_0047	520689.109	3652317.32	646.44	2.55	4.19	2.37	6.17642E-06
U10_0048	520681.372	3652321.92	646.44	2.55	4.19	2.37	6.17642E-06
U10_0049	520673.634	3652326.52	646.51	2.55	4.19	2.37	6.17642E-06
U10_0050	520666.5	3652331.96	646.77	2.55	4.19	2.37	6.17642E-06
U10_0051	520659.639	3652337.78	646.96	2.55	4.19	2.37	6.17642E-06
U10_0052	520652.158	3652342.14	647.17	2.55	4.19	2.37	6.17642E-06
U10_0053	520643.2	3652343.01	647.27	2.55	4.19	2.37	6.17642E-06
U10_0054	520636.915	3652336.82	647.02	2.55	4.19	2.37	6.17642E-06
U10_0055	520634.541	3652328.14	646.77	2.55	4.19	2.37	6.17642E-06
U10_0056	520637.889	3652320.16	646.74	2.55	4.19	2.37	6.17642E-06
U10_0057	520642.633	3652312.58	646.73	2.55	4.19	2.37	6.17642E-06
U10_0058	520649.314	3652306.55	646.61	2.55	4.19	2.37	6.17642E-06
U10_0059	520655.995	3652300.52	646.44	2.55	4.19	2.37	6.17642E-06
U10_0060	520662.676	3652294.49	646.53	2.55	4.19	2.37	6.17642E-06
U10_0061	520669.357	3652288.46	646.72	2.55	4.19	2.37	6.17642E-06
U10_0062	520675.725	3652282.14	646.55	2.55	4.19	2.37	6.17642E-06
U10_0063	520681.355	3652275.11	646.39	2.55	4.19	2.37	6.17642E-06
U10_0064	520680.399	3652266.23	646.24	2.55	4.19	2.37	6.17642E-06
U10_0065	520675.263	3652259.35	646.21	2.55	4.19	2.37	6.17642E-06
U10_0066	520668.691	3652253.2	646.18	2.55	4.19	2.37	6.17642E-06
U10_0067	520661.57	3652247.7	646.26	2.55	4.19	2.37	6.17642E-06
U10_0068	520654.406	3652242.25	646.34	2.55	4.19	2.37	6.17642E-06
U10_0069	520647.241	3652236.8	646.63	2.55	4.19	2.37	6.17642E-06
U10_0070	520641.49	3652229.92	646.91	2.55	4.19	2.37	6.17642E-06
U10_0071	520635.903	3652222.86	647.14	2.55	4.19	2.37	6.17642E-06
U10_0072	520630.316	3652215.8	647.36	2.55	4.19	2.37	6.17642E-06
U10_0073	520624.73	3652208.75	647.65	2.55	4.19	2.37	6.17642E-06
U10_0074	520619.143	3652201.69	647.72	2.55	4.19	2.37	6.17642E-06
U10_0075	520613.557	3652194.64	647.83	2.55	4.19	2.37	6.17642E-06
U10_0076	520607.97	3652187.58	647.54	2.55	4.19	2.37	6.17642E-06
U10_0077	520602.383	3652180.52	647.32	2.55	4.19	2.37	6.17642E-06
U10_0078	520596.797	3652173.47	647.43	2.55	4.19	2.37	6.17642E-06
U10_0079	520591.21	3652166.41	647.42	2.55	4.19	2.37	6.17642E-06
U10_0080	520583.199	3652163.49	647.51	2.55	4.19	2.37	6.17642E-06
U10_0081	520576.631	3652167.01	647.36	2.55	4.19	2.37	6.17642E-06
U10_0082	520574.472	3652175.01	647.1	2.55	4.19	2.37	6.17642E-06
U10_0083	520577.313	3652183.55	646.98	2.55	4.19	2.37	6.17642E-06
U10_0084	520580.153	3652192.09	646.96	2.55	4.19	2.37	6.17642E-06
U10_0085	520582.994	3652200.63	646.89	2.55	4.19	2.37	6.17642E-06
U10_0086	520584.334	3652209.47	646.76	2.55	4.19	2.37	6.17642E-06
U10_0087	520585.019	3652218.45	646.74	2.55	4.19	2.37	6.17642E-06
U10_0088	520585.705	3652227.42	646.73	2.55	4.19	2.37	6.17642E-06
U10_0089	520586.39	3652236.39	646.75	2.55	4.19	2.37	6.17642E-06
U10_0090	520586.71	3652245.38	646.76	2.55	4.19	2.37	6.17642E-06
U10_0091	520586.484	3652254.38	646.72	2.55	4.19	2.37	6.17642E-06
U10_0092	520586.259	3652263.37	646.7	2.55	4.19	2.37	6.17642E-06
U10_0093	520586.034	3652272.37	646.68	2.55	4.19	2.37	6.17642E-06
U10_0094	520585.068	3652281.31	646.66	2.55	4.19	2.37	6.17642E-06
U10_0095	520583.222	3652290.05	646.6	2.55	4.19	2.37	6.17642E-06

U10_0096	520579.631	3652298.3	646.45	2.55	4.19	2.37	6.17642E-06
U10_0097	520574.284	3652305.46	646.44	2.55	4.19	2.37	6.17642E-06
U10_0098	520566.344	3652309.18	646.44	2.55	4.19	2.37	6.17642E-06
U10_0099	520557.549	3652307.53	646.44	2.55	4.19	2.37	6.17642E-06
U10_0100	520550.804	3652302.13	646.44	2.55	4.19	2.37	6.17642E-06
U10_0101	520544.829	3652295.4	646.44	2.55	4.19	2.37	6.17642E-06
U10_0102	520543.891	3652286.71	646.44	2.55	4.19	2.37	6.17642E-06
U10_0103	520543.747	3652277.71	646.44	2.55	4.19	2.37	6.17642E-06
U10_0104	520543.603	3652268.71	646.44	2.55	4.19	2.37	6.17642E-06
U10_0105	520543.459	3652259.71	646.43	2.55	4.19	2.37	6.17642E-06
U10_0106	520542.468	3652250.82	646.23	2.55	4.19	2.37	6.17642E-06
U10_0107	520540.407	3652242.06	646.14	2.55	4.19	2.37	6.17642E-06
U10_0108	520538.347	3652233.29	646.13	2.55	4.19	2.37	6.17642E-06

ASARCO Roads
Summary

		No. of Volume Sources by Road Segment																																	Per Volume Source Q (tpy)	(g/s)
Truck type	Pb Annual (tpy)	Paved 1	Paved 2	Paved 3	Paved 4	Paved 5	Paved 6	Paved 7	Paved 8	Paved 9	Paved 10	Paved 11	Paved 12	Paved 13	Paved 14	Paved 15	Paved 16	Paved 17	Paved 18	Paved 19	Paved 20	Paved 21	Paved 22	Unpaved 1	Unpaved 2	Unpaved 3	Unpaved 4	Unpaved 5	Unpaved 6	Unpaved 7	Unpaved 8	Unpaved 9	Unpaved 10	Total Volume Sources	Pb	Pb
Concentrate	9.21E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	0	26	76	12	0	0	0	0	0	0	0	0	0	0	0	0	178	0.0000517	0.0000015
Flux delivery to crusher	5.89E-03	6	0	0	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67	0.0000880	0.0000025
Flux to storage	3.69E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	12	0	0	42	0.0000880	0.0000025
Flux to bedding area	6.77E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0	0	8	0	77	0.0000880	0.0000025
H2SO4	2.54E-03	6	0	0	61	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	0.0000244	0.0000007
Slag to crusher	1.74E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	11	20	0	0	0	81	0.0002147	0.0000062
Slag crusher to lumber spur	3.13E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	8	108	146	0.0002147	0.0000062
Misc truck deliveries	2.89E-04	6	86	35	61	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	13	9	0	0	0	0	0	0	0	0	0	0	236	0.0000012	0.0000000
General traffic & warehouse	4.60E-03	0	0	0	0	0	0	27	57	0	0	0	0	52	0	0	0	6	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	168	0.0000274	0.0000008
Scrap handling forklift	9.64E-03	0	0	0	0	0	0	0	57	0	0	0	0	0	3	4	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	0.0000753	0.0000022
Water/sweeper trucks	7.97E-03	0	86	35	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	182	0.0000438	0.0000013
Misc use forklift	1.32E-03	0	0	0	0	37	6	0	57	17	9	16	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	147	0.0000090	0.0000003
Storage pile loader	8.85E-03	0	0	0	0	0	0	0	0	0	0	0	0	52	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	64	0.0001383	0.0000040
Misc use loader	7.37E-03	0	0	35	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	62	0.0001190	0.0000034
Blister copper	9.73E-03	6	86	35	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	188	0.0000517	0.0000015
Slag hauler	1.29E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	155	0	0	0	0	0	0	0	0	0	155	0.0000832	0.0000024
Flux, delivery to crusher	1.59E-02	6	0	0	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	30	0	50	0	0	12	0	0	181	0.0000880	0.0000025
Smithco	2.16E-02	0	0	0	0	0	0	0	30	0	0	0	0	15	0	0	0	0	0	0	0	13	0	0	22	0	0	50	11	0	0	0	0	141	0.0001531	0.0000044

Paved 1

Distance 545.7 m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	1
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	1
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	1
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	1
Smithco	0

P1_0057	521362.8	3651148
P1_0058	521360	3651156
P1_0059	521358.2	3651165
P1_0060	521356.3	3651174
P1_0061	521354.4	3651183
P1_0062	521352.9	3651189

Paved 2

Distance	764.3	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	1
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	1
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P2_0001	521351.2	3651185
P2_0002	521347	3651177
P2_0003	521342.7	3651169
P2_0004	521338.4	3651161
P2_0005	521334.1	3651153
P2_0006	521329.8	3651145
P2_0007	521325.6	3651137
P2_0008	521321.3	3651130
P2_0009	521317	3651122
P2_0010	521311.1	3651115
P2_0011	521303.8	3651110
P2_0012	521296.5	3651105
P2_0013	521289.2	3651099
P2_0014	521282	3651094
P2_0015	521274.7	3651089
P2_0016	521267.4	3651084
P2_0017	521258.7	3651081
P2_0018	521250.1	3651078
P2_0019	521241.5	3651076
P2_0020	521232.6	3651075
P2_0021	521223.6	3651074
P2_0022	521214.7	3651073
P2_0023	521205.7	3651074
P2_0024	521196.8	3651075
P2_0025	521187.9	3651076
P2_0026	521179.2	3651078
P2_0027	521171	3651082
P2_0028	521162.8	3651086
P2_0029	521154.7	3651089
P2_0030	521146.8	3651094
P2_0031	521138.8	3651098

P2_0032	521130.3	3651101
P2_0033	521121.9	3651104
P2_0034	521113.3	3651107
P2_0035	521104.4	3651108
P2_0036	521095.5	3651109
P2_0037	521086.6	3651111
P2_0038	521077.6	3651111
P2_0039	521068.6	3651111
P2_0040	521059.6	3651111
P2_0041	521050.6	3651112
P2_0042	521041.6	3651112
P2_0043	521032.6	3651112
P2_0044	521023.6	3651112
P2_0045	521014.6	3651113
P2_0046	521005.6	3651113
P2_0047	520996.6	3651113
P2_0048	520987.6	3651113
P2_0049	520978.6	3651113
P2_0050	520969.6	3651114
P2_0051	520960.6	3651114
P2_0052	520951.7	3651114
P2_0053	520942.7	3651114
P2_0054	520933.7	3651114
P2_0055	520924.7	3651115
P2_0056	520915.7	3651115
P2_0057	520906.7	3651114
P2_0058	520897.7	3651114
P2_0059	520888.7	3651114
P2_0060	520879.7	3651114
P2_0061	520870.7	3651115
P2_0062	520861.7	3651116
P2_0063	520852.8	3651116
P2_0064	520843.8	3651117
P2_0065	520835.3	3651120
P2_0066	520826.8	3651123
P2_0067	520818.4	3651126
P2_0068	520810.4	3651130
P2_0069	520802.9	3651135
P2_0070	520795.5	3651140
P2_0071	520788.8	3651146
P2_0072	520782.6	3651153
P2_0073	520776.4	3651159
P2_0074	520772	3651167
P2_0075	520768.2	3651175
P2_0076	520764.3	3651183
P2_0077	520760.5	3651192
P2_0078	520756.8	3651200
P2_0079	520753.3	3651208
P2_0080	520749.8	3651216
P2_0081	520746.3	3651225
P2_0082	520743.5	3651233
P2_0083	520741.6	3651242
P2_0084	520739.8	3651251
P2_0085	520737.9	3651260
P2_0086	520736.1	3651268

Paved 3

Distance	305.1	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	1
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	1
Blister copper (p11)	1
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P3_0001	520735.2	3651275
P3_0002	520732.8	3651284
P3_0003	520730.4	3651293
P3_0004	520729.5	3651301
P3_0005	520729.3	3651310
P3_0006	520729	3651319
P3_0007	520729	3651328
P3_0008	520730	3651337
P3_0009	520730.9	3651346
P3_0010	520731.9	3651355
P3_0011	520734.3	3651364
P3_0012	520737	3651372
P3_0013	520739.8	3651381
P3_0014	520742.6	3651390
P3_0015	520746	3651398
P3_0016	520750	3651406
P3_0017	520753.9	3651414
P3_0018	520757.9	3651422
P3_0019	520761.8	3651430
P3_0020	520766.1	3651438
P3_0021	520770.4	3651446
P3_0022	520774.6	3651454
P3_0023	520779	3651462
P3_0024	520784.4	3651469
P3_0025	520789.8	3651476
P3_0026	520795.6	3651483
P3_0027	520802.3	3651489
P3_0028	520808.9	3651495
P3_0029	520815.1	3651502
P3_0030	520820.6	3651509
P3_0031	520826.1	3651516
P3_0032	520828.4	3651524
P3_0033	520829.7	3651533
P3_0034	520831	3651542
P3_0035	520832.2	3651551

Paved 4

Distance	539.6	m

Present on Segment = 1; else = 0

Concentrate (p1)	0
Flux delivery to crusher (p2)	1
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	1
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	1
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	1
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	1
Smithco	0

P4_0001	521354.6	3651194
P4_0002	521356	3651203
P4_0003	521357.4	3651212
P4_0004	521358.8	3651221
P4_0005	521360.2	3651230
P4_0006	521362.6	3651238
P4_0007	521365	3651247
P4_0008	521367.4	3651256
P4_0009	521369.8	3651264
P4_0010	521372	3651273
P4_0011	521374.3	3651282
P4_0012	521376.5	3651291
P4_0013	521378.7	3651299
P4_0014	521378.7	3651308
P4_0015	521378.7	3651317
P4_0016	521378.3	3651326
P4_0017	521377.9	3651335
P4_0018	521375.7	3651344
P4_0019	521372.3	3651352
P4_0020	521368.9	3651360
P4_0021	521365.1	3651369
P4_0022	521361.3	3651377
P4_0023	521357.2	3651385
P4_0024	521352.9	3651393
P4_0025	521348.7	3651401
P4_0026	521344.5	3651409
P4_0027	521340.4	3651417
P4_0028	521336.3	3651425
P4_0029	521332.8	3651433
P4_0030	521330.2	3651442
P4_0031	521328	3651450
P4_0032	521327.3	3651459
P4_0033	521326.5	3651468
P4_0034	521325.9	3651477

P4_0035	521325.2	3651486
P4_0036	521323.2	3651495
P4_0037	521320.3	3651503
P4_0038	521316.6	3651512
P4_0039	521312.5	3651520
P4_0040	521308.5	3651528
P4_0041	521304.4	3651536
P4_0042	521300.3	3651544
P4_0043	521296.2	3651552
P4_0044	521292.1	3651560
P4_0045	521288.1	3651568
P4_0046	521284	3651576
P4_0047	521279.9	3651584
P4_0048	521275.3	3651591
P4_0049	521270.2	3651599
P4_0050	521265.1	3651606
P4_0051	521258.6	3651612
P4_0052	521251.8	3651618
P4_0053	521244.9	3651624
P4_0054	521237.6	3651629
P4_0055	521230.3	3651635
P4_0056	521222.9	3651640
P4_0057	521215.5	3651645
P4_0058	521208.1	3651650
P4_0059	521201.1	3651656
P4_0060	521193.4	3651660
P4_0061	521185.3	3651664

Paved 5

Distance	323.1	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	1
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	1
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P5_0001	521182.5	3651662
P5_0002	521176.1	3651656
P5_0003	521169.5	3651649
P5_0004	521162.7	3651644
P5_0005	521156.9	3651637
P5_0006	521155.8	3651628
P5_0007	521155.8	3651620
P5_0008	521160	3651612
P5_0009	521162.9	3651603
P5_0010	521164.3	3651594
P5_0011	521165.6	3651585
P5_0012	521166.7	3651576
P5_0013	521166.4	3651567
P5_0014	521166	3651558
P5_0015	521165.7	3651550
P5_0016	521165.4	3651541
P5_0017	521167.1	3651532
P5_0018	521168.8	3651523
P5_0019	521170.9	3651514
P5_0020	521173.5	3651505
P5_0021	521176.7	3651497
P5_0022	521182	3651490
P5_0023	521187.4	3651483
P5_0024	521192.7	3651475
P5_0025	521198.1	3651468
P5_0026	521203.4	3651461
P5_0027	521208.8	3651454
P5_0028	521214.2	3651446
P5_0029	521219.5	3651439
P5_0030	521224.9	3651432
P5_0031	521230.2	3651425
P5_0032	521235.6	3651418
P5_0033	521240.9	3651410
P5_0034	521246.3	3651403
P5_0035	521251.6	3651396
P5_0036	521257	3651389
P5_0037	521262.3	3651381

Paved 6

Distance	45.0	m
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	0	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	1	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	0	

P6_0001	521172.6	3651497
P6_0002	521171.5	3651488
P6_0003	521170.4	3651479
P6_0004	521169.3	3651470
P6_0005	521169.8	3651461
P6_0006	521170.8	3651453

Paved 7

Distance	231.2	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	1
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	1
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P7_0001	521168.9	3651504
P7_0002	521160	3651505
P7_0003	521151.1	3651506
P7_0004	521142.1	3651507
P7_0005	521133.1	3651507
P7_0006	521124.1	3651507
P7_0007	521115.1	3651507
P7_0008	521106.1	3651507
P7_0009	521097.1	3651508
P7_0010	521088.1	3651508
P7_0011	521079.1	3651508
P7_0012	521070.1	3651508
P7_0013	521061.1	3651508
P7_0014	521052.1	3651509
P7_0015	521043.1	3651509
P7_0016	521034.1	3651509
P7_0017	521025.1	3651509
P7_0018	521016.1	3651509
P7_0019	521007.1	3651509
P7_0020	520998.1	3651510
P7_0021	520989.1	3651510
P7_0022	520980.1	3651511
P7_0023	520971.2	3651511
P7_0024	520962.2	3651512
P7_0025	520953.2	3651512
P7_0026	520944.7	3651515
P7_0027	520939.2	3651518

Paved 8

Distance	499.4	m
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	1	
Scrap handling forklift (p7)	1	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	1	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	1	30 sources only, P8_0028 thru P8_0057

P8_0001	521023.4	3651930
P8_0002	521031.3	3651926
P8_0003	521032.8	3651918
P8_0004	521033	3651909
P8_0005	521033.2	3651900
P8_0006	521033.4	3651891
P8_0007	521033.6	3651882
P8_0008	521033.8	3651873
P8_0009	521034	3651864
P8_0010	521035.5	3651856
P8_0011	521041.9	3651849
P8_0012	521049.3	3651844
P8_0013	521054.9	3651837
P8_0014	521060.1	3651830
P8_0015	521062.9	3651822
P8_0016	521065.6	3651813
P8_0017	521068.3	3651804
P8_0018	521071.1	3651796
P8_0019	521073.8	3651787
P8_0020	521076.6	3651779
P8_0021	521079.3	3651770
P8_0022	521082.1	3651762
P8_0023	521084.8	3651753
P8_0024	521087.6	3651744
P8_0025	521090.3	3651736
P8_0026	521093.1	3651727
P8_0027	521094.8	3651719
P8_0028	521093.9	3651710
P8_0029	521087.5	3651703
P8_0030	521079.3	3651700
P8_0031	521070.6	3651698
P8_0032	521061.9	3651696
P8_0033	521053.2	3651693
P8_0034	521044.6	3651691

P8_0035	521036.8	3651686
P8_0036	521031.9	3651679
P8_0037	521028.3	3651671
P8_0038	521024.7	3651663
P8_0039	521020.5	3651655
P8_0040	521016.1	3651647
P8_0041	521012.4	3651639
P8_0042	521009.3	3651630
P8_0043	521006.1	3651622
P8_0044	521002.9	3651613
P8_0045	520999.2	3651605
P8_0046	520995.2	3651597
P8_0047	520991.2	3651589
P8_0048	520986.8	3651581
P8_0049	520982.4	3651573
P8_0050	520977.9	3651566
P8_0051	520973.2	3651558
P8_0052	520968.3	3651550
P8_0053	520962.8	3651543
P8_0054	520957.3	3651536
P8_0055	520951.4	3651529
P8_0056	520944.5	3651524
P8_0057	520939.4	3651519

Paved 9

Distance	141.8	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	1
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P9_0001	521031.6	3651852
P9_0002	521023.2	3651849
P9_0003	521014.2	3651848
P9_0004	521005.2	3651848
P9_0005	520996.3	3651847
P9_0006	520987.4	3651845
P9_0007	520978.5	3651844
P9_0008	520969.5	3651843
P9_0009	520962.1	3651839
P9_0010	520958.7	3651831
P9_0011	520958.2	3651822
P9_0012	520957.8	3651813
P9_0013	520957.3	3651804
P9_0014	520956.8	3651795
P9_0015	520956.4	3651786
P9_0016	520955.9	3651777
P9_0017	520951.2	3651771

Paved 10

Distance	70.9	m
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	0	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	1	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	0	

P10_0001	521028.4	3651676
P10_0002	521025.9	3651685
P10_0003	521020	3651692
P10_0004	521018.2	3651701
P10_0005	521017	3651709
P10_0006	521016.4	3651718
P10_0007	521013	3651726
P10_0008	521005.1	3651730
P10_0009	520996.2	3651731

Paved 11

Distance	133.7	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	1
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

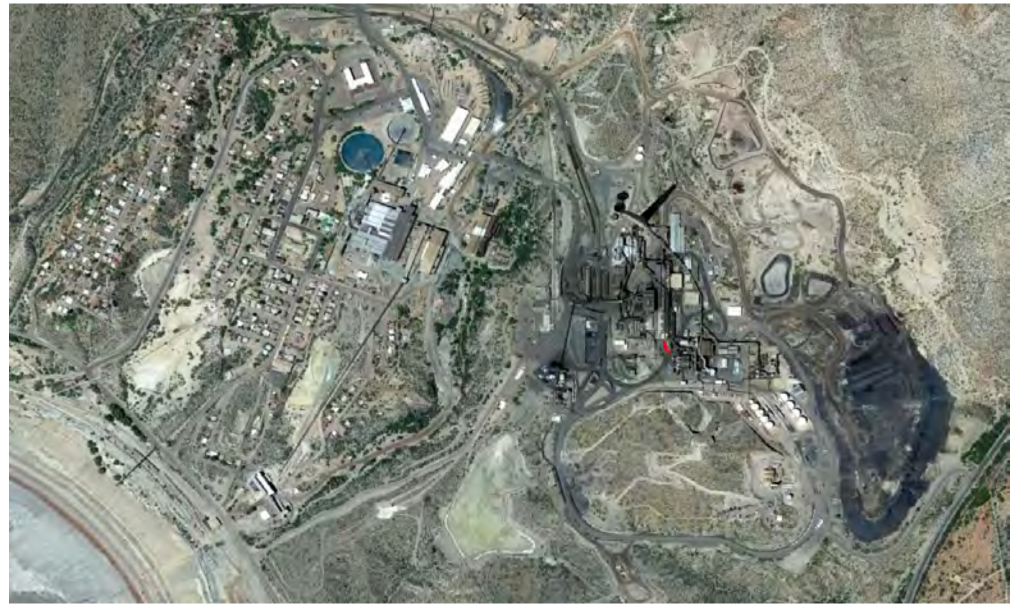
P11_0001	521028.4	3651659
P11_0002	521037.2	3651658
P11_0003	521046.1	3651656
P11_0004	521055	3651655
P11_0005	521063.9	3651654
P11_0006	521072.8	3651652
P11_0007	521081.8	3651652
P11_0008	521090.6	3651650
P11_0009	521099.1	3651647
P11_0010	521107.7	3651644
P11_0011	521116.2	3651641
P11_0012	521124.6	3651638
P11_0013	521132.8	3651634
P11_0014	521140.7	3651630
P11_0015	521148.3	3651625
P11_0016	521154.6	3651621

Paved 12

Distance 33.8 m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	1
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P12_0001	520989.1	3651597
P12_0002	520981.6	3651602
P12_0003	520978.5	3651610
P12_0004	520977.1	3651619
P12_0005	520976	3651626



Paved 13

Distance	455.2 m	
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	1	
Scrap handling forklift (p7)	0	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	0	
Storage pile loader (p10)	1	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	1	15 only; P13_0001 thru P13_0015

P13_0001	520936.2	3651518
P13_0002	520927.6	3651515
P13_0003	520918.9	3651513
P13_0004	520910.2	3651511
P13_0005	520901.4	3651509
P13_0006	520892.4	3651509
P13_0007	520883.6	3651510
P13_0008	520875.4	3651514
P13_0009	520867.3	3651518
P13_0010	520859.4	3651522
P13_0011	520852.1	3651527
P13_0012	520844.8	3651533
P13_0013	520839.2	3651540
P13_0014	520833.8	3651547
P13_0015	520833.4	3651556
P13_0016	520833.4	3651565
P13_0017	520833.4	3651574
P13_0018	520833.4	3651583
P13_0019	520833.4	3651592
P13_0020	520833.4	3651601
P13_0021	520833.4	3651610
P13_0022	520833.4	3651619
P13_0023	520833.4	3651628
P13_0024	520833.4	3651637
P13_0025	520833.4	3651646
P13_0026	520833.4	3651655
P13_0027	520831.3	3651663
P13_0028	520828.3	3651672
P13_0029	520824.3	3651680
P13_0030	520817.3	3651685
P13_0031	520808.8	3651688
P13_0032	520800.3	3651691
P13_0033	520791.5	3651693
P13_0034	520782.7	3651695
P13_0035	520773.9	3651696
P13_0036	520766.2	3651701

P13_0037	520758.6	3651706
P13_0038	520751.4	3651711
P13_0039	520747	3651719
P13_0040	520742.6	3651727
P13_0041	520739.1	3651735
P13_0042	520738.3	3651744
P13_0043	520737.4	3651753
P13_0044	520737	3651762
P13_0045	520738.2	3651771
P13_0046	520739.4	3651779
P13_0047	520740.5	3651788
P13_0048	520740.7	3651797
P13_0049	520740.7	3651806
P13_0050	520742.8	3651815
P13_0051	520745.9	3651823
P13_0052	520748.2	3651830

Paved 14

Distance	17.9 m	
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	1	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	0	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	0	
P14_0001	520839.2	3651531
P14_0002	520831	3651528
P14_0003	520823.5	3651523

Paved 15

Distance	24.1 m	
	Present on Segment = 1; else = 0	
Concentrate (p1)	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	1	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	0	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	0	
P15_0001	520829.4	3651553
P15_0002	520820.6	3651554
P15_0003	520812.1	3651551
P15_0004	520806.3	3651549

Paved 16

Distance	564.9	m

	Present on Segment = 1; else = 0
Concentrate (p1)	1
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	1
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P16_0001	520750.2	3651835
P16_0002	520753.2	3651843
P16_0003	520756.2	3651852
P16_0004	520759.2	3651860
P16_0005	520761.6	3651869
P16_0006	520763.5	3651878
P16_0007	520765.4	3651886
P16_0008	520767.3	3651895
P16_0009	520768.8	3651904
P16_0010	520770.1	3651913
P16_0011	520771.3	3651922
P16_0012	520771.7	3651931
P16_0013	520771.7	3651940
P16_0014	520771.7	3651949
P16_0015	520770.9	3651958
P16_0016	520769.3	3651967
P16_0017	520767.8	3651975
P16_0018	520765.8	3651984
P16_0019	520762.3	3651992
P16_0020	520758.4	3652000
P16_0021	520751.8	3652007
P16_0022	520745.2	3652013
P16_0023	520738.3	3652018
P16_0024	520730.6	3652023
P16_0025	520722.8	3652028
P16_0026	520715	3652032
P16_0027	520706.8	3652036
P16_0028	520698.7	3652040
P16_0029	520690.6	3652044
P16_0030	520682.4	3652047
P16_0031	520674.3	3652051
P16_0032	520666.2	3652055
P16_0033	520658	3652059
P16_0034	520649.9	3652063
P16_0035	520641.8	3652067
P16_0036	520633.6	3652070

P16_0037	520625.5	3652074
P16_0038	520617.4	3652078
P16_0039	520609.2	3652082
P16_0040	520601.1	3652086
P16_0041	520593	3652090
P16_0042	520584.8	3652094
P16_0043	520576.6	3652097
P16_0044	520567.8	3652099
P16_0045	520559	3652100
P16_0046	520550	3652099
P16_0047	520541.1	3652098
P16_0048	520532.2	3652097
P16_0049	520523.3	3652095
P16_0050	520514.3	3652095
P16_0051	520505.4	3652096
P16_0052	520496.4	3652097
P16_0053	520487.6	3652099
P16_0054	520478.7	3652100
P16_0055	520469.8	3652102
P16_0056	520461.1	3652104
P16_0057	520452.8	3652107
P16_0058	520444.4	3652111
P16_0059	520436.1	3652114
P16_0060	520427.9	3652118
P16_0061	520419.7	3652121
P16_0062	520412.9	3652127
P16_0063	520413.5	3652136
P16_0064	520415	3652144

Paved 17

Distance	44.9	m

	Present on Segment = 1; else = 0
Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	1
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P17_0001	520419.5	3652145
P17_0002	520427.9	3652148
P17_0003	520435.3	3652153
P17_0004	520441.7	3652159
P17_0005	520447.3	3652166
P17_0006	520452.9	3652173

Paved 18

Distance	218.8	m

	Present on Segment = 1; else = 0
Concentrate (p1)	1
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	1
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P18_0001	520415.7	3652148
P18_0002	520416.3	3652157
P18_0003	520416.9	3652166
P18_0004	520417.5	3652175
P18_0005	520416.1	3652184
P18_0006	520412.8	3652192
P18_0007	520409.6	3652201
P18_0008	520406.4	3652209
P18_0009	520403.2	3652218
P18_0010	520400	3652226
P18_0011	520396.8	3652235
P18_0012	520393.6	3652243
P18_0013	520390.4	3652251
P18_0014	520386.5	3652259
P18_0015	520383	3652268
P18_0016	520375.8	3652268
P18_0017	520367.2	3652265
P18_0018	520358.6	3652263
P18_0019	520350.1	3652260
P18_0020	520341.6	3652256
P18_0021	520333.2	3652253
P18_0022	520324.7	3652250
P18_0023	520316.3	3652247
P18_0024	520307.8	3652244
P18_0025	520299.3	3652241
P18_0026	520294.8	3652240

Paved 19

Distance	672.3 m	
	Present on Segment = 1; else = 0	
Concentrate (p1)	1	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	0	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	0	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	0	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	0	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	0	
Smithco	0	

P19_0001	520379.9745	3652274.686
P19_0002	520376.9554	3652283.165
P19_0003	520373.9364	3652291.643
P19_0004	520370.9174	3652300.122
P19_0005	520367.8983	3652308.6
P19_0006	520364.8793	3652317.079
P19_0007	520361.8603	3652325.557
P19_0008	520358.8412	3652334.036
P19_0009	520355.8222	3652342.514
P19_0010	520352.5388	3652350.836
P19_0011	520346.5511	3652357.555
P19_0012	520340.5633	3652364.275
P19_0013	520334.5756	3652370.994
P19_0014	520328.5879	3652377.713
P19_0015	520322.6002	3652384.432
P19_0016	520316.2631	3652390.795
P19_0017	520309.434	3652396.657
P19_0018	520302.605	3652402.52
P19_0019	520295.7759	3652408.382
P19_0020	520288.9469	3652414.244
P19_0021	520283.2925	3652421.037
P19_0022	520279.1407	3652429.022
P19_0023	520274.9889	3652437.008
P19_0024	520270.8371	3652444.993
P19_0025	520266.6852	3652452.978
P19_0026	520264.6606	3652461.483
P19_0027	520264.6638	3652470.483
P19_0028	520264.6669	3652479.483
P19_0029	520264.4757	3652488.329
P19_0030	520255.7165	3652490.397
P19_0031	520246.9572	3652492.464
P19_0032	520238.198	3652494.532
P19_0033	520229.4387	3652496.6

P19_0034	520220.6795	3652498.668
P19_0035	520211.9202	3652500.735
P19_0036	520203.2754	3652503.044
P19_0037	520196.1356	3652508.523
P19_0038	520188.9957	3652514.003
P19_0039	520181.8558	3652519.482
P19_0040	520174.7159	3652524.961
P19_0041	520167.5761	3652530.441
P19_0042	520160.4362	3652535.92
P19_0043	520153.2963	3652541.399
P19_0044	520146.1565	3652546.878
P19_0045	520139.0166	3652552.358
P19_0046	520131.8767	3652557.837
P19_0047	520124.7369	3652563.316
P19_0048	520117.597	3652568.795
P19_0049	520110.4571	3652574.275
P19_0050	520103.3173	3652579.754
P19_0051	520101.9978	3652587.803
P19_0052	520102.7576	3652596.771
P19_0053	520103.8696	3652605.676
P19_0054	520106.2768	3652614.348
P19_0055	520108.6839	3652623.02
P19_0056	520112.537	3652630.948
P19_0057	520118.2001	3652637.943
P19_0058	520124.592	3652644.185
P19_0059	520131.7663	3652649.619
P19_0060	520139.4327	3652654.288
P19_0061	520147.352	3652658.564
P19_0062	520155.2713	3652662.84
P19_0063	520163.8248	3652665.347
P19_0064	520172.6571	3652667.076
P19_0065	520181.4895	3652668.805
P19_0066	520190.3218	3652670.534
P19_0067	520199.1541	3652672.264
P19_0068	520207.9864	3652673.993
P19_0069	520216.8188	3652675.722
P19_0070	520225.6511	3652677.451
P19_0071	520227.9248	3652669.51
P19_0072	520229.5847	3652660.665
P19_0073	520231.2446	3652651.819
P19_0074	520232.9045	3652642.974
P19_0075	520234.5644	3652634.128
P19_0076	520236.2243	3652625.282

Paved 20

Distance 97.7 m

	Present on Segment = 1; else = 0
Concentrate (p1)	1
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	1
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P20_0001	520751.9	3651832
P20_0002	520753.7	3651823
P20_0003	520755.6	3651814
P20_0004	520761.7	3651808
P20_0005	520768.5	3651802
P20_0006	520775.2	3651796
P20_0007	520780.1	3651789
P20_0008	520781	3651780
P20_0009	520781.8	3651771
P20_0010	520782.7	3651762
P20_0011	520783.6	3651753
P20_0012	520784.4	3651745

Paved 21

Distance	104.3	m

Present on Segment = 1; else = 0

Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	1

P21_0001	521181.1	3651668
P21_0002	521173.9	3651673
P21_0003	521165.4	3651676
P21_0004	521156.6	3651678
P21_0005	521147.9	3651680
P21_0006	521138.9	3651681
P21_0007	521130.3	3651683
P21_0008	521122.6	3651687
P21_0009	521115.1	3651692
P21_0010	521108	3651698
P21_0011	521102.2	3651705
P21_0012	521098.1	3651713
P21_0013	521095.4	3651718

Paved 22

Distance	67.6	m

Present on Segment = 1; else = 0

Concentrate (p1)	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	1
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

P22_0001	520450.8	3652114
P22_0002	520450.6	3652123
P22_0003	520450.6	3652132
P22_0004	520453.2	3652141
P22_0005	520449.5	3652143
P22_0006	520442.1	3652138
P22_0007	520434.3	3652134
P22_0008	520426	3652130
P22_0009	520417.3	3652128

Unpaved 1

Distance 1376.6 m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	1
Flux, delivery to crusher (p2)	0
Smithco	0

U1_0001	521438.1	3651390
U1_0002	521447	3651389
U1_0003	521456	3651388
U1_0004	521464.9	3651387
U1_0005	521473.8	3651386
U1_0006	521481.6	3651382
U1_0007	521489.1	3651377
U1_0008	521496.5	3651372
U1_0009	521503.9	3651366
U1_0010	521507.1	3651358
U1_0011	521510.2	3651350
U1_0012	521513.3	3651341
U1_0013	521516	3651333
U1_0014	521517.6	3651324
U1_0015	521516.9	3651315
U1_0016	521515.5	3651306
U1_0017	521512.1	3651298
U1_0018	521507.4	3651290
U1_0019	521502.8	3651282
U1_0020	521497.9	3651275
U1_0021	521491.4	3651269
U1_0022	521485	3651262
U1_0023	521476.8	3651260
U1_0024	521467.8	3651259
U1_0025	521458.9	3651257
U1_0026	521451.9	3651262
U1_0027	521445.1	3651268
U1_0028	521439.5	3651275
U1_0029	521436.2	3651283
U1_0030	521432.9	3651292
U1_0031	521429.7	3651300
U1_0032	521427.5	3651309
U1_0033	521426.2	3651318
U1_0034	521425	3651327
U1_0035	521423.8	3651336
U1_0036	521422.6	3651344

U1_0037	521421.2	3651353
U1_0038	521419.5	3651362
U1_0039	521417.9	3651371
U1_0040	521416.2	3651380
U1_0041	521414.6	3651389
U1_0042	521412.9	3651398
U1_0043	521409.7	3651406
U1_0044	521405.5	3651414
U1_0045	521401.3	3651422
U1_0046	521397.1	3651430
U1_0047	521392.8	3651438
U1_0048	521388.6	3651446
U1_0049	521384.4	3651454
U1_0050	521380.2	3651461
U1_0051	521375.9	3651469
U1_0052	521372.3	3651478
U1_0053	521370	3651486
U1_0054	521367.7	3651495
U1_0055	521365.4	3651504
U1_0056	521363.2	3651512
U1_0057	521360.9	3651521
U1_0058	521359.9	3651530
U1_0059	521359.4	3651539
U1_0060	521358.9	3651548
U1_0061	521359.4	3651557
U1_0062	521364.7	3651564
U1_0063	521369.9	3651571
U1_0064	521375.2	3651579
U1_0065	521380.4	3651586
U1_0066	521385.5	3651593
U1_0067	521390.6	3651601
U1_0068	521393.4	3651609
U1_0069	521392.2	3651618
U1_0070	521390.9	3651627
U1_0071	521388.1	3651635
U1_0072	521383.9	3651643
U1_0073	521379.7	3651651
U1_0074	521374.5	3651658
U1_0075	521368.6	3651665
U1_0076	521362.7	3651672
U1_0077	521356.6	3651678
U1_0078	521349.1	3651683
U1_0079	521341.6	3651688
U1_0080	521334.1	3651693
U1_0081	521325.3	3651695
U1_0082	521316.4	3651696
U1_0083	521307.6	3651697
U1_0084	521298.7	3651695
U1_0085	521289.9	3651694
U1_0086	521281.1	3651692
U1_0087	521272.4	3651690
U1_0088	521263.7	3651687
U1_0089	521255	3651685
U1_0090	521246.3	3651683
U1_0091	521237.5	3651681
U1_0092	521228.5	3651680
U1_0093	521219.6	3651679
U1_0094	521210.6	3651679
U1_0095	521202.1	3651681
U1_0096	521193.7	3651685
U1_0097	521185.3	3651688

U1_0098	521179.9	3651695
U1_0099	521175.1	3651702
U1_0100	521172.7	3651711
U1_0101	521170.9	3651720
U1_0102	521169.1	3651729
U1_0103	521167.3	3651737
U1_0104	521165.6	3651746
U1_0105	521163.8	3651755
U1_0106	521162	3651764
U1_0107	521160.2	3651773
U1_0108	521158.5	3651781
U1_0109	521157	3651790
U1_0110	521155.7	3651799
U1_0111	521154.3	3651808
U1_0112	521153	3651817
U1_0113	521151.7	3651826
U1_0114	521150.4	3651835
U1_0115	521149	3651844
U1_0116	521147.7	3651853
U1_0117	521145.8	3651861
U1_0118	521142.7	3651870
U1_0119	521139.6	3651878
U1_0120	521136.5	3651887
U1_0121	521133.4	3651895
U1_0122	521129.3	3651903
U1_0123	521124.1	3651910
U1_0124	521118.9	3651918
U1_0125	521113.7	3651925
U1_0126	521107.8	3651932
U1_0127	521101.3	3651938
U1_0128	521094.9	3651944
U1_0129	521088.5	3651951
U1_0130	521082	3651957
U1_0131	521075.6	3651963
U1_0132	521069.2	3651970
U1_0133	521062.7	3651976
U1_0134	521056.3	3651982
U1_0135	521049.9	3651989
U1_0136	521043.2	3651995
U1_0137	521035.3	3651999
U1_0138	521027.3	3652003
U1_0139	521018.9	3652005
U1_0140	521010	3652004
U1_0141	521001	3652003
U1_0142	520994.2	3651998
U1_0143	520987.8	3651991
U1_0144	520984	3651984
U1_0145	520982.6	3651975
U1_0146	520981.2	3651966
U1_0147	520980.3	3651957
U1_0148	520979.7	3651948
U1_0149	520979.1	3651939
U1_0150	520978.5	3651930
U1_0151	520977.9	3651921
U1_0152	520977.2	3651912
U1_0153	520978	3651903
U1_0154	520980.8	3651895
U1_0155	520982.3	3651890

Unpaved 2

Distance 188.6 m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	1
Smithco	1

U2_0001	521230.4	3651683
U2_0002	521237.2	3651688
U2_0003	521244	3651694
U2_0004	521252.1	3651697
U2_0005	521261	3651699
U2_0006	521269.8	3651701
U2_0007	521278.7	3651703
U2_0008	521287.5	3651704
U2_0009	521296.3	3651706
U2_0010	521305.2	3651708
U2_0011	521313.8	3651710
U2_0012	521322.4	3651713
U2_0013	521331	3651716
U2_0014	521339.5	3651718
U2_0015	521348.1	3651721
U2_0016	521356.7	3651724
U2_0017	521364.9	3651727
U2_0018	521371	3651734
U2_0019	521377.1	3651740
U2_0020	521383.2	3651747
U2_0021	521389.3	3651754
U2_0022	521395.4	3651760

Unpaved 3

Distance	259.2 m	
	Present on Segment = 1; else = 0	
Concentrate	0	
Flux delivery to crusher (p2)	0	
Flux to storage (p2)	1	
Flux to bedding area (p2)	0	
H2SO4 (p3)	0	
Slag to crusher (p4)	0	
Slag crusher to lumber spur (p4)	1	
Misc truck deliveries (p5)	0	
General traffic & warehouse (p6)	0	
Scrap handling forklift (p7)	0	
Water/sweeper trucks (p8)	0	
Misc use forklift (p9)	0	
Storage pile loader (p10)	0	
Misc use loader (p10)	0	
Blister copper (p11)	0	
Slag hauler (p1)	0	
Flux, delivery to crusher (p2)	1	
Smithco	0	

U3_0001	521218.0031	3652126.544
U3_0002	521213.4912	3652134.331
U3_0003	521208.9793	3652142.118
U3_0004	521204.4674	3652149.906
U3_0005	521201.1487	3652158.269
U3_0006	521197.8623	3652166.647
U3_0007	521194.5758	3652175.026
U3_0008	521190.7667	3652183.162
U3_0009	521186.5001	3652191.086
U3_0010	521182.2335	3652199.011
U3_0011	521178.7804	3652207.306
U3_0012	521175.5928	3652215.723
U3_0013	521171.8328	3652223.871
U3_0014	521167.0156	3652231.424
U3_0015	521160.9202	3652238.045
U3_0016	521152.7573	3652241.308
U3_0017	521144.0996	3652243.766
U3_0018	521135.4333	3652246.194
U3_0019	521126.7503	3652248.561
U3_0020	521118.0672	3652250.929
U3_0021	521109.3726	3652253.245
U3_0022	521100.5109	3652254.816
U3_0023	521091.6492	3652256.388
U3_0024	521082.7875	3652257.96
U3_0025	521074.1298	3652260.349
U3_0026	521065.568	3652263.123
U3_0027	521057.0062	3652265.897
U3_0028	521048.402	3652268.535
U3_0029	521039.7915	3652271.153
U3_0030	521032.609	3652273.429

Unpaved 4

Distance	605.2	m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	1
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

U4_0001	520962.8	3652248
U4_0002	520956	3652242
U4_0003	520949.3	3652236
U4_0004	520942.5	3652230
U4_0005	520935.8	3652225
U4_0006	520929.8	3652218
U4_0007	520930.4	3652209
U4_0008	520930.9	3652200
U4_0009	520931.4	3652191
U4_0010	520931.9	3652182
U4_0011	520932.5	3652173
U4_0012	520933	3652164
U4_0013	520929.8	3652156
U4_0014	520926	3652148
U4_0015	520921.5	3652140
U4_0016	520915.8	3652133
U4_0017	520910	3652126
U4_0018	520904.3	3652119
U4_0019	520898.8	3652112
U4_0020	520893.3	3652105
U4_0021	520887.8	3652098
U4_0022	520882.1	3652091
U4_0023	520876.3	3652084
U4_0024	520867.7	3652082
U4_0025	520858.8	3652081
U4_0026	520849.8	3652080
U4_0027	520840.9	3652080
U4_0028	520831.9	3652080
U4_0029	520822.9	3652079
U4_0030	520827.2	3652074
U4_0031	520833.9	3652068
U4_0032	520840.7	3652062
U4_0033	520849.6	3652060
U4_0034	520858.5	3652059

U4_0035	520867.3	3652057
U4_0036	520876	3652055
U4_0037	520884.5	3652052
U4_0038	520893	3652049
U4_0039	520901.2	3652045
U4_0040	520906.8	3652039
U4_0041	520910.4	3652031
U4_0042	520908.6	3652022
U4_0043	520906.7	3652013
U4_0044	520904.9	3652004
U4_0045	520903	3651996
U4_0046	520901.1	3651987
U4_0047	520899.1	3651978
U4_0048	520896	3651970
U4_0049	520892.8	3651961
U4_0050	520889.7	3651953
U4_0051	520886.1	3651945
U4_0052	520882.3	3651936
U4_0053	520878.6	3651928
U4_0054	520874.4	3651920
U4_0055	520869.9	3651912
U4_0056	520865.5	3651905
U4_0057	520861.1	3651897
U4_0058	520857.1	3651889
U4_0059	520853.4	3651881
U4_0060	520852.7	3651872
U4_0061	520852.1	3651863
U4_0062	520851.4	3651854
U4_0063	520850.8	3651845
U4_0064	520850.1	3651836
U4_0065	520849.5	3651827
U4_0066	520844.7	3651822
U4_0067	520835.7	3651822
U4_0068	520826.7	3651821
U4_0069	520818.4	3651821

Unpaved 5

Distance	439.9	m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	1
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	1
Smithco	1

U5_0001	521398.5	3651766
U5_0002	521399.5	3651775
U5_0003	521400.5	3651784
U5_0004	521399.9	3651792
U5_0005	521398.5	3651801
U5_0006	521397.1	3651810
U5_0007	521395.5	3651819
U5_0008	521393.8	3651828
U5_0009	521392	3651837
U5_0010	521390.4	3651846
U5_0011	521389.2	3651854
U5_0012	521387.9	3651863
U5_0013	521388.2	3651872
U5_0014	521389.1	3651881
U5_0015	521390	3651890
U5_0016	521390.4	3651899
U5_0017	521390.7	3651908
U5_0018	521391	3651917
U5_0019	521391	3651926
U5_0020	521390.9	3651935
U5_0021	521390.8	3651944
U5_0022	521390.6	3651953
U5_0023	521388.8	3651962
U5_0024	521386.4	3651971
U5_0025	521383.2	3651979
U5_0026	521379.7	3651987
U5_0027	521373.6	3651993
U5_0028	521365.3	3651997
U5_0029	521357	3652000
U5_0030	521348.6	3652003
U5_0031	521339.8	3652005
U5_0032	521331	3652007
U5_0033	521322.6	3652010
U5_0034	521315	3652014

U5_0035	521307.4	3652019
U5_0036	521299.8	3652024
U5_0037	521292.7	3652030
U5_0038	521285.9	3652035
U5_0039	521279	3652041
U5_0040	521272.4	3652047
U5_0041	521266.4	3652054
U5_0042	521260.3	3652061
U5_0043	521254.6	3652068
U5_0044	521249.6	3652075
U5_0045	521244.6	3652083
U5_0046	521239.4	3652090
U5_0047	521234.3	3652097
U5_0048	521229.6	3652105
U5_0049	521225.5	3652113
U5_0050	521221.4	3652121

Unpaved 6

Distance	85.6	m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	1
Slag crusher to lumber spur (p4)	1
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	1

U6_0001	521225.5	3652107
U6_0002	521217.5	3652111
U6_0003	521209	3652112
U6_0004	521200.1	3652111
U6_0005	521191.2	3652109
U6_0006	521182.3	3652108
U6_0007	521173.5	3652106
U6_0008	521164.8	3652104
U6_0009	521156.1	3652102
U6_0010	521147.4	3652099
U6_0011	521142.5	3652098

Unpaved 7

Distance	169.5	m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	1
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

U7_0001	521401.1	3651757
U7_0002	521406.9	3651751
U7_0003	521413.7	3651745
U7_0004	521420.5	3651739
U7_0005	521427.4	3651733
U7_0006	521434.2	3651727
U7_0007	521441.1	3651721
U7_0008	521447.9	3651716
U7_0009	521454.6	3651710
U7_0010	521459.9	3651702
U7_0011	521465.1	3651695
U7_0012	521468.8	3651687
U7_0013	521472.1	3651678
U7_0014	521475.4	3651670
U7_0015	521478.7	3651662
U7_0016	521482	3651653
U7_0017	521485.3	3651645
U7_0018	521488.6	3651637
U7_0019	521491.9	3651628
U7_0020	521494.7	3651621

Unpaved 8

Distance 92.7 m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	1
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	0
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	1
Smithco	0

U8_0001	521029.7	3652278
U8_0002	521030.3	3652286
U8_0003	521037.2	3652290
U8_0004	521045.9	3652293
U8_0005	521054.9	3652294
U8_0006	521063.8	3652295
U8_0007	521072.7	3652296
U8_0008	521081.7	3652297
U8_0009	521090.6	3652298
U8_0010	521099.6	3652299
U8_0011	521108.5	3652300
U8_0012	521113.1	3652300

Unpaved 9

Distance	62.7	m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	1
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	1
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

U9_0001	521027.5	3652273
U9_0002	521018.5	3652272
U9_0003	521009.5	3652271
U9_0004	521000.5	3652271
U9_0005	520992.5	3652268
U9_0006	520984.9	3652263
U9_0007	520977.4	3652258
U9_0008	520969.9	3652253

Unpaved 10

Distance 956.1 m

	Present on Segment = 1; else = 0
Concentrate	0
Flux delivery to crusher (p2)	0
Flux to storage (p2)	0
Flux to bedding area (p2)	0
H2SO4 (p3)	0
Slag to crusher (p4)	0
Slag crusher to lumber spur (p4)	1
Misc truck deliveries (p5)	0
General traffic & warehouse (p6)	0
Scrap handling forklift (p7)	0
Water/sweeper trucks (p8)	0
Misc use forklift (p9)	0
Storage pile loader (p10)	0
Misc use loader (p10)	0
Blister copper (p11)	0
Slag hauler (p1)	0
Flux, delivery to crusher (p2)	0
Smithco	0

U10_0001	520965	3652255
U10_0002	520956	3652255
U10_0003	520947.8	3652258
U10_0004	520940.3	3652263
U10_0005	520934.6	3652270
U10_0006	520930.8	3652278
U10_0007	520928.6	3652286
U10_0008	520926.4	3652295
U10_0009	520924.2	3652304
U10_0010	520922.1	3652313
U10_0011	520919.9	3652321
U10_0012	520917.7	3652330
U10_0013	520915.5	3652339
U10_0014	520913.3	3652347
U10_0015	520911.1	3652356
U10_0016	520908.9	3652365
U10_0017	520906.7	3652374
U10_0018	520904.6	3652382
U10_0019	520902.4	3652391
U10_0020	520899.1	3652399
U10_0021	520892.3	3652405
U10_0022	520884.3	3652409
U10_0023	520875.5	3652409
U10_0024	520866.6	3652407
U10_0025	520859.3	3652402
U10_0026	520852.3	3652397
U10_0027	520845.2	3652391
U10_0028	520838.2	3652386
U10_0029	520831.2	3652380
U10_0030	520824.1	3652374
U10_0031	520817.1	3652369
U10_0032	520810.1	3652363
U10_0033	520803	3652358
U10_0034	520795.9	3652352
U10_0035	520787.9	3652348
U10_0036	520779.8	3652344
U10_0037	520771.7	3652340
U10_0038	520763.7	3652336
U10_0039	520755.6	3652332
U10_0040	520747.5	3652328
U10_0041	520739.5	3652324
U10_0042	520731.4	3652320
U10_0043	520723.3	3652316
U10_0044	520714.6	3652314
U10_0045	520705.7	3652313
U10_0046	520696.8	3652313
U10_0047	520689.1	3652317
U10_0048	520681.4	3652322
U10_0049	520673.6	3652327
U10_0050	520666.5	3652332
U10_0051	520659.6	3652338
U10_0052	520652.2	3652342
U10_0053	520643.2	3652343
U10_0054	520636.9	3652337
U10_0055	520634.5	3652328

U10_0056	520637.9	3652320
U10_0057	520642.6	3652313
U10_0058	520649.3	3652307
U10_0059	520656	3652301
U10_0060	520662.7	3652294
U10_0061	520669.4	3652288
U10_0062	520675.7	3652282
U10_0063	520681.4	3652275
U10_0064	520680.4	3652266
U10_0065	520675.3	3652259
U10_0066	520668.7	3652253
U10_0067	520661.6	3652248
U10_0068	520654.4	3652242
U10_0069	520647.2	3652237
U10_0070	520641.5	3652230
U10_0071	520635.9	3652223
U10_0072	520630.3	3652216
U10_0073	520624.7	3652209
U10_0074	520619.1	3652202
U10_0075	520613.6	3652195
U10_0076	520608	3652188
U10_0077	520602.4	3652181
U10_0078	520596.8	3652173
U10_0079	520591.2	3652166
U10_0080	520583.2	3652163
U10_0081	520576.6	3652167
U10_0082	520574.5	3652175
U10_0083	520577.3	3652184
U10_0084	520580.2	3652192
U10_0085	520583	3652201
U10_0086	520584.3	3652209
U10_0087	520585	3652218
U10_0088	520585.7	3652227
U10_0089	520586.4	3652236
U10_0090	520586.7	3652245
U10_0091	520586.5	3652254
U10_0092	520586.3	3652263
U10_0093	520586	3652272
U10_0094	520585.1	3652281
U10_0095	520583.2	3652290
U10_0096	520579.6	3652298
U10_0097	520574.3	3652305
U10_0098	520566.3	3652309
U10_0099	520557.5	3652308
U10_0100	520550.8	3652302
U10_0101	520544.8	3652295
U10_0102	520543.9	3652287
U10_0103	520543.7	3652278
U10_0104	520543.6	3652269
U10_0105	520543.5	3652260
U10_0106	520542.5	3652251
U10_0107	520540.4	3652242
U10_0108	520538.3	3652233

Appendix C
Background Concentration Supporting Information

Hayden Area Pb Background
2019 thru September 2022

Period	Globe Highway	Hillcrest	
		All data	Excluding 16-106 degs
Average of Rolling 3-Month Averages (ug/m3), starting with Nov-Jan 2019: *(only post-temporary shut down data)*	0.004	0.012	0.010

Globe Highway
Pb Concentrations
2019 - September 2022

Average of Rolling 3-Month Averages, starting with Nov-Jan 2019: 0.004 ug/m3 (this average contains only post-strike data)

	Globe Highway	Rolling 3-Month Average	
Date	24-hr (ug/m3)	Period	Conc (ug/m3)
1/3/2019	0.004		
1/9/2019	0.001		
1/15/2019	0.018		
1/21/2019	0.257		
1/27/2019	0.005		
2/2/2019	0.005		
2/8/2019	0.005		
2/14/2019	0.01		
2/20/2019	0.033		
2/26/2019	0.034		
3/4/2019	0.077		
3/10/2019	0.031		
3/16/2019	0.003		
3/22/2019	0.155		
3/28/2019	0.166	Jan-Mar	0.054
4/3/2019	0.114		
4/9/2019	0.114		
4/15/2019	0.191		
4/21/2019	0.028		
4/27/2019	0.03	Feb-Apr	0.066
5/3/2019	0.122		
5/9/2019	0.113		
5/15/2019	0.089		
5/21/2019	0.054		
5/27/2019	0.32	Mar-May	0.107
6/2/2019	0.112		
6/8/2019	0.101		
6/14/2019	0.17		
6/20/2019	0.182		
6/26/2019	0.154	Apr-Jun	0.126
7/2/2019	0.236		
7/8/2019	0.083		
7/14/2019	0.292		
7/20/2019	0.281		
7/26/2019	0.199	May-Jul	0.167
8/1/2019	0.141		
8/7/2019	0.158		
8/13/2019	0.111		
8/19/2019	0.154		
8/25/2019	0.179		
8/31/2019	0.057	Jun-Aug	0.163
9/6/2019	0.382		
9/12/2019	0.063		
9/18/2019	0.087		
9/20/2019	0.257		
9/24/2019	0.006		
9/30/2019	0.127	Jul-Sep	0.165
10/6/2019	0.041		
10/12/2019	0.027		
10/18/2019	0.1		
10/24/2019	0.005		
10/30/2019	0.004	Aug-Oct	0.112
11/5/2019	0.004		
11/17/2019	0.002		
11/19/2019	0.019		
11/23/2019	0.001		
11/29/2019	0.002	Sep-Nov	0.070
12/5/2019	0.003		
12/11/2019	0.001		
12/17/2019	0.001	Oct-Dec	0.016
1/10/2020	0.003		
1/16/2020	0.006	Nov-Jan	0.004
2/5/2020	0.01		
2/9/2020	0.003		
2/12/2020	0.003		
2/15/2020	0.003		
2/19/2020	0.007		
2/21/2020	0.002		
2/25/2020	0.001		
2/27/2020	0.001	Dec-Feb	0.003
3/4/2020	0.008		
3/10/2020	0.002		
3/16/2020	0.004		
3/22/2020	0.002		
3/28/2020	0.003	Jan-Mar	0.004
4/8/2020	0.017		
4/11/2020	0.003		
4/15/2020	0.003		
4/21/2020	0.012		
4/27/2020	0.007	Feb-Apr	0.005
5/3/2020	0.004		
5/9/2020	0.004		
5/15/2020	0.004		
5/21/2020	0.003		

5/27/2020	0.006	Mar-May	0.005
6/2/2020	0.004		
6/8/2020	0.007		
6/14/2020	0.003		
6/20/2020	0.003		
6/26/2020	0.003	Apr-Jun	0.006
7/2/2020	0.004		
7/8/2020	0.005		
7/14/2020	0.004		
7/20/2020	0.008		
7/26/2020	0.002	May-Jul	0.004
8/1/2020	0.002		
8/7/2020	0.003		
8/13/2020	0.004		
8/19/2020	0.003		
8/25/2020	0.003		
8/31/2020	0.005	Jun-Aug	0.004
9/6/2020	0.002		
9/12/2020	0.002		
9/18/2020	0.002		
9/24/2020	0.005		
9/30/2020	0.003	Jul-Sep	0.004
10/6/2020	0.005		
10/12/2020	0.006		
10/18/2020	0.005		
10/24/2020	0.005		
10/30/2020	0.002	Aug-Oct	0.004
11/5/2020	0.002		
11/11/2020	0.003		
11/17/2020	0.002	Sep-Nov	0.003
12/5/2020	0.001		
12/11/2020	0.002		
12/17/2020	0.001		
12/23/2020	0.003		
12/29/2020	0.002	Oct-Dec	0.003
1/4/2021	0.004		
1/10/2021	0.002		
1/16/2021	0.002		
1/22/2021	0.001		
1/28/2021	0.001	Nov-Jan	0.002
2/3/2021	0.003		
2/9/2021	0.002		
2/15/2021	0.002		
2/21/2021	0.001		
2/27/2021	0.004	Dec-Feb	0.002
3/5/2021	0.002		
3/11/2021	0.005		
3/17/2021	0.002		
3/23/2021	0.009		
3/31/2021	0.002	Jan-Mar	0.003
4/4/2021	0.003		
4/10/2021	0.005		
4/16/2021	0.003		
4/22/2021	0.007		
4/28/2021	0.003	Feb-Apr	0.004
5/4/2021	0.002		
5/10/2021	0.004		
5/16/2021	0.004		
5/22/2021	0.014		
5/28/2021	0.004	Mar-May	0.005
6/21/2021	0.008		
6/27/2021	0.003		
6/29/2021	0.001	Apr-Jun	0.005
7/3/2021	0.002		
7/9/2021	0.007		
7/15/2021	0.004		
7/21/2021	0.003		
7/27/2021	0.002	May-Jul	0.004
8/2/2021	0.003		
8/8/2021	0.004		
8/14/2021	0.001		
8/20/2021	0.001		
8/26/2021	0.002	Jun-Aug	0.003
9/1/2021	0.002		
9/7/2021	0.004		
9/13/2021	0.004		
9/19/2021	0.003		
9/25/2021	0.003	Jul-Sep	0.003
10/1/2021	0.001		
10/7/2021	0.002		
10/13/2021	0.004		
10/19/2021	0.002		
10/25/2021	0.002		
10/31/2021	0.002	Aug-Oct	0.003
11/6/2021	0.003		
11/12/2021	0.001		
11/18/2021	0.003		
11/24/2021	0.003	Sep-Nov	0.003
12/24/2021	0.003		
12/30/2021	0.001	Oct-Dec	0.002
1/5/2022	0.002		

1/11/2022	0.001		
1/17/2022	0.002		
1/23/2022	0.001		
1/29/2022	0.001	Nov-Jan	0.002
2/4/2022	0.001		
2/10/2022	0.002		
2/16/2022	0.004		
2/22/2022	0.006		
2/28/2022	0.001	Dec-Feb	0.002
3/6/2022	0.003		
3/12/2022	0.002		
3/18/2022	0.004		
3/24/2022	0.003		
3/30/2022	0.004	Jan-Mar	0.002
4/5/2022	0.004		
4/11/2022	0.022		
4/17/2022	0.005		
4/23/2022	0.005		
4/29/2022	0.005	Feb-Apr	0.005
5/5/2022	0.003		
5/11/2022	0.011		
5/17/2022	0.003		
5/23/2022	0.006		
5/29/2022	0.017	Mar-May	0.006
6/4/2022	0.004		
6/14/2022	0.006		
6/16/2022	0.005		
6/22/2022	0.002		
6/28/2022	0.002	Apr-Jun	0.007
7/4/2022	0.002		
7/10/2022	0.003		
7/16/2022	0.003		
7/22/2022	0.005		
7/28/2022	0.002	May-Jul	0.005
8/3/2022	0.011		
8/9/2022	0.001		
8/15/2022	0.005		
8/21/2022	0.001		
8/27/2022	0.003	Jun-Aug	0.004
9/2/2022	0.002		
9/8/2022	0.002		
9/14/2022	0.002		
9/20/2022	0.002		
9/26/2022	0.002	Jul-Sep	0.003

Hillcrest
Pb Concentrations
2019 - September 2022

Raw Data						Excluding 16-106 degs			
Hillcrest		Rolling 3-Month Average		No. Wdirs between 16-106 degs		Hillcrest		Rolling 3-Month Average	
Date	24-hr (ug/m3)	Period	Conc (ug/m3)			Date	24-hr (ug/m3)	Period	Conc (ug/m3)
1/27/2019	0.08			27-Jan	9	1/27/2019			
2/2/2019	0.072			2-Feb	3	2/2/2019			
2/8/2019	0.041			8-Feb	10	2/8/2019			
2/14/2019	0.135			14-Feb	3	2/14/2019			
2/20/2019	0.037			20-Feb	1	2/20/2019			
2/26/2019	0.129			26-Feb	2	2/26/2019			
3/4/2019	0.051			4-Mar	1	3/4/2019			
3/10/2019	0.093			10-Mar	3	3/10/2019			
3/16/2019	0.323			16-Mar	24	3/16/2019			
3/22/2019	0.045			22-Mar	0	3/22/2019	0.045		
3/28/2019	0.078	Jan-Mar	0.099	28-Mar	0	3/28/2019	0.078	Jan-Mar	0.062
4/3/2019	0.078			3-Apr	4	4/3/2019			
4/9/2019	0.139			9-Apr	1	4/9/2019			
4/15/2019	0.06			15-Apr	2	4/15/2019			
4/21/2019	0.031			21-Apr	3	4/21/2019			
4/27/2019	0.024	Feb-Apr	0.089	27-Apr	4	4/27/2019		Feb-Apr	0.062
5/3/2019	0.052			3-May	4	5/3/2019			
5/9/2019	0.139			9-May	8	5/9/2019			
5/15/2019	0.071			15-May	0	5/15/2019	0.071		
5/21/2019	0.111			21-May	0	5/21/2019	0.111		
5/27/2019	0.007	Mar-May	0.087	27-May	0	5/27/2019	0.007	Mar-May	0.062
6/2/2019	0.033			2-Jun	1	6/2/2019			
6/8/2019	0.063			8-Jun	3	6/8/2019			
6/14/2019	0.118			14-Jun	0	6/14/2019	0.118		
6/20/2019	0.068			20-Jun	1	6/20/2019			
6/26/2019	0.079	Apr-Jun	0.072	26-Jun	3	6/26/2019		Apr-Jun	0.077
7/2/2019	0.155			2-Jul	3	7/2/2019			
7/8/2019	0.085			8-Jul	0	7/8/2019	0.085		
7/14/2019	0.036			14-Jul	2	7/14/2019			
7/20/2019	0.032			20-Jul	2	7/20/2019			
7/26/2019	0.034	May-Jul	0.072	26-Jul	1	7/26/2019		May-Jul	0.078
8/1/2019	0.05			1-Aug	0	8/1/2019	0.05		
8/7/2019	0.071			7-Aug	3	8/7/2019			
8/13/2019	0.138			13-Aug	2	8/13/2019			
8/19/2019	0.076			19-Aug	0	8/19/2019	0.076		
8/25/2019	0.01			25-Aug	2	8/25/2019			
8/31/2019	0.064	Jun-Aug	0.070	31-Aug	1	8/31/2019		Jun-Aug	0.082
9/6/2019	0.045			6-Sep	2	9/6/2019			
9/12/2019	0.083			12-Sep	1	9/12/2019			
9/18/2019	0.102			18-Sep	0	9/18/2019	0.102		
9/24/2019	0.317			24-Sep	13	9/24/2019			
9/30/2019	0.054	Jul-Sep	0.085	30-Sep	2	9/30/2019		Jul-Sep	0.078
10/6/2019	0.04			6-Oct	2	10/6/2019			
10/12/2019	0.313			12-Oct	15	10/12/2019			
10/18/2019	0.025			18-Oct	1	10/18/2019			
10/24/2019	0.096			24-Oct	18	10/24/2019			
10/30/2019	0.056	Aug-Oct	0.096	30-Oct	19	10/30/2019		Aug-Oct	0.076
11/5/2019	0.018			5-Nov	8	11/5/2019			
11/17/2019	0.006			17-Nov	6	11/17/2019			
11/19/2019	0.041			19-Nov	7	11/19/2019			
11/23/2019	0.004			23-Nov	14	11/23/2019			
11/29/2019	0.003	Sep-Nov	0.080	29-Nov	3	11/29/2019		Sep-Nov	0.102
12/5/2019	0.003			5-Dec	2	12/5/2019			
12/11/2019	0.003			11-Dec	8	12/11/2019			
12/17/2019	0.034			17-Dec	23	12/17/2019			
12/23/2019	0.008			23-Dec	0	12/23/2019	0.008		
12/29/2019	0.003	Oct-Dec	0.044	29-Dec	6	12/29/2019		Oct-Dec	0.008
1/4/2020	0.004			4-Jan	3	1/4/2020			
1/10/2020	0.003			10-Jan	2	1/10/2020			
1/16/2020	0.014			16-Jan	2	1/16/2020			
1/22/2020	0.002			22-Jan	0	1/22/2020	0.002		
1/28/2020	0.011	Nov-Jan	0.010	28-Jan	2	1/28/2020		Nov-Jan	0.005
2/3/2020	0.023			3-Feb	2	2/3/2020			
2/9/2020	0.007			9-Feb	1	2/9/2020			
2/15/2020	0.007			15-Feb	0	2/15/2020	0.007		
2/21/2020	0.292			21-Feb	24	2/21/2020			
2/27/2020	0.003	Dec-Feb	0.028	27-Feb	11	2/27/2020		Dec-Feb	0.006
3/4/2020	0.007			4-Mar	1	3/4/2020			
3/10/2020	0.009			10-Mar	3	3/10/2020			
3/22/2020	0.003			22-Mar	0	3/22/2020	0.003		
3/28/2020	0.005	Jan-Mar	0.028	28-Mar	1	3/28/2020		Jan-Mar	0.004
4/10/2020	0.006			10-Apr	1	4/10/2020			
4/15/2020	0.005			15-Apr	0	4/15/2020	0.005		
4/21/2020	0.016			21-Apr	1	4/21/2020			
4/27/2020	0.008	Feb-Apr	0.030	27-Apr	0	4/27/2020	0.008	Feb-Apr	0.006
5/2/2020	0.007			2-May	1	5/2/2020			
5/5/2020	0.008			5-May	0	5/5/2020	0.008		
5/9/2020	0.006			9-May	0	5/9/2020	0.006		
5/15/2020	0.006			15-May	0	5/15/2020	0.006		
5/21/2020	0.008			21-May	1	5/21/2020			
5/27/2020	0.011	Mar-May	0.008	27-May	0	5/27/2020	0.011	Mar-May	0.007
6/2/2020	0.005			2-Jun	0	6/2/2020	0.005		
6/8/2020	0.005			8-Jun	0	6/8/2020	0.005		
6/14/2020	0.005			14-Jun	2	6/14/2020			
6/20/2020	0.006			20-Jun	0	6/20/2020	0.006		
6/26/2020	0.005	Apr-Jun	0.007	26-Jun	1	6/26/2020		Apr-Jun	0.007
7/2/2020	0.02			2-Jul	1	7/2/2020			
7/8/2020	0.016			8-Jul	0	7/8/2020	0.016		
7/14/2020	0.008			14-Jul	3	7/14/2020			
7/20/2020	0.011			20-Jul	1	7/20/2020			
7/26/2020	0.005	May-Jul	0.008	26-Jul	4	7/26/2020		May-Jul	0.008
8/1/2020	0.005			1-Aug	11	8/1/2020			
8/7/2020	0.005			7-Aug	0	8/7/2020	0.005		
8/13/2020	0.01			13-Aug	1	8/13/2020			
8/19/2020	0.007			19-Aug	1	8/19/2020			
8/25/2020	0.007			25-Aug	5	8/25/2020			
8/31/2020	0.004	Jun-Aug	0.008	31-Aug	0	8/31/2020	0.004	Jun-Aug	0.007
9/6/2020	0.004			6-Sep	3	9/6/2020			
9/12/2020	0.008			12-Sep	3	9/12/2020			
9/18/2020	0.018			18-Sep	7	9/18/2020			
9/24/2020	0.007			24-Sep	0	9/24/2020	0.007		
9/30/2020	0.006	Jul-Sep	0.009	30-Sep	0	9/30/2020	0.006	Jul-Sep	0.008
10/6/2020	0.014			6-Oct	1	10/6/2020			
10/12/2020	0.076			12-Oct	0	10/12/2020	0.076		
10/18/2020	0.007			18-Oct	2	10/18/2020			
10/24/2020	0.041			24-Oct	1	10/24/2020			
10/30/2020	0.012	Aug-Oct	0.014	30-Oct	18	10/30/2020		Aug-Oct	0.020
11/5/2020	0.022			5-Nov	7	11/5/2020			
11/11/2020	0.009			12-Nov	0	11/11/2020	0.009		
11/17/2020	0.015	Sep-Nov	0.018	17-Nov	11	11/17/2020		Sep-Nov	0.025
12/5/2020	0.004			5-Dec	0	12/5/2020	0.004		
12/8/2020	0.014			8-Dec	14	12/8/2020			
12/11/2020	0.011			11-Dec	1	12/11/2020			
12/17/2020	0.01			17-Dec	0	12/17/2020	0.01		

All data (i.e., no exclusions)

Average of Rolling 3-Month Averages, starting with Nov 2019-Jan 2020: 0.012 ug/m3 (this average contains only post-strike data)

Excluding 16-106 degs

Average of Rolling 3-Month Averages, starting with Nov 2019-Jan 2020: 0.010 ug/m3 (this average contains only post-strike data)

12/23/2020	0.021	Oct-Dec	0.020	23-Dec	12	12/23/2020		Oct-Dec	0.025
1/10/2021	0.006			10-Jan	17	1/10/2021			
1/16/2021	0.004			16-Jan	1	1/16/2021			
1/22/2021	0.003			22-Jan	3	1/22/2021			
1/30/2021	0.003	Nov-Jan	0.010	30-Jan	7	1/30/2021		Nov-Jan	0.008
2/3/2021	0.02			3-Feb	3	2/3/2021			
2/9/2021	0.011			9-Feb	0	2/9/2021	0.011		
2/15/2021	0.006			15-Feb	0	2/15/2021	0.006		
2/21/2021	0.008			21-Feb	3	2/21/2021			
2/27/2021	0.007	Dec-Feb	0.009	27-Feb	3	2/27/2021		Dec-Feb	0.008
3/5/2021	0.025			5-Mar	3	3/5/2021			
3/11/2021	0.01			11-Mar	1	3/11/2021			
3/17/2021	0.004			17-Mar	24	3/17/2021			
3/23/2021	0.007			23-Mar	2	3/23/2021			
3/25/2021	0.003			25-Mar	6	3/25/2021			
3/29/2021	0.011	Jan-Mar	0.009	29-Mar	0	3/29/2021	0.011	Jan-Mar	0.009
4/4/2021	0.006			4-Apr	1	4/4/2021			
4/10/2021	0.01			10-Apr	0	4/10/2021	0.01		
4/16/2021	0.007			16-Apr	1	4/16/2021			
4/22/2021	0.008			22-Apr	0	4/22/2021	0.008		
4/28/2021	0.004	Feb-Apr	0.009	28-Apr	4	4/28/2021		Feb-Apr	0.009
5/4/2021	0.006			4-May	4	5/4/2021			
5/10/2021	0.01			10-May	3	5/10/2021			
5/16/2021	0.008			16-May	1	5/16/2021			
5/22/2021	0.007			22-May	1	5/22/2021			
5/28/2021	0.004	Mar-May	0.008	28-May	2	5/28/2021		Mar-May	0.010
6/3/2021	0.01			3-Jun	0	6/3/2021	0.01		
6/9/2021	0.008			9-Jun	0	6/9/2021	0.008		
6/15/2021	0.012			15-Jun	3	6/15/2021			
6/21/2021	0.005			21-Jun	2	6/21/2021			
6/27/2021	0.021	Apr-Jun	0.008	27-Jun	2	6/27/2021		Apr-Jun	0.009
7/3/2021	0.006			3-Jul	2	7/3/2021			
7/9/2021	0.012			9-Jul	3	7/9/2021			
7/15/2021	0.004			15-Jul	2	7/15/2021			
7/21/2021	0.006			21-Jul	3	7/21/2021			
7/27/2021	0.006	May-Jul	0.008	27-Jul	4	7/27/2021		May-Jul	0.009
8/2/2021	0.01			2-Aug	1	8/2/2021			
8/14/2021	0.002			14-Aug	1	8/14/2021			
8/20/2021	0.004			20-Aug	2	8/20/2021			
8/26/2021	0.01	Jun-Aug	0.008	26-Aug	1	8/26/2021		Jun-Aug	0.009
9/1/2021	0.002			1-Sep	2	9/1/2021			
9/7/2021	0.005			7-Sep	7	9/7/2021			
9/13/2021	0.007			13-Sep	4	9/13/2021			
9/19/2021	0.002			19-Sep	2	9/19/2021			
9/25/2021	0.013	Jul-Sep	0.006	25-Sep	2	9/25/2021		Jul-Sep	#DIV/0!
10/1/2021	0.005			1-Oct	4	10/1/2021			
10/7/2021	0.009			7-Oct	13	10/7/2021			
10/13/2021	0.009			13-Oct	1	10/13/2021			
10/19/2021	0.008			19-Oct	3	10/19/2021			
10/25/2021	0.01			25-Oct	22	10/25/2021			
10/31/2021	0.007	Aug-Oct	0.007	31-Oct	21	10/31/2021		Aug-Oct	#DIV/0!
11/6/2021	0.01			6-Nov	6	11/6/2021			
11/12/2021	0.019			12-Nov	22	11/12/2021			
11/18/2021	0.04			18-Nov	3	11/18/2021			
11/24/2021	0.003			24-Nov	2	11/24/2021			
11/30/2021	0.008	Sep-Nov	0.010	30-Nov	7	11/30/2021		Sep-Nov	#DIV/0!
12/6/2021	0.012			6-Dec	8	12/6/2021			
12/12/2021	0.003			12-Dec	2	12/12/2021			
12/18/2021	0.003			18-Dec	24	12/18/2021			
12/24/2021	0.002			24-Dec	4	12/24/2021			
12/30/2021	0.002	Oct-Dec	0.009	30-Dec	20	12/30/2021		Oct-Dec	#DIV/0!
1/5/2022	0.004					1/5/2022	0.004		
1/11/2022	0.008					1/11/2022	0.008		
1/17/2022	0.005					1/17/2022	0.005		
1/23/2022	0.003					1/23/2022	0.003		
1/29/2022	0.009	Nov-Jan	0.006			1/29/2022	0.009	Nov-Jan	0.006
2/4/2022	0.021					2/4/2022	0.021		
2/10/2022	0.012					2/10/2022	0.012		
2/16/2022	0.008					2/16/2022	0.008		
2/22/2022	0.013					2/22/2022	0.013		
2/28/2022	0.008	Dec-Feb	0.009			2/28/2022	0.008	Dec-Feb	0.009
3/6/2022	0.005					3/6/2022	0.005		
3/12/2022	0.006					3/12/2022	0.006		
3/18/2022	0.01					3/18/2022	0.01		
3/24/2022	0.007					3/24/2022	0.007		
3/30/2022	0.005	Jan-Mar	0.008			3/30/2022	0.005	Jan-Mar	0.008
4/1/2022	0.005					4/1/2022	0.005		
4/5/2022	0.006					4/5/2022	0.006		
4/11/2022	0.057					4/11/2022	0.057		
4/17/2022	0.01					4/17/2022	0.01		
4/23/2022	0.006					4/23/2022	0.006		
4/29/2022	0.012	Feb-Apr	0.012			4/29/2022	0.012	Feb-Apr	0.012
5/5/2022	0.009					5/5/2022	0.009		
5/11/2022	0.017					5/11/2022	0.017		
5/17/2022	0.012					5/17/2022	0.012		
5/23/2022	0.009					5/23/2022	0.009		
5/29/2022	0.009	Mar-May	0.012			5/29/2022	0.009	Mar-May	0.012
6/4/2022	0.014					6/4/2022	0.014		
6/14/2022	0.01					6/14/2022	0.01		
6/16/2022	0.014					6/16/2022	0.014		
6/22/2022	0.01					6/22/2022	0.01		
6/28/2022	0.013	Apr-Jun	0.013			6/28/2022	0.013	Apr-Jun	0.013
7/4/2022	0.007					7/4/2022	0.007		
7/10/2022	0.008					7/10/2022	0.008		
7/16/2022	0.01					7/16/2022	0.01		
7/22/2022	0.016					7/22/2022	0.016		
7/28/2022	0.007	May-Jul	0.011			7/28/2022	0.007	May-Jul	0.011
8/3/2022	0.004					8/3/2022	0.004		
8/9/2022	0.002					8/9/2022	0.002		
8/15/2022	0.004					8/15/2022	0.004		
8/21/2022	0.002					8/21/2022	0.002		
8/27/2022	0.007	Jun-Aug	0.009			8/27/2022	0.007	Jun-Aug	0.009
9/2/2022	0.018					9/2/2022	0.018		
9/8/2022	0.015					9/8/2022	0.015		
9/14/2022	0.004					9/14/2022	0.004		
9/20/2022	0.011					9/20/2022	0.011		
9/26/2022	0.028	Jul-Sep	0.010			9/26/2022	0.028	Jul-Sep	0.010

Hayden Jail Wind Data
2019

						Excluding from 16-106 degs				
Year	Month	Day	Hour	Wdir	16 to 106	By Day	Date	No. hrs impact		
19	1	1	1	146.5	0		1-Jan	9	No. Impacted Days:	325
19	1	1	2	143.9	0		2-Jan	11		
19	1	1	3	133.5	0		3-Jan	10		
19	1	1	4	137.1	0		4-Jan	8		
19	1	1	5	116.4	0		5-Jan	3		
19	1	1	6	128.6	0		6-Jan	3		
19	1	1	7	113	0		7-Jan	5		
19	1	1	8	144.5	0		8-Jan	14		
19	1	1	9	238	0		9-Jan	24		
19	1	1	10	266.2	0		10-Jan	17		
19	1	1	11	243.9	0		11-Jan	2		
19	1	1	12	253.2	0		12-Jan	8		
19	1	1	13	212.1	0		13-Jan	5		
19	1	1	14	11.3	0		14-Jan	8		
19	1	1	15	195.2	0		15-Jan	0		
19	1	1	16	51.6	1		16-Jan	1		
19	1	1	17	66.5	1		17-Jan	2		
19	1	1	18	60.2	1		18-Jan	2		
19	1	1	19	29.5	1		19-Jan	17		
19	1	1	20	51.6	1		20-Jan	6		
19	1	1	21	51.8	1		21-Jan	0		
19	1	1	22	38.8	1		22-Jan	3		
19	1	1	23	30.4	1		23-Jan	1		
19	1	1	24	63	1	9	24-Jan	11		
19	1	2	1	65.9	1		25-Jan	5		
19	1	2	2	27.6	1		26-Jan	7		
19	1	2	3	23.2	1		27-Jan	9		
19	1	2	4	44.5	1		28-Jan	2		
19	1	2	5	47.9	1		29-Jan	11		
19	1	2	6	14.8	0		30-Jan	7		
19	1	2	7	18.7	1		31-Jan	0		
19	1	2	8	83.5	1		1-Feb	1		
19	1	2	9	63.1	1		2-Feb	3		
19	1	2	10	67.4	1		3-Feb	3		
19	1	2	11	79.5	1		4-Feb	0		
19	1	2	12	246.3	0		5-Feb	1		
19	1	2	13	224.5	0		6-Feb	3		
19	1	2	14	228.2	0		7-Feb	8		
19	1	2	15	252.1	0		8-Feb	10		
19	1	2	16	203.5	0		9-Feb	0		
19	1	2	17	220	0		10-Feb	2		
19	1	2	18	278.8	0		11-Feb	2		
19	1	2	19	51.2	1		12-Feb	11		
19	1	2	20	166.5	0		13-Feb	2		
19	1	2	21	146.5	0		14-Feb	3		

19	1	2	22	139.3	0		15-Feb	0
19	1	2	23	159.2	0		16-Feb	1
19	1	2	24	180.7	0	11	17-Feb	3
19	1	3	1	62.9	1		18-Feb	4
19	1	3	2	121	0		19-Feb	1
19	1	3	3	161.4	0		20-Feb	1
19	1	3	4	107.3	0		21-Feb	3
19	1	3	5	154.9	0		22-Feb	1
19	1	3	6	116.6	0		23-Feb	5
19	1	3	7	161.8	0		24-Feb	10
19	1	3	8	125.1	0		25-Feb	1
19	1	3	9	155.5	0		26-Feb	2
19	1	3	10	139.7	0		27-Feb	3
19	1	3	11	155.7	0		28-Feb	4
19	1	3	12	159.1	0		1-Mar	1
19	1	3	13	127.2	0		2-Mar	4
19	1	3	14	42.4	1		3-Mar	2
19	1	3	15	45.9	1		4-Mar	1
19	1	3	16	54.8	1		5-Mar	3
19	1	3	17	51.3	1		6-Mar	1
19	1	3	18	38.1	1		7-Mar	3
19	1	3	19	53.2	1		8-Mar	0
19	1	3	20	130.3	0		9-Mar	3
19	1	3	21	70.8	1		10-Mar	3
19	1	3	22	68.8	1		11-Mar	1
19	1	3	23	85.5	1		12-Mar	1
19	1	3	24	161	0	10	13-Mar	1
19	1	4	1	162.4	0		14-Mar	4
19	1	4	2	169.6	0		15-Mar	20
19	1	4	3	159.5	0		16-Mar	24
19	1	4	4	155.5	0		17-Mar	24
19	1	4	5	151.7	0		18-Mar	12
19	1	4	6	151.4	0		19-Mar	12
19	1	4	7	151.8	0		20-Mar	2
19	1	4	8	155.5	0		21-Mar	1
19	1	4	9	159.2	0		22-Mar	0
19	1	4	10	156.1	0		23-Mar	2
19	1	4	11	99.7	1		24-Mar	0
19	1	4	12	75.4	1		25-Mar	6
19	1	4	13	68.3	1		26-Mar	1
19	1	4	14	66.4	1		27-Mar	0
19	1	4	15	56.6	1		28-Mar	0
19	1	4	16	59.9	1		29-Mar	0
19	1	4	17	60.8	1		30-Mar	4
19	1	4	18	9.3	0		31-Mar	10
19	1	4	19	259.3	0		1-Apr	15
19	1	4	20	249.4	0		2-Apr	0
19	1	4	21	112.5	0		3-Apr	4
19	1	4	22	105.6	1		4-Apr	1
19	1	4	23	167	0		5-Apr	0
19	1	4	24	163.3	0	8	6-Apr	2

19	1	5	1	175.2	0		7-Apr	0
19	1	5	2	172.8	0		8-Apr	1
19	1	5	3	175.9	0		9-Apr	1
19	1	5	4	173.4	0		10-Apr	0
19	1	5	5	157.3	0		11-Apr	3
19	1	5	6	164.1	0		12-Apr	8
19	1	5	7	184.5	0		13-Apr	0
19	1	5	8	172.1	0		14-Apr	1
19	1	5	9	167.2	0		15-Apr	2
19	1	5	10	164	0		16-Apr	1
19	1	5	11	169.7	0		17-Apr	2
19	1	5	12	166.6	0		18-Apr	2
19	1	5	13	147.4	0		19-Apr	2
19	1	5	14	145.7	0		20-Apr	3
19	1	5	15	83.3	1		21-Apr	3
19	1	5	16	54.5	1		22-Apr	0
19	1	5	17	34.1	1		23-Apr	5
19	1	5	18	346.1	0		24-Apr	3
19	1	5	19	320.4	0		25-Apr	2
19	1	5	20	301.2	0		26-Apr	3
19	1	5	21	119.2	0		27-Apr	4
19	1	5	22	146.2	0		28-Apr	4
19	1	5	23	235.7	0		29-Apr	3
19	1	5	24	335.6	0	3	30-Apr	1
19	1	6	1	270.4	0		1-May	1
19	1	6	2	248.7	0		2-May	0
19	1	6	3	312.1	0		3-May	4
19	1	6	4	251.8	0		4-May	4
19	1	6	5	313.5	0		5-May	1
19	1	6	6	280.5	0		6-May	2
19	1	6	7	277.6	0		7-May	0
19	1	6	8	281.3	0		8-May	6
19	1	6	9	320.7	0		9-May	8
19	1	6	10	312.5	0		10-May	3
19	1	6	11	325.7	0		11-May	4
19	1	6	12	338.1	0		12-May	2
19	1	6	13	337.8	0		13-May	1
19	1	6	14	259.3	0		14-May	1
19	1	6	15	317.1	0		15-May	0
19	1	6	16	321.3	0		16-May	1
19	1	6	17	322.2	0		17-May	2
19	1	6	18	269.8	0		18-May	2
19	1	6	19	35.2	1		19-May	1
19	1	6	20	320.3	0		20-May	1
19	1	6	21	116.4	0		21-May	0
19	1	6	22	41.8	1		22-May	1
19	1	6	23	146.3	0		23-May	2
19	1	6	24	96.6	1	3	24-May	1
19	1	7	1	179.3	0		25-May	0
19	1	7	2	65.1	1		26-May	2
19	1	7	3	157.8	0		27-May	0

19	1	7	4	160.1	0		28-May	2
19	1	7	5	147.6	0		29-May	3
19	1	7	6	139.9	0		30-May	1
19	1	7	7	147.8	0		31-May	3
19	1	7	8	149.5	0		1-Jun	2
19	1	7	9	87.5	1		2-Jun	1
19	1	7	10	120.4	0		3-Jun	0
19	1	7	11	153.8	0		4-Jun	1
19	1	7	12	169.3	0		5-Jun	2
19	1	7	13	184.6	0		6-Jun	3
19	1	7	14	206	0		7-Jun	1
19	1	7	15	196.4	0		8-Jun	3
19	1	7	16	268.8	0		9-Jun	0
19	1	7	17	237.6	0		10-Jun	16
19	1	7	18	318	0		11-Jun	13
19	1	7	19	327.6	0		12-Jun	2
19	1	7	20	9.3	0		13-Jun	0
19	1	7	21	20.4	1		14-Jun	0
19	1	7	22	67.4	1		15-Jun	3
19	1	7	23	104.7	1		16-Jun	2
19	1	7	24	129.2	0	5	17-Jun	2
19	1	8	1	166.2	0		18-Jun	3
19	1	8	2	162.8	0		19-Jun	3
19	1	8	3	159.3	0		20-Jun	1
19	1	8	4	133.4	0		21-Jun	2
19	1	8	5	156	0		22-Jun	1
19	1	8	6	175.1	0		23-Jun	2
19	1	8	7	170.1	0		24-Jun	3
19	1	8	8	162.5	0		25-Jun	2
19	1	8	9	128.7	0		26-Jun	3
19	1	8	10	82.4	1		27-Jun	2
19	1	8	11	67.4	1		28-Jun	1
19	1	8	12	72.2	1		29-Jun	12
19	1	8	13	51.2	1		30-Jun	7
19	1	8	14	43.8	1		1-Jul	1
19	1	8	15	37.7	1		2-Jul	3
19	1	8	16	36.6	1		3-Jul	2
19	1	8	17	40	1		4-Jul	4
19	1	8	18	40	1		5-Jul	2
19	1	8	19	41.9	1		6-Jul	1
19	1	8	20	50.4	1		7-Jul	14
19	1	8	21	44.9	1		8-Jul	0
19	1	8	22	56.6	1		9-Jul	3
19	1	8	23	68.8	1		10-Jul	1
19	1	8	24	0	0	14	11-Jul	5
19	1	9	1	74.7	1		12-Jul	6
19	1	9	2	76.2	1		13-Jul	3
19	1	9	3	64.6	1		14-Jul	2
19	1	9	4	59.7	1		15-Jul	2
19	1	9	5	60	1		16-Jul	1
19	1	9	6	78.1	1		17-Jul	4

19	1	9	7	65	1		18-Jul	1
19	1	9	8	77.5	1		19-Jul	4
19	1	9	9	55.7	1		20-Jul	2
19	1	9	10	69.9	1		21-Jul	3
19	1	9	11	54.3	1		22-Jul	3
19	1	9	12	54	1		23-Jul	7
19	1	9	13	57.9	1		24-Jul	1
19	1	9	14	50.7	1		25-Jul	0
19	1	9	15	59.1	1		26-Jul	1
19	1	9	16	55.9	1		27-Jul	4
19	1	9	17	68.4	1		28-Jul	2
19	1	9	18	50.1	1		29-Jul	6
19	1	9	19	44.9	1		30-Jul	2
19	1	9	20	53	1		31-Jul	2
19	1	9	21	51.4	1		1-Aug	0
19	1	9	22	53.8	1		2-Aug	1
19	1	9	23	61.5	1		3-Aug	0
19	1	9	24	79.4	1	24	4-Aug	9
19	1	10	1	64.8	1		5-Aug	3
19	1	10	2	49.3	1		6-Aug	13
19	1	10	3	50.9	1		7-Aug	3
19	1	10	4	44.3	1		8-Aug	3
19	1	10	5	48.6	1		9-Aug	2
19	1	10	6	69.3	1		10-Aug	5
19	1	10	7	55.1	1		11-Aug	2
19	1	10	8	76.1	1		12-Aug	0
19	1	10	9	91.9	1		13-Aug	2
19	1	10	10	86.7	1		14-Aug	1
19	1	10	11	147.1	0		15-Aug	5
19	1	10	12	98.5	1		16-Aug	3
19	1	10	13	81.6	1		17-Aug	1
19	1	10	14	79.7	1		18-Aug	3
19	1	10	15	112.2	0		19-Aug	0
19	1	10	16	130.2	0		20-Aug	2
19	1	10	17	115.2	0		21-Aug	3
19	1	10	18	83.4	1		22-Aug	1
19	1	10	19	45.5	1		23-Aug	0
19	1	10	20	44.7	1		24-Aug	1
19	1	10	21	81.6	1		25-Aug	2
19	1	10	22	196.7	0		26-Aug	1
19	1	10	23	226.9	0		27-Aug	2
19	1	10	24	351	0	17	28-Aug	2
19	1	11	1	227.7	0		29-Aug	6
19	1	11	2	11.4	0		30-Aug	3
19	1	11	3	324.5	0		31-Aug	1
19	1	11	4	136.4	0		1-Sep	2
19	1	11	5	72	1		2-Sep	2
19	1	11	6	165.1	0		3-Sep	3
19	1	11	7	338.5	0		4-Sep	2
19	1	11	8	31.9	1		5-Sep	1
19	1	11	9	177	0		6-Sep	2

19	1	11	10	177.5	0		7-Sep	7
19	1	11	11	149.3	0		8-Sep	1
19	1	11	12	197.5	0		9-Sep	1
19	1	11	13	217.9	0		10-Sep	1
19	1	11	14	267.3	0		11-Sep	1
19	1	11	15	266.9	0		12-Sep	1
19	1	11	16	269.5	0		13-Sep	4
19	1	11	17	258.7	0		14-Sep	15
19	1	11	18	318.7	0		15-Sep	22
19	1	11	19	324.3	0		16-Sep	12
19	1	11	20	291	0		17-Sep	2
19	1	11	21	194.3	0		18-Sep	0
19	1	11	22	201.5	0		19-Sep	2
19	1	11	23	162	0		20-Sep	2
19	1	11	24	168.8	0	2	21-Sep	3
19	1	12	1	147.3	0		22-Sep	1
19	1	12	2	149.4	0		23-Sep	7
19	1	12	3	169.2	0		24-Sep	13
19	1	12	4	157.4	0		25-Sep	2
19	1	12	5	175.9	0		26-Sep	0
19	1	12	6	204.8	0		27-Sep	5
19	1	12	7	174	0		28-Sep	2
19	1	12	8	188.5	0		29-Sep	5
19	1	12	9	171.9	0		30-Sep	2
19	1	12	10	163.6	0		1-Oct	4
19	1	12	11	169.5	0		2-Oct	3
19	1	12	12	158.4	0		3-Oct	3
19	1	12	13	199.9	0		4-Oct	1
19	1	12	14	102.4	1		5-Oct	3
19	1	12	15	44.1	1		6-Oct	2
19	1	12	16	44.9	1		7-Oct	13
19	1	12	17	18.3	1		8-Oct	2
19	1	12	18	27.5	1		9-Oct	0
19	1	12	19	38.1	1		10-Oct	10
19	1	12	20	47.9	1		11-Oct	23
19	1	12	21	52.1	1		12-Oct	15
19	1	12	22	114	0		13-Oct	1
19	1	12	23	261.6	0		14-Oct	3
19	1	12	24	309.6	0	8	15-Oct	2
19	1	13	1	319.8	0		16-Oct	12
19	1	13	2	68.5	1		17-Oct	3
19	1	13	3	147.8	0		18-Oct	1
19	1	13	4	132.1	0		19-Oct	3
19	1	13	5	70.3	1		20-Oct	2
19	1	13	6	214.2	0		21-Oct	3
19	1	13	7	168	0		22-Oct	7
19	1	13	8	126.8	0		23-Oct	5
19	1	13	9	155.8	0		24-Oct	18
19	1	13	10	152.7	0		25-Oct	22
19	1	13	11	161.2	0		26-Oct	10
19	1	13	12	123.1	0		27-Oct	5

19	1	13	13	81.8	1		28-Oct	2
19	1	13	14	148.6	0		29-Oct	2
19	1	13	15	249.1	0		30-Oct	19
19	1	13	16	69.7	1		31-Oct	21
19	1	13	17	83.8	1		1-Nov	8
19	1	13	18	262.9	0		2-Nov	16
19	1	13	19	4.6	0		3-Nov	6
19	1	13	20	270.6	0		4-Nov	3
19	1	13	21	213.7	0		5-Nov	8
19	1	13	22	295.6	0		6-Nov	6
19	1	13	23	195	0		7-Nov	11
19	1	13	24	230.3	0	5	8-Nov	24
19	1	14	1	157	0		9-Nov	20
19	1	14	2	158.1	0		10-Nov	1
19	1	14	3	182.5	0		11-Nov	4
19	1	14	4	174.8	0		12-Nov	22
19	1	14	5	176.9	0		13-Nov	10
19	1	14	6	173.8	0		14-Nov	2
19	1	14	7	172.6	0		15-Nov	21
19	1	14	8	173.9	0		16-Nov	8
19	1	14	9	154	0		17-Nov	6
19	1	14	10	148.4	0		18-Nov	3
19	1	14	11	163.3	0		19-Nov	7
19	1	14	12	150.4	0		20-Nov	8
19	1	14	13	121	0		21-Nov	7
19	1	14	14	147.7	0		22-Nov	2
19	1	14	15	104.2	1		23-Nov	14
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19	1	14	17	60.6	1		25-Nov	2
19	1	14	18	35	1		26-Nov	0
19	1	14	19	29.6	1		27-Nov	10
19	1	14	20	30.1	1		28-Nov	22
19	1	14	21	33.9	1		29-Nov	3
19	1	14	22	76.7	1		30-Nov	7
19	1	14	23	165.7	0		1-Dec	15
19	1	14	24	150.4	0	8	2-Dec	10
19	1	15	1	162	0		3-Dec	1
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19	1	15	3	158.2	0		5-Dec	2
19	1	15	4	158	0		6-Dec	8
19	1	15	5	152.8	0		7-Dec	3
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19	1	15	7	158	0		9-Dec	13
19	1	15	8	160.1	0		10-Dec	4
19	1	15	9	162.2	0		11-Dec	8
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19	1	15	12	166.4	0		14-Dec	6
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19	1	15	15	199.1	0		17-Dec	23

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19	1	15	17	338.3	0		19-Dec	12
19	1	15	18	328.5	0		20-Dec	13
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19	1	15	20	229.6	0		22-Dec	21
19	1	15	21	5.1	0		23-Dec	0
19	1	15	22	179.1	0		24-Dec	4
19	1	15	23	207.1	0		25-Dec	3
19	1	15	24	322.1	0	0	26-Dec	1
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19	1	16	2	341.6	0		28-Dec	1
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19	1	16	5	135.1	0		31-Dec	21
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19	12	22	15	46.1	1	
19	12	22	16	37.5	1	
19	12	22	17	35.4	1	
19	12	22	18	33.3	1	
19	12	22	19	42.8	1	
19	12	22	20	56.8	1	
19	12	22	21	53	1	
19	12	22	22	71.5	1	
19	12	22	23	128.2	0	
19	12	22	24	149	0	21
19	12	23	1	166.4	0	
19	12	23	2	175.2	0	
19	12	23	3	172.5	0	
19	12	23	4	166.2	0	
19	12	23	5	169.9	0	
19	12	23	6	177.8	0	
19	12	23	7	164.5	0	
19	12	23	8	168	0	
19	12	23	9	170.4	0	
19	12	23	10	167.5	0	
19	12	23	11	172.4	0	
19	12	23	12	173.5	0	
19	12	23	13	168.9	0	
19	12	23	14	169.7	0	
19	12	23	15	168.8	0	
19	12	23	16	160.3	0	
19	12	23	17	162.9	0	
19	12	23	18	174.2	0	

19	12	23	19	156.9	0	
19	12	23	20	171.3	0	
19	12	23	21	171.6	0	
19	12	23	22	166.4	0	
19	12	23	23	175.1	0	
19	12	23	24	274.7	0	0
19	12	24	1	159	0	
19	12	24	2	357.8	0	
19	12	24	3	267.2	0	
19	12	24	4	212.9	0	
19	12	24	5	157	0	
19	12	24	6	167.7	0	
19	12	24	7	122.9	0	
19	12	24	8	8	0	
19	12	24	9	227.2	0	
19	12	24	10	316.4	0	
19	12	24	11	13.1	0	
19	12	24	12	65.4	1	
19	12	24	13	87.8	1	
19	12	24	14	142.9	0	
19	12	24	15	126.1	0	
19	12	24	16	181	0	
19	12	24	17	286.8	0	
19	12	24	18	147.2	0	
19	12	24	19	136.7	0	
19	12	24	20	107.2	0	
19	12	24	21	80.5	1	
19	12	24	22	39.5	1	
19	12	24	23	257.5	0	
19	12	24	24	273.4	0	4
19	12	25	1	313.3	0	
19	12	25	2	286	0	
19	12	25	3	233.8	0	
19	12	25	4	318.3	0	
19	12	25	5	353	0	
19	12	25	6	348.6	0	
19	12	25	7	158.5	0	
19	12	25	8	118.4	0	
19	12	25	9	157.5	0	
19	12	25	10	342.6	0	
19	12	25	11	81.9	1	
19	12	25	12	132.3	0	
19	12	25	13	131.5	0	
19	12	25	14	264.1	0	
19	12	25	15	320.3	0	
19	12	25	16	315.8	0	
19	12	25	17	318.8	0	
19	12	25	18	303	0	
19	12	25	19	146.7	0	
19	12	25	20	1.6	0	
19	12	25	21	158.2	0	

19	12	25	22	299.8	0	
19	12	25	23	44	1	
19	12	25	24	93.9	1	3
19	12	26	1	303	0	
19	12	26	2	165.2	0	
19	12	26	3	167.2	0	
19	12	26	4	163.6	0	
19	12	26	5	163.7	0	
19	12	26	6	162.1	0	
19	12	26	7	171.5	0	
19	12	26	8	171.7	0	
19	12	26	9	179.5	0	
19	12	26	10	172.8	0	
19	12	26	11	179.6	0	
19	12	26	12	189.2	0	
19	12	26	13	215.5	0	
19	12	26	14	187.9	0	
19	12	26	15	208.4	0	
19	12	26	16	56.3	1	
19	12	26	17	145	0	
19	12	26	18	316.8	0	
19	12	26	19	312.3	0	
19	12	26	20	269.3	0	
19	12	26	21	283.9	0	
19	12	26	22	265.5	0	
19	12	26	23	308.9	0	
19	12	26	24	315.5	0	1
19	12	27	1	325.8	0	
19	12	27	2	323	0	
19	12	27	3	274	0	
19	12	27	4	88.2	1	
19	12	27	5	157.9	0	
19	12	27	6	73	1	
19	12	27	7	88.5	1	
19	12	27	8	139.7	0	
19	12	27	9	162.2	0	
19	12	27	10	206.6	0	
19	12	27	11	76	1	
19	12	27	12	116.8	0	
19	12	27	13	101.5	1	
19	12	27	14	128	0	
19	12	27	15	218.1	0	
19	12	27	16	254.9	0	
19	12	27	17	304.2	0	
19	12	27	18	329.2	0	
19	12	27	19	339.9	0	
19	12	27	20	285.6	0	
19	12	27	21	307	0	
19	12	27	22	157.2	0	
19	12	27	23	2.2	0	
19	12	27	24	61.8	1	6

19	12	28	1	178.8	0	
19	12	28	2	222.1	0	
19	12	28	3	179.9	0	
19	12	28	4	19.6	1	
19	12	28	5	159.3	0	
19	12	28	6	148.3	0	
19	12	28	7	191.8	0	
19	12	28	8	145.2	0	
19	12	28	9	340.8	0	
19	12	28	10	267.1	0	
19	12	28	11	240.2	0	
19	12	28	12	242.6	0	
19	12	28	13	239.5	0	
19	12	28	14	232.4	0	
19	12	28	15	234.8	0	
19	12	28	16	237.3	0	
19	12	28	17	316.7	0	
19	12	28	18	331.6	0	
19	12	28	19	335.7	0	
19	12	28	20	238.9	0	
19	12	28	21	13.5	0	
19	12	28	22	320.3	0	
19	12	28	23	7.1	0	
19	12	28	24	1.6	0	1
19	12	29	1	27.7	1	
19	12	29	2	271.6	0	
19	12	29	3	328.7	0	
19	12	29	4	7.6	0	
19	12	29	5	254.8	0	
19	12	29	6	134.6	0	
19	12	29	7	143.5	0	
19	12	29	8	174.2	0	
19	12	29	9	152.4	0	
19	12	29	10	165.8	0	
19	12	29	11	167.5	0	
19	12	29	12	164.7	0	
19	12	29	13	103.9	1	
19	12	29	14	121.4	0	
19	12	29	15	65.2	1	
19	12	29	16	60.5	1	
19	12	29	17	92.8	1	
19	12	29	18	79.3	1	
19	12	29	19	136.4	0	
19	12	29	20	263.1	0	
19	12	29	21	177.7	0	
19	12	29	22	163.5	0	
19	12	29	23	110.1	0	
19	12	29	24	120.5	0	6
19	12	30	1	125.5	0	
19	12	30	2	147.6	0	
19	12	30	3	126.3	0	

19	12	30	4	52.1	1	
19	12	30	5	47.9	1	
19	12	30	6	66.5	1	
19	12	30	7	91.6	1	
19	12	30	8	95.8	1	
19	12	30	9	143.3	0	
19	12	30	10	59.3	1	
19	12	30	11	50.7	1	
19	12	30	12	47.9	1	
19	12	30	13	41.2	1	
19	12	30	14	46.7	1	
19	12	30	15	44.8	1	
19	12	30	16	46.7	1	
19	12	30	17	42.2	1	
19	12	30	18	42.6	1	
19	12	30	19	36.6	1	
19	12	30	20	42	1	
19	12	30	21	36.5	1	
19	12	30	22	35.9	1	
19	12	30	23	45.9	1	
19	12	30	24	43.6	1	20
19	12	31	1	51	1	
19	12	31	2	47.5	1	
19	12	31	3	46.6	1	
19	12	31	4	39.3	1	
19	12	31	5	39.9	1	
19	12	31	6	53	1	
19	12	31	7	50.6	1	
19	12	31	8	51	1	
19	12	31	9	49.1	1	
19	12	31	10	46	1	
19	12	31	11	43.2	1	
19	12	31	12	43.5	1	
19	12	31	13	37.1	1	
19	12	31	14	50.3	1	
19	12	31	15	47.3	1	
19	12	31	16	47.4	1	
19	12	31	17	39	1	
19	12	31	18	34	1	
19	12	31	19	41.1	1	
19	12	31	20	50.9	1	
19	12	31	21	337.7	0	
19	12	31	22	31.7	1	
19	12	31	23	156.6	0	
19	12	31	24	148.6	0	21

0

Hayden Jail Wind Data
2020

								Excluding from 16-106 degs		
								No. hrs		
Year	Month	Day	Hour	Wdir	16 to 106	By Day	Date	impact		
20	1	1	1	0	0		1-Jan	0	No. Impacted Days:	244
20	1	1	2	0	0		2-Jan	1		
20	1	1	3	0	0		3-Jan	0		
20	1	1	4	0	0		4-Jan	3		
20	1	1	5	148	0		5-Jan	1		
20	1	1	6	177.1	0		6-Jan	8		
20	1	1	7	160.6	0		7-Jan	17		
20	1	1	8	0	0		8-Jan	1		
20	1	1	9	0	0		9-Jan	2		
20	1	1	10	174.4	0		10-Jan	2		
20	1	1	11	176.6	0		11-Jan	3		
20	1	1	12	180.4	0		12-Jan	2		
20	1	1	13	186.2	0		13-Jan	1		
20	1	1	14	230.5	0		14-Jan	2		
20	1	1	15	243.9	0		15-Jan	1		
20	1	1	16	327.3	0		16-Jan	2		
20	1	1	17	322.1	0		17-Jan	6		
20	1	1	18	332.6	0		18-Jan	12		
20	1	1	19	328.5	0		19-Jan	17		
20	1	1	20	333.1	0		20-Jan	24		
20	1	1	21	350	0		21-Jan	1		
20	1	1	22	0	0		22-Jan	0		
20	1	1	23	0	0		23-Jan	6		
20	1	1	24	359.7	0	0	24-Jan	1		
20	1	2	1	138.1	0		25-Jan	0		
20	1	2	2	188.6	0		26-Jan	0		
20	1	2	3	37.1	1		27-Jan	0		
20	1	2	4	0	0		28-Jan	2		
20	1	2	5	356.2	0		29-Jan	0		
20	1	2	6	0	0		30-Jan	0		
20	1	2	7	0	0		31-Jan	3		
20	1	2	8	0	0		1-Feb	10		
20	1	2	9	0	0		2-Feb	2		
20	1	2	10	0	0		3-Feb	2		
20	1	2	11	212.7	0		4-Feb	0		
20	1	2	12	254.7	0		5-Feb	0		
20	1	2	13	310.9	0		6-Feb	1		
20	1	2	14	291.7	0		7-Feb	0		
20	1	2	15	275	0		8-Feb	0		
20	1	2	16	265.7	0		9-Feb	1		
20	1	2	17	264	0		10-Feb	5		
20	1	2	18	318.1	0		11-Feb	1		
20	1	2	19	339.9	0		12-Feb	0		
20	1	2	20	313.5	0		13-Feb	1		
20	1	2	21	0	0		14-Feb	1		

20	1	2	22	0	0		15-Feb	0
20	1	2	23	0	0		16-Feb	1
20	1	2	24	0	0	1	17-Feb	1
20	1	3	1	0	0		18-Feb	0
20	1	3	2	0	0		19-Feb	1
20	1	3	3	161	0		20-Feb	9
20	1	3	4	183.5	0		21-Feb	24
20	1	3	5	115	0		22-Feb	9
20	1	3	6	242.8	0		23-Feb	0
20	1	3	7	0	0		24-Feb	0
20	1	3	8	0	0		25-Feb	9
20	1	3	9	177.8	0		26-Feb	23
20	1	3	10	159.7	0		27-Feb	11
20	1	3	11	184.1	0		28-Feb	10
20	1	3	12	255.6	0		29-Feb	0
20	1	3	13	235	0		1-Mar	1
20	1	3	14	207.6	0		2-Mar	0
20	1	3	15	215.7	0		3-Mar	3
20	1	3	16	238.1	0		4-Mar	1
20	1	3	17	251.7	0		5-Mar	14
20	1	3	18	303.5	0		6-Mar	24
20	1	3	19	341.8	0		7-Mar	0
20	1	3	20	311.6	0		8-Mar	0
20	1	3	21	0	0		9-Mar	3
20	1	3	22	0	0		10-Mar	3
20	1	3	23	159.9	0		11-Mar	0
20	1	3	24	176	0	0	12-Mar	3
20	1	4	1	151.1	0		13-Mar	0
20	1	4	2	164.8	0		14-Mar	1
20	1	4	3	150.2	0		15-Mar	1
20	1	4	4	163.3	0		16-Mar	0
20	1	4	5	153.1	0		17-Mar	0
20	1	4	6	151.1	0		18-Mar	2
20	1	4	7	166.7	0		19-Mar	0
20	1	4	8	164.9	0		20-Mar	0
20	1	4	9	172.5	0		21-Mar	0
20	1	4	10	166.9	0		22-Mar	0
20	1	4	11	161.8	0		23-Mar	1
20	1	4	12	165.1	0		24-Mar	1
20	1	4	13	171.8	0		25-Mar	1
20	1	4	14	135.9	0		26-Mar	0
20	1	4	15	42	1		27-Mar	0
20	1	4	16	57.8	1		28-Mar	1
20	1	4	17	277.6	0		29-Mar	0
20	1	4	18	313.4	0		30-Mar	0
20	1	4	19	0	0		31-Mar	0
20	1	4	20	23.7	1		1-Apr	0
20	1	4	21	0	0		2-Apr	0
20	1	4	22	138	0		3-Apr	1
20	1	4	23	145.9	0		4-Apr	1
20	1	4	24	159.6	0	3	5-Apr	1

20	1	5	1	164.1	0		6-Apr	0
20	1	5	2	160.9	0		7-Apr	0
20	1	5	3	168.3	0		8-Apr	1
20	1	5	4	156.8	0		9-Apr	0
20	1	5	5	168.9	0		10-Apr	1
20	1	5	6	172.7	0		11-Apr	0
20	1	5	7	174.2	0		12-Apr	0
20	1	5	8	157.9	0		13-Apr	2
20	1	5	9	175.1	0		14-Apr	5
20	1	5	10	149.9	0		15-Apr	0
20	1	5	11	163.1	0		16-Apr	0
20	1	5	12	174.1	0		17-Apr	1
20	1	5	13	158.9	0		18-Apr	0
20	1	5	14	156.2	0		19-Apr	0
20	1	5	15	148.8	0		20-Apr	0
20	1	5	16	179.6	0		21-Apr	1
20	1	5	17	224.3	0		22-Apr	0
20	1	5	18	0	0		23-Apr	1
20	1	5	19	26.7	1		24-Apr	2
20	1	5	20	15.8	0		25-Apr	2
20	1	5	21	0	0		26-Apr	2
20	1	5	22	0	0		27-Apr	0
20	1	5	23	0	0		28-Apr	0
20	1	5	24	0	0	1	29-Apr	0
20	1	6	1	0	0		30-Apr	2
20	1	6	2	0	0		1-May	3
20	1	6	3	0	0		2-May	1
20	1	6	4	0	0		3-May	4
20	1	6	5	0	0		4-May	0
20	1	6	6	0	0		5-May	0
20	1	6	7	0	0		6-May	2
20	1	6	8	0	0		7-May	3
20	1	6	9	164.8	0		8-May	1
20	1	6	10	149	0		9-May	0
20	1	6	11	157.6	0		10-May	7
20	1	6	12	177	0		11-May	6
20	1	6	13	87.8	1		12-May	1
20	1	6	14	67	1		13-May	1
20	1	6	15	68.4	1		14-May	1
20	1	6	16	66.7	1		15-May	0
20	1	6	17	53.7	1		16-May	1
20	1	6	18	55.2	1		17-May	1
20	1	6	19	0	0		18-May	0
20	1	6	20	24.9	1		19-May	0
20	1	6	21	16.3	1		20-May	2
20	1	6	22	170.6	0		21-May	1
20	1	6	23	162.2	0		22-May	0
20	1	6	24	158.2	0	8	23-May	2
20	1	7	1	164.4	0		24-May	1
20	1	7	2	166.5	0		25-May	0
20	1	7	3	162.8	0		26-May	2

20	1	7	4	162.2	0		27-May	0
20	1	7	5	151.9	0		28-May	2
20	1	7	6	150.3	0		29-May	5
20	1	7	7	141.7	0		30-May	1
20	1	7	8	102.8	1		31-May	2
20	1	7	9	69.9	1		1-Jun	2
20	1	7	10	55.4	1		2-Jun	0
20	1	7	11	47.5	1		3-Jun	1
20	1	7	12	44	1		4-Jun	0
20	1	7	13	34	1		5-Jun	1
20	1	7	14	36.1	1		6-Jun	0
20	1	7	15	50.9	1		7-Jun	0
20	1	7	16	57.4	1		8-Jun	0
20	1	7	17	57.4	1		9-Jun	12
20	1	7	18	44.4	1		10-Jun	1
20	1	7	19	42	1		11-Jun	1
20	1	7	20	63.9	1		12-Jun	7
20	1	7	21	57.3	1		13-Jun	0
20	1	7	22	53.1	1		14-Jun	2
20	1	7	23	51.7	1		15-Jun	4
20	1	7	24	75.9	1	17	16-Jun	7
20	1	8	1	147.4	0		17-Jun	0
20	1	8	2	159.8	0		18-Jun	2
20	1	8	3	158.1	0		19-Jun	0
20	1	8	4	155.3	0		20-Jun	0
20	1	8	5	161.2	0		21-Jun	0
20	1	8	6	164.5	0		22-Jun	4
20	1	8	7	169.2	0		23-Jun	2
20	1	8	8	166.1	0		24-Jun	1
20	1	8	9	169.1	0		25-Jun	0
20	1	8	10	157.9	0		26-Jun	1
20	1	8	11	167.1	0		27-Jun	2
20	1	8	12	167.9	0		28-Jun	5
20	1	8	13	213.5	0		29-Jun	3
20	1	8	14	222.4	0		30-Jun	0
20	1	8	15	264.3	0		1-Jul	0
20	1	8	16	295.6	0		2-Jul	1
20	1	8	17	286.4	0		3-Jul	1
20	1	8	18	326.2	0		4-Jul	1
20	1	8	19	322.8	0		5-Jul	2
20	1	8	20	312.8	0		6-Jul	1
20	1	8	21	294.5	0		7-Jul	0
20	1	8	22	0	0		8-Jul	0
20	1	8	23	0	0		9-Jul	0
20	1	8	24	23.5	1	1	10-Jul	0
20	1	9	1	146.7	0		11-Jul	1
20	1	9	2	171.8	0		12-Jul	2
20	1	9	3	159.6	0		13-Jul	0
20	1	9	4	0	0		14-Jul	3
20	1	9	5	9.2	0		15-Jul	2
20	1	9	6	0	0		16-Jul	4

20	1	9	7	0	0		17-Jul	12
20	1	9	8	162.7	0		18-Jul	0
20	1	9	9	161.8	0		19-Jul	2
20	1	9	10	146	0		20-Jul	1
20	1	9	11	235.1	0		21-Jul	1
20	1	9	12	250.6	0		22-Jul	0
20	1	9	13	250.9	0		23-Jul	5
20	1	9	14	261	0		24-Jul	7
20	1	9	15	174.4	0		25-Jul	9
20	1	9	16	299.7	0		26-Jul	4
20	1	9	17	320	0		27-Jul	9
20	1	9	18	293.5	0		28-Jul	4
20	1	9	19	280.1	0		29-Jul	0
20	1	9	20	325.4	0		30-Jul	0
20	1	9	21	87.8	1		31-Jul	2
20	1	9	22	67.9	1		1-Aug	11
20	1	9	23	132.8	0		2-Aug	5
20	1	9	24	128.2	0	2	3-Aug	1
20	1	10	1	120	0		4-Aug	3
20	1	10	2	158.9	0		5-Aug	0
20	1	10	3	94	1		6-Aug	1
20	1	10	4	0	0		7-Aug	0
20	1	10	5	278.7	0		8-Aug	1
20	1	10	6	298	0		9-Aug	2
20	1	10	7	200.3	0		10-Aug	0
20	1	10	8	255.2	0		11-Aug	0
20	1	10	9	77.7	1		12-Aug	1
20	1	10	10	164.5	0		13-Aug	1
20	1	10	11	212.6	0		14-Aug	1
20	1	10	12	295.1	0		15-Aug	4
20	1	10	13	321.4	0		16-Aug	4
20	1	10	14	309.5	0		17-Aug	9
20	1	10	15	253.6	0		18-Aug	17
20	1	10	16	274	0		19-Aug	1
20	1	10	17	315.7	0		20-Aug	3
20	1	10	18	320	0		21-Aug	2
20	1	10	19	334.2	0		22-Aug	2
20	1	10	20	8.7	0		23-Aug	3
20	1	10	21	0	0		24-Aug	4
20	1	10	22	0	0		25-Aug	5
20	1	10	23	0	0		26-Aug	0
20	1	10	24	0	0	2	27-Aug	2
20	1	11	1	49.7	1		28-Aug	2
20	1	11	2	0	0		29-Aug	0
20	1	11	3	110	0		30-Aug	2
20	1	11	4	155.3	0		31-Aug	0
20	1	11	5	158	0		1-Sep	4
20	1	11	6	162.7	0		2-Sep	0
20	1	11	7	136.2	0		3-Sep	1
20	1	11	8	159.3	0		4-Sep	3
20	1	11	9	136.7	0		5-Sep	11

20	1	11	10	138.9	0		6-Sep	3
20	1	11	11	163.8	0		7-Sep	1
20	1	11	12	199.1	0		8-Sep	0
20	1	11	13	174.7	0		9-Sep	0
20	1	11	14	117.7	0		10-Sep	12
20	1	11	15	114.5	0		11-Sep	16
20	1	11	16	74.4	1		12-Sep	3
20	1	11	17	240.5	0		13-Sep	10
20	1	11	18	308.3	0		14-Sep	7
20	1	11	19	328.6	0		15-Sep	11
20	1	11	20	33.2	1		16-Sep	0
20	1	11	21	0	0		17-Sep	3
20	1	11	22	0	0		18-Sep	7
20	1	11	23	0	0		19-Sep	13
20	1	11	24	0	0	3	20-Sep	7
20	1	12	1	0	0		21-Sep	0
20	1	12	2	0	0		22-Sep	0
20	1	12	3	0	0		23-Sep	0
20	1	12	4	0	0		24-Sep	0
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20	1	12	6	0	0		26-Sep	4
20	1	12	7	0	0		27-Sep	1
20	1	12	8	0	0		28-Sep	13
20	1	12	9	164.8	0		29-Sep	20
20	1	12	10	158	0		30-Sep	0
20	1	12	11	210.2	0		1-Oct	1
20	1	12	12	184.4	0		2-Oct	3
20	1	12	13	140.6	0		3-Oct	1
20	1	12	14	147.5	0		4-Oct	2
20	1	12	15	153.1	0		5-Oct	0
20	1	12	16	119.8	0		6-Oct	1
20	1	12	17	249.9	0		7-Oct	0
20	1	12	18	304.8	0		8-Oct	2
20	1	12	19	333	0		9-Oct	2
20	1	12	20	20.3	1		10-Oct	0
20	1	12	21	0	0		11-Oct	2
20	1	12	22	0	0		12-Oct	0
20	1	12	23	162.4	0		13-Oct	1
20	1	12	24	163.6	0	2	14-Oct	1
20	1	13	1	158.6	0		15-Oct	1
20	1	13	2	17.1	1		16-Oct	15
20	1	13	3	0	0		17-Oct	1
20	1	13	4	0	0		18-Oct	2
20	1	13	5	7.6	0		19-Oct	0
20	1	13	6	0	0		20-Oct	0
20	1	13	7	0	0		21-Oct	1
20	1	13	8	0	0		22-Oct	0
20	1	13	9	207.2	0		23-Oct	0
20	1	13	10	216.9	0		24-Oct	1
20	1	13	11	192.1	0		25-Oct	0
20	1	13	12	241.6	0		26-Oct	2

20	1	13	13	230.3	0		27-Oct	11
20	1	13	14	242.2	0		28-Oct	2
20	1	13	15	240.2	0		29-Oct	16
20	1	13	16	223.7	0		30-Oct	18
20	1	13	17	238.4	0		31-Oct	4
20	1	13	18	314.9	0		1-Nov	14
20	1	13	19	357.6	0		2-Nov	24
20	1	13	20	11.2	0		3-Nov	13
20	1	13	21	0	0		4-Nov	1
20	1	13	22	0	0		5-Nov	7
20	1	13	23	0	0		6-Nov	11
20	1	13	24	139.2	0	1	7-Nov	3
20	1	14	1	158.1	0		8-Nov	0
20	1	14	2	161	0		9-Nov	1
20	1	14	3	0	0		10-Nov	0
20	1	14	4	216.5	0		11-Nov	0
20	1	14	5	162.6	0		12-Nov	0
20	1	14	6	157.9	0		13-Nov	1
20	1	14	7	156	0		14-Nov	0
20	1	14	8	0	0		15-Nov	11
20	1	14	9	167.6	0		16-Nov	13
20	1	14	10	167.3	0		17-Nov	11
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20	1	14	12	176.5	0		19-Nov	1
20	1	14	13	217.6	0		20-Nov	0
20	1	14	14	209.1	0		21-Nov	0
20	1	14	15	199.3	0		22-Nov	1
20	1	14	16	231.6	0		23-Nov	0
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20	1	14	18	354.6	0		25-Nov	0
20	1	14	19	21.5	1		26-Nov	0
20	1	14	20	12.9	0		27-Nov	2
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20	1	14	22	0	0		29-Nov	14
20	1	14	23	0	0		30-Nov	24
20	1	14	24	0	0	2	1-Dec	1
20	1	15	1	0	0		2-Dec	13
20	1	15	2	0	0		3-Dec	20
20	1	15	3	0	0		4-Dec	7
20	1	15	4	0	0		5-Dec	0
20	1	15	5	0	0		6-Dec	0
20	1	15	6	152.3	0		7-Dec	15
20	1	15	7	162.6	0		8-Dec	14
20	1	15	8	174.9	0		9-Dec	8
20	1	15	9	167.8	0		10-Dec	1
20	1	15	10	162.4	0		11-Dec	1
20	1	15	11	167.4	0		12-Dec	1
20	1	15	12	173.3	0		13-Dec	24
20	1	15	13	166.6	0		14-Dec	8
20	1	15	14	161.4	0		15-Dec	2
20	1	15	15	167	0		16-Dec	6

20	1	15	16	140.2	0		17-Dec	0
20	1	15	17	293.8	0		18-Dec	0
20	1	15	18	0	0		19-Dec	0
20	1	15	19	23.3	1		20-Dec	9
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20	1	15	22	0	0		23-Dec	12
20	1	15	23	0	0		24-Dec	22
20	1	15	24	0	0	1	25-Dec	20
20	1	16	1	123.4	0		26-Dec	1
20	1	16	2	151.3	0		27-Dec	1
20	1	16	3	154.2	0		28-Dec	2
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20	1	16	5	169.4	0		30-Dec	5
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20	1	16	8	0	0			
20	1	16	9	331.9	0			
20	1	16	10	163.1	0			
20	1	16	11	51.1	1			
20	1	16	12	177.1	0			
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20	12	23	18	39.2	1	
20	12	23	19	71.2	1	
20	12	23	20	33	1	
20	12	23	21	50.7	1	
20	12	23	22	79.4	1	
20	12	23	23	64	1	
20	12	23	24	87.1	1	12
20	12	24	1	47.3	1	
20	12	24	2	66.9	1	
20	12	24	3	77.3	1	
20	12	24	4	134.8	0	
20	12	24	5	130	0	
20	12	24	6	64	1	
20	12	24	7	70.4	1	
20	12	24	8	81.6	1	
20	12	24	9	98.7	1	
20	12	24	10	99.2	1	
20	12	24	11	57.8	1	
20	12	24	12	39.4	1	
20	12	24	13	41	1	
20	12	24	14	48.7	1	
20	12	24	15	55.6	1	
20	12	24	16	47.9	1	
20	12	24	17	35.2	1	
20	12	24	18	39.5	1	
20	12	24	19	44.4	1	
20	12	24	20	39.4	1	
20	12	24	21	43	1	

20	12	24	22	54.3	1	
20	12	24	23	53.5	1	
20	12	24	24	62.6	1	22
20	12	25	1	63.9	1	
20	12	25	2	66.6	1	
20	12	25	3	63.3	1	
20	12	25	4	57.9	1	
20	12	25	5	89.3	1	
20	12	25	6	77.9	1	
20	12	25	7	91	1	
20	12	25	8	93.4	1	
20	12	25	9	91.9	1	
20	12	25	10	61.4	1	
20	12	25	11	47.5	1	
20	12	25	12	57.5	1	
20	12	25	13	56.4	1	
20	12	25	14	52.1	1	
20	12	25	15	40.1	1	
20	12	25	16	39.8	1	
20	12	25	17	39.8	1	
20	12	25	18	36.9	1	
20	12	25	19	40.2	1	
20	12	25	20	41.4	1	
20	12	25	21	302.3	0	
20	12	25	22	0	0	
20	12	25	23	178.3	0	
20	12	25	24	167.1	0	20
20	12	26	1	164.4	0	
20	12	26	2	157.3	0	
20	12	26	3	156.4	0	
20	12	26	4	155.1	0	
20	12	26	5	152.6	0	
20	12	26	6	170.3	0	
20	12	26	7	154.9	0	
20	12	26	8	152.5	0	
20	12	26	9	153.3	0	
20	12	26	10	162.4	0	
20	12	26	11	149.9	0	
20	12	26	12	167.9	0	
20	12	26	13	183.4	0	
20	12	26	14	170	0	
20	12	26	15	229.4	0	
20	12	26	16	257.1	0	
20	12	26	17	266.8	0	
20	12	26	18	293	0	
20	12	26	19	288.2	0	
20	12	26	20	0	0	
20	12	26	21	0	0	
20	12	26	22	21.5	1	
20	12	26	23	187.3	0	
20	12	26	24	179	0	1

20	12	27	1	191.2	0	
20	12	27	2	354.1	0	
20	12	27	3	0	0	
20	12	27	4	0	0	
20	12	27	5	0	0	
20	12	27	6	175.1	0	
20	12	27	7	154.4	0	
20	12	27	8	158.5	0	
20	12	27	9	172	0	
20	12	27	10	150.4	0	
20	12	27	11	136.2	0	
20	12	27	12	150	0	
20	12	27	13	173.6	0	
20	12	27	14	176.5	0	
20	12	27	15	223.4	0	
20	12	27	16	259.2	0	
20	12	27	17	240.6	0	
20	12	27	18	23	1	
20	12	27	19	0	0	
20	12	27	20	0	0	
20	12	27	21	174.2	0	
20	12	27	22	152.1	0	
20	12	27	23	145.6	0	
20	12	27	24	158.7	0	1
20	12	28	1	191	0	
20	12	28	2	153.7	0	
20	12	28	3	128.1	0	
20	12	28	4	113.5	0	
20	12	28	5	80.8	1	
20	12	28	6	150.1	0	
20	12	28	7	203.1	0	
20	12	28	8	282.6	0	
20	12	28	9	0	0	
20	12	28	10	212.7	0	
20	12	28	11	98.2	1	
20	12	28	12	174.6	0	
20	12	28	13	198.9	0	
20	12	28	14	242.2	0	
20	12	28	15	257.3	0	
20	12	28	16	251.6	0	
20	12	28	17	247.8	0	
20	12	28	18	244	0	
20	12	28	19	240.1	0	
20	12	28	20	258.3	0	
20	12	28	21	276	0	
20	12	28	22	284.1	0	
20	12	28	23	334.2	0	
20	12	28	24	276.2	0	2
20	12	29	1	314.3	0	
20	12	29	2	298.7	0	
20	12	29	3	283.2	0	

20	12	29	4	0	0	
20	12	29	5	135	0	
20	12	29	6	112.9	0	
20	12	29	7	87.2	1	
20	12	29	8	132.5	0	
20	12	29	9	187.8	0	
20	12	29	10	197	0	
20	12	29	11	193.8	0	
20	12	29	12	194	0	
20	12	29	13	231	0	
20	12	29	14	281.8	0	
20	12	29	15	345	0	
20	12	29	16	279.4	0	
20	12	29	17	329.4	0	
20	12	29	18	0	0	
20	12	29	19	26.9	1	
20	12	29	20	17.3	1	
20	12	29	21	0	0	
20	12	29	22	0	0	
20	12	29	23	0	0	
20	12	29	24	0	0	3
20	12	30	1	0	0	
20	12	30	2	0	0	
20	12	30	3	0	0	
20	12	30	4	0	0	
20	12	30	5	0	0	
20	12	30	6	118.5	0	
20	12	30	7	33.7	1	
20	12	30	8	0	0	
20	12	30	9	0	0	
20	12	30	10	129.1	0	
20	12	30	11	189.5	0	
20	12	30	12	41.8	1	
20	12	30	13	77.5	1	
20	12	30	14	339.4	0	
20	12	30	15	242	0	
20	12	30	16	221.6	0	
20	12	30	17	229	0	
20	12	30	18	301.7	0	
20	12	30	19	344.7	0	
20	12	30	20	0	0	
20	12	30	21	21.9	1	
20	12	30	22	0	0	
20	12	30	23	0	0	
20	12	30	24	100.3	1	5
20	12	31	1	0	0	
20	12	31	2	139.4	0	
20	12	31	3	133.7	0	
20	12	31	4	130	0	
20	12	31	5	97.3	1	
20	12	31	6	125.4	0	

20	12	31	7	142.5	0	
20	12	31	8	149.6	0	
20	12	31	9	133.1	0	
20	12	31	10	117.2	0	
20	12	31	11	113.5	0	
20	12	31	12	150.5	0	
20	12	31	13	174.4	0	
20	12	31	14	195.9	0	
20	12	31	15	241	0	
20	12	31	16	92.9	1	
20	12	31	17	249.4	0	
20	12	31	18	345.9	0	
20	12	31	19	0	0	
20	12	31	20	0	0	
20	12	31	21	95.1	1	
20	12	31	22	68.9	1	
20	12	31	23	0	0	
20	12	31	24	0	0	4

Hayden Jail Wind Data
2021

Year	Month	Day	Hour	Wdir	16 to 106	By Day	Date	No. hrs impact		
							Excluding from 16-106 degs			
21	1	1	1	21.5	1		1-Jan	9	No. Impacted Days:	325
21	1	1	2	81	1		2-Jan	11		
21	1	1	3	25	1		3-Jan	10		
21	1	1	4	33.2	1		4-Jan	8		
21	1	1	5	334.9	0		5-Jan	3		
21	1	1	6	67	1		6-Jan	3		
21	1	1	7	28.5	1		7-Jan	5		
21	1	1	8	58.7	1		8-Jan	14		
21	1	1	9	142	0		9-Jan	24		
21	1	1	10	146.4	0		10-Jan	17		
21	1	1	11	157.6	0		11-Jan	2		
21	1	1	12	191.6	0		12-Jan	8		
21	1	1	13	191.4	0		13-Jan	5		
21	1	1	14	211.8	0		14-Jan	8		
21	1	1	15	253.7	0		15-Jan	0		
21	1	1	16	285.1	0		16-Jan	1		
21	1	1	17	283	0		17-Jan	2		
21	1	1	18	306.8	0		18-Jan	2		
21	1	1	19	304.5	0		19-Jan	17		
21	1	1	20	305.5	0		20-Jan	6		
21	1	1	21	236.1	0		21-Jan	0		
21	1	1	22	189.3	0		22-Jan	3		
21	1	1	23	197.7	0		23-Jan	1		
21	1	1	24	151.1	0	7	24-Jan	11		
21	1	2	1	69.2	1		25-Jan	5		
21	1	2	2	164.6	0		26-Jan	7		
21	1	2	3	298.5	0		27-Jan	9		
21	1	2	4	6.5	0		28-Jan	2		
21	1	2	5	184.7	0		29-Jan	11		
21	1	2	6	25.8	1		30-Jan	7		
21	1	2	7	45.3	1		31-Jan	0		
21	1	2	8	129.4	0		1-Feb	1		
21	1	2	9	161.6	0		2-Feb	3		
21	1	2	10	146.5	0		3-Feb	3		
21	1	2	11	144	0		4-Feb	0		
21	1	2	12	151.6	0		5-Feb	1		
21	1	2	13	168.6	0		6-Feb	3		
21	1	2	14	219.8	0		7-Feb	8		
21	1	2	15	241.6	0		8-Feb	10		
21	1	2	16	300.1	0		9-Feb	0		
21	1	2	17	305.9	0		10-Feb	2		
21	1	2	18	330.8	0		11-Feb	2		
21	1	2	19	312.5	0		12-Feb	11		
21	1	2	20	303.3	0		13-Feb	2		
21	1	2	21	113.4	0		14-Feb	3		

21	1	2	22	58.7	1		15-Feb	0
21	1	2	23	140.2	0		16-Feb	1
21	1	2	24	58	1	5	17-Feb	3
21	1	3	1	323.6	0		18-Feb	4
21	1	3	2	28.5	1		19-Feb	1
21	1	3	3	349.5	0		20-Feb	1
21	1	3	4	61.1	1		21-Feb	3
21	1	3	5	350.9	0		22-Feb	1
21	1	3	6	4.1	0		23-Feb	5
21	1	3	7	276.1	0		24-Feb	10
21	1	3	8	96.5	1		25-Feb	1
21	1	3	9	143.9	0		26-Feb	2
21	1	3	10	129.4	0		27-Feb	3
21	1	3	11	124.6	0		28-Feb	4
21	1	3	12	152.3	0		1-Mar	1
21	1	3	13	142.4	0		2-Mar	4
21	1	3	14	195.5	0		3-Mar	2
21	1	3	15	217.7	0		4-Mar	1
21	1	3	16	262.1	0		5-Mar	3
21	1	3	17	315.3	0		6-Mar	1
21	1	3	18	317.1	0		7-Mar	3
21	1	3	19	323.3	0		8-Mar	0
21	1	3	20	308.7	0		9-Mar	3
21	1	3	21	280.2	0		10-Mar	3
21	1	3	22	140.6	0		11-Mar	1
21	1	3	23	14.8	0		12-Mar	1
21	1	3	24	257.8	0	3	13-Mar	1
21	1	4	1	353.9	0		14-Mar	4
21	1	4	2	246.3	0		15-Mar	20
21	1	4	3	155.7	0		16-Mar	24
21	1	4	4	178.9	0		17-Mar	24
21	1	4	5	141.4	0		18-Mar	12
21	1	4	6	292.1	0		19-Mar	12
21	1	4	7	129	0		20-Mar	2
21	1	4	8	150.1	0		21-Mar	1
21	1	4	9	196.6	0		22-Mar	0
21	1	4	10	155.3	0		23-Mar	2
21	1	4	11	145.1	0		24-Mar	0
21	1	4	12	168.2	0		25-Mar	6
21	1	4	13	232.3	0		26-Mar	1
21	1	4	14	178.2	0		27-Mar	0
21	1	4	15	210.3	0		28-Mar	0
21	1	4	16	198	0		29-Mar	0
21	1	4	17	189.4	0		30-Mar	4
21	1	4	18	63	1		31-Mar	10
21	1	4	19	39	1		1-Apr	15
21	1	4	20	357.5	0		2-Apr	0
21	1	4	21	353.8	0		3-Apr	4
21	1	4	22	14.9	0		4-Apr	1
21	1	4	23	156.5	0		5-Apr	0
21	1	4	24	319.6	0	2	6-Apr	2

21	1	5	1	156.7	0		7-Apr	0
21	1	5	2	50.3	1		8-Apr	1
21	1	5	3	140	0		9-Apr	1
21	1	5	4	170.7	0		10-Apr	0
21	1	5	5	116.1	0		11-Apr	3
21	1	5	6	136.7	0		12-Apr	8
21	1	5	7	131.4	0		13-Apr	0
21	1	5	8	130.2	0		14-Apr	1
21	1	5	9	159	0		15-Apr	2
21	1	5	10	200.2	0		16-Apr	1
21	1	5	11	202.6	0		17-Apr	2
21	1	5	12	196.8	0		18-Apr	2
21	1	5	13	207.1	0		19-Apr	2
21	1	5	14	285.9	0		20-Apr	3
21	1	5	15	257.7	0		21-Apr	3
21	1	5	16	303	0		22-Apr	0
21	1	5	17	300.7	0		23-Apr	5
21	1	5	18	303.7	0		24-Apr	3
21	1	5	19	311.9	0		25-Apr	2
21	1	5	20	315.4	0		26-Apr	3
21	1	5	21	162.5	0		27-Apr	4
21	1	5	22	3.5	0		28-Apr	4
21	1	5	23	5.2	0		29-Apr	3
21	1	5	24	104	1	2	30-Apr	1
21	1	6	1	354.7	0		1-May	1
21	1	6	2	15	0		2-May	0
21	1	6	3	232.7	0		3-May	4
21	1	6	4	31.1	1		4-May	4
21	1	6	5	274.1	0		5-May	1
21	1	6	6	85.3	1		6-May	2
21	1	6	7	15.3	0		7-May	0
21	1	6	8	157.6	0		8-May	6
21	1	6	9	157.3	0		9-May	8
21	1	6	10	135.3	0		10-May	3
21	1	6	11	118.2	0		11-May	4
21	1	6	12	143.5	0		12-May	2
21	1	6	13	122.6	0		13-May	1
21	1	6	14	46.4	1		14-May	1
21	1	6	15	61	1		15-May	0
21	1	6	16	107.5	0		16-May	1
21	1	6	17	223.2	0		17-May	2
21	1	6	18	357.8	0		18-May	2
21	1	6	19	20.6	1		19-May	1
21	1	6	20	26.3	1		20-May	1
21	1	6	21	84.1	1		21-May	0
21	1	6	22	138.1	0		22-May	1
21	1	6	23	15.9	0		23-May	2
21	1	6	24	110.7	0	7	24-May	1
21	1	7	1	83	1		25-May	0
21	1	7	2	102.7	1		26-May	2
21	1	7	3	70.7	1		27-May	0

21	1	7	4	128.5	0		28-May	2
21	1	7	5	149.1	0		29-May	3
21	1	7	6	61.5	1		30-May	1
21	1	7	7	90.5	1		31-May	3
21	1	7	8	93.6	1		1-Jun	2
21	1	7	9	176.3	0		2-Jun	1
21	1	7	10	151.2	0		3-Jun	0
21	1	7	11	137.6	0		4-Jun	1
21	1	7	12	139.5	0		5-Jun	2
21	1	7	13	181.4	0		6-Jun	3
21	1	7	14	209.9	0		7-Jun	1
21	1	7	15	176.1	0		8-Jun	3
21	1	7	16	210.3	0		9-Jun	0
21	1	7	17	228.4	0		10-Jun	16
21	1	7	18	273.1	0		11-Jun	13
21	1	7	19	311.9	0		12-Jun	2
21	1	7	20	325.6	0		13-Jun	0
21	1	7	21	151.9	0		14-Jun	0
21	1	7	22	18.7	1		15-Jun	3
21	1	7	23	252.1	0		16-Jun	2
21	1	7	24	3.5	0	7	17-Jun	2
21	1	8	1	118.4	0		18-Jun	3
21	1	8	2	142	0		19-Jun	3
21	1	8	3	133.5	0		20-Jun	1
21	1	8	4	167.9	0		21-Jun	2
21	1	8	5	323.4	0		22-Jun	1
21	1	8	6	238.8	0		23-Jun	2
21	1	8	7	338.4	0		24-Jun	3
21	1	8	8	259.1	0		25-Jun	2
21	1	8	9	148.2	0		26-Jun	3
21	1	8	10	121.7	0		27-Jun	2
21	1	8	11	134.5	0		28-Jun	1
21	1	8	12	153.9	0		29-Jun	12
21	1	8	13	181.6	0		30-Jun	7
21	1	8	14	203.9	0		1-Jul	1
21	1	8	15	233.9	0		2-Jul	3
21	1	8	16	285	0		3-Jul	2
21	1	8	17	306.7	0		4-Jul	4
21	1	8	18	297.5	0		5-Jul	2
21	1	8	19	305	0		6-Jul	1
21	1	8	20	312.2	0		7-Jul	14
21	1	8	21	262.2	0		8-Jul	0
21	1	8	22	12.6	0		9-Jul	3
21	1	8	23	53.2	1		10-Jul	1
21	1	8	24	354.3	0	1	11-Jul	5
21	1	9	1	262.3	0		12-Jul	6
21	1	9	2	17.7	1		13-Jul	3
21	1	9	3	35.5	1		14-Jul	2
21	1	9	4	276.5	0		15-Jul	2
21	1	9	5	281.7	0		16-Jul	1
21	1	9	6	56.1	1		17-Jul	4

21	1	9	7	53.1	1		18-Jul	1
21	1	9	8	157.4	0		19-Jul	4
21	1	9	9	185.7	0		20-Jul	2
21	1	9	10	183.7	0		21-Jul	3
21	1	9	11	210.8	0		22-Jul	3
21	1	9	12	146.1	0		23-Jul	7
21	1	9	13	230.4	0		24-Jul	1
21	1	9	14	279.2	0		25-Jul	0
21	1	9	15	244.9	0		26-Jul	1
21	1	9	16	264	0		27-Jul	4
21	1	9	17	270.6	0		28-Jul	2
21	1	9	18	312.2	0		29-Jul	6
21	1	9	19	333.9	0		30-Jul	2
21	1	9	20	358.3	0		31-Jul	2
21	1	9	21	49.6	1		1-Aug	0
21	1	9	22	72.7	1		2-Aug	1
21	1	9	23	70.9	1		3-Aug	0
21	1	9	24	80.8	1	8	4-Aug	9
21	1	10	1	32.8	1		5-Aug	3
21	1	10	2	142	0		6-Aug	13
21	1	10	3	41.4	1		7-Aug	3
21	1	10	4	149.1	0		8-Aug	3
21	1	10	5	56.1	1		9-Aug	2
21	1	10	6	119.5	0		10-Aug	5
21	1	10	7	138.6	0		11-Aug	2
21	1	10	8	129.8	0		12-Aug	0
21	1	10	9	125.1	0		13-Aug	2
21	1	10	10	128	0		14-Aug	1
21	1	10	11	135.7	0		15-Aug	5
21	1	10	12	52.2	1		16-Aug	3
21	1	10	13	15.6	0		17-Aug	1
21	1	10	14	40.2	1		18-Aug	3
21	1	10	15	66.9	1		19-Aug	0
21	1	10	16	76.4	1		20-Aug	2
21	1	10	17	27.7	1		21-Aug	3
21	1	10	18	31.2	1		22-Aug	1
21	1	10	19	29.9	1		23-Aug	0
21	1	10	20	42	1		24-Aug	1
21	1	10	21	49.4	1		25-Aug	2
21	1	10	22	53.6	1		26-Aug	1
21	1	10	23	51.5	1		27-Aug	2
21	1	10	24	42.7	1	15	28-Aug	2
21	1	11	1	52.2	1		29-Aug	6
21	1	11	2	56.6	1		30-Aug	3
21	1	11	3	47	1		31-Aug	1
21	1	11	4	68.3	1		1-Sep	2
21	1	11	5	49.2	1		2-Sep	2
21	1	11	6	39.6	1		3-Sep	3
21	1	11	7	36.1	1		4-Sep	2
21	1	11	8	41.6	1		5-Sep	1
21	1	11	9	61.7	1		6-Sep	2

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21	1	11	11	40.1	1		8-Sep	1
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21	1	11	13	54.3	1		10-Sep	1
21	1	11	14	97	1		11-Sep	1
21	1	11	15	47	1		12-Sep	1
21	1	11	16	40.3	1		13-Sep	4
21	1	11	17	69.8	1		14-Sep	15
21	1	11	18	57.2	1		15-Sep	22
21	1	11	19	37.1	1		16-Sep	12
21	1	11	20	61.8	1		17-Sep	2
21	1	11	21	88.1	1		18-Sep	0
21	1	11	22	68	1		19-Sep	2
21	1	11	23	53.5	1		20-Sep	2
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21	1	12	3	37.7	1		24-Sep	13
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21	1	12	5	35.6	1		26-Sep	0
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21	1	12	7	35.1	1		28-Sep	2
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21	1	13	16	257.6	0		31-Oct	21
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21	12	17	3	196.1	0	
21	12	17	4	105.3	1	
21	12	17	5	332.3	0	
21	12	17	6	177.3	0	
21	12	17	7	240.2	0	
21	12	17	8	172.7	0	
21	12	17	9	159.5	0	

21	12	17	10	260.4	0	
21	12	17	11	252.2	0	
21	12	17	12	246.1	0	
21	12	17	13	222.5	0	
21	12	17	14	237.1	0	
21	12	17	15	265.7	0	
21	12	17	16	286.9	0	
21	12	17	17	317	0	
21	12	17	18	332.2	0	
21	12	17	19	331.6	0	
21	12	17	20	310.9	0	
21	12	17	21	345.7	0	
21	12	17	22	10.7	0	
21	12	17	23	359.7	0	
21	12	17	24	178.9	0	1
21	12	18	1	318	0	
21	12	18	2	6.5	0	
21	12	18	3	235.9	0	
21	12	18	4	33.6	1	
21	12	18	5	282.5	0	
21	12	18	6	4.4	0	
21	12	18	7	59.7	1	
21	12	18	8	249.7	0	
21	12	18	9	242.6	0	
21	12	18	10	210	0	
21	12	18	11	63.8	1	
21	12	18	12	58.8	1	
21	12	18	13	71	1	
21	12	18	14	45.5	1	
21	12	18	15	47	1	
21	12	18	16	37.1	1	
21	12	18	17	38.6	1	
21	12	18	18	35.8	1	
21	12	18	19	41.3	1	
21	12	18	20	66	1	
21	12	18	21	64.2	1	
21	12	18	22	60.1	1	
21	12	18	23	63.1	1	
21	12	18	24	48.9	1	16
21	12	19	1	44	1	
21	12	19	2	38.5	1	
21	12	19	3	47.2	1	
21	12	19	4	45.5	1	
21	12	19	5	52.3	1	
21	12	19	6	56.5	1	
21	12	19	7	61.1	1	
21	12	19	8	66.3	1	
21	12	19	9	135.7	0	
21	12	19	10	63.7	1	
21	12	19	11	54.1	1	
21	12	19	12	53.4	1	

21	12	19	13	49.1	1	
21	12	19	14	73	1	
21	12	19	15	37.2	1	
21	12	19	16	29.8	1	
21	12	19	17	29.9	1	
21	12	19	18	35	1	
21	12	19	19	33.3	1	
21	12	19	20	3.4	0	
21	12	19	21	309.5	0	
21	12	19	22	201.9	0	
21	12	19	23	121	0	
21	12	19	24	157.7	0	18
21	12	20	1	164.7	0	
21	12	20	2	181.1	0	
21	12	20	3	155.9	0	
21	12	20	4	164.8	0	
21	12	20	5	158.7	0	
21	12	20	6	159.1	0	
21	12	20	7	154.3	0	
21	12	20	8	173.1	0	
21	12	20	9	142.8	0	
21	12	20	10	144.6	0	
21	12	20	11	146.3	0	
21	12	20	12	162.2	0	
21	12	20	13	174.1	0	
21	12	20	14	189.6	0	
21	12	20	15	200	0	
21	12	20	16	153.1	0	
21	12	20	17	146.8	0	
21	12	20	18	331.5	0	
21	12	20	19	289.6	0	
21	12	20	20	15.8	0	
21	12	20	21	330.5	0	
21	12	20	22	165.6	0	
21	12	20	23	149.9	0	
21	12	20	24	168.1	0	0
21	12	21	1	173.4	0	
21	12	21	2	162.7	0	
21	12	21	3	166.4	0	
21	12	21	4	119.9	0	
21	12	21	5	159.6	0	
21	12	21	6	157.8	0	
21	12	21	7	168.1	0	
21	12	21	8	138.1	0	
21	12	21	9	134.3	0	
21	12	21	10	158.6	0	
21	12	21	11	159.4	0	
21	12	21	12	165.3	0	
21	12	21	13	174.6	0	
21	12	21	14	193.1	0	
21	12	21	15	31	1	

21	12	21	16	328.5	0	
21	12	21	17	40.1	1	
21	12	21	18	312	0	
21	12	21	19	330.5	0	
21	12	21	20	322.3	0	
21	12	21	21	32.5	1	
21	12	21	22	154.2	0	
21	12	21	23	127.1	0	
21	12	21	24	150.9	0	3
21	12	22	1	15.5	0	
21	12	22	2	44.9	1	
21	12	22	3	4.6	0	
21	12	22	4	8	0	
21	12	22	5	37.1	1	
21	12	22	6	158.4	0	
21	12	22	7	143.9	0	
21	12	22	8	152.1	0	
21	12	22	9	146	0	
21	12	22	10	151.9	0	
21	12	22	11	155.7	0	
21	12	22	12	144.4	0	
21	12	22	13	172	0	
21	12	22	14	167.7	0	
21	12	22	15	194.8	0	
21	12	22	16	233.6	0	
21	12	22	17	277.1	0	
21	12	22	18	333.5	0	
21	12	22	19	337.6	0	
21	12	22	20	354.9	0	
21	12	22	21	229.8	0	
21	12	22	22	15.3	0	
21	12	22	23	153.8	0	
21	12	22	24	138.8	0	2
21	12	23	1	155.1	0	
21	12	23	2	155.4	0	
21	12	23	3	314.8	0	
21	12	23	4	323.8	0	
21	12	23	5	341.9	0	
21	12	23	6	105.7	1	
21	12	23	7	225.2	0	
21	12	23	8	166.2	0	
21	12	23	9	166.3	0	
21	12	23	10	130.2	0	
21	12	23	11	176.1	0	
21	12	23	12	193.3	0	
21	12	23	13	208.9	0	
21	12	23	14	265.1	0	
21	12	23	15	271.6	0	
21	12	23	16	310.1	0	
21	12	23	17	302.8	0	
21	12	23	18	326.6	0	

21	12	23	19	321.6	0	
21	12	23	20	27.1	1	
21	12	23	21	69.2	1	
21	12	23	22	67	1	
21	12	23	23	17.2	1	
21	12	23	24	325.7	0	5
21	12	24	1	307.9	0	
21	12	24	2	175.3	0	
21	12	24	3	34.9	1	
21	12	24	4	322	0	
21	12	24	5	286.1	0	
21	12	24	6	284.1	0	
21	12	24	7	309.2	0	
21	12	24	8	316.6	0	
21	12	24	9	160.5	0	
21	12	24	10	127.4	0	
21	12	24	11	142.9	0	
21	12	24	12	74.2	1	
21	12	24	13	83	1	
21	12	24	14	44.5	1	
21	12	24	15	320.2	0	
21	12	24	16	322.4	0	
21	12	24	17	256.3	0	
21	12	24	18	292.7	0	
21	12	24	19	322.3	0	
21	12	24	20	277.8	0	
21	12	24	21	309.1	0	
21	12	24	22	327	0	
21	12	24	23	291.7	0	
21	12	24	24	272.7	0	4
21	12	25	1	297.8	0	
21	12	25	2	265.1	0	
21	12	25	3	321.9	0	
21	12	25	4	356	0	
21	12	25	5	21	1	
21	12	25	6	45.4	1	
21	12	25	7	342	0	
21	12	25	8	343.3	0	
21	12	25	9	121.5	0	
21	12	25	10	204	0	
21	12	25	11	224.6	0	
21	12	25	12	172.1	0	
21	12	25	13	293.2	0	
21	12	25	14	300.9	0	
21	12	25	15	334.1	0	
21	12	25	16	273.1	0	
21	12	25	17	306	0	
21	12	25	18	336.8	0	
21	12	25	19	329.9	0	
21	12	25	20	327.1	0	
21	12	25	21	24.6	1	

21	12	25	22	316.6	0	
21	12	25	23	344.6	0	
21	12	25	24	185	0	3
21	12	26	1	238.2	0	
21	12	26	2	326.2	0	
21	12	26	3	314.8	0	
21	12	26	4	288.7	0	
21	12	26	5	109.3	0	
21	12	26	6	352.5	0	
21	12	26	7	282.3	0	
21	12	26	8	317.6	0	
21	12	26	9	330.6	0	
21	12	26	10	325.9	0	
21	12	26	11	296.7	0	
21	12	26	12	290	0	
21	12	26	13	321	0	
21	12	26	14	322.7	0	
21	12	26	15	318	0	
21	12	26	16	331.3	0	
21	12	26	17	322.6	0	
21	12	26	18	328.5	0	
21	12	26	19	340	0	
21	12	26	20	17	1	
21	12	26	21	43.8	1	
21	12	26	22	15	0	
21	12	26	23	160.5	0	
21	12	26	24	165.3	0	2
21	12	27	1	158.7	0	
21	12	27	2	209.6	0	
21	12	27	3	21.3	1	
21	12	27	4	227.5	0	
21	12	27	5	54.8	1	
21	12	27	6	242.2	0	
21	12	27	7	70	1	
21	12	27	8	205.8	0	
21	12	27	9	156.3	0	
21	12	27	10	151.9	0	
21	12	27	11	209.6	0	
21	12	27	12	218.9	0	
21	12	27	13	246	0	
21	12	27	14	275.1	0	
21	12	27	15	258.8	0	
21	12	27	16	235.5	0	
21	12	27	17	305.4	0	
21	12	27	18	268.7	0	
21	12	27	19	254	0	
21	12	27	20	18.1	1	
21	12	27	21	261.1	0	
21	12	27	22	163.6	0	
21	12	27	23	165.6	0	
21	12	27	24	357.2	0	4

21	12	28	1	301.9	0	
21	12	28	2	326.5	0	
21	12	28	3	318.8	0	
21	12	28	4	298.8	0	
21	12	28	5	300.9	0	
21	12	28	6	264.4	0	
21	12	28	7	131.9	0	
21	12	28	8	46	1	
21	12	28	9	130.5	0	
21	12	28	10	128.3	0	
21	12	28	11	106.9	0	
21	12	28	12	202.9	0	
21	12	28	13	251.5	0	
21	12	28	14	241.9	0	
21	12	28	15	245.1	0	
21	12	28	16	237.4	0	
21	12	28	17	239.9	0	
21	12	28	18	288.2	0	
21	12	28	19	324.2	0	
21	12	28	20	331.8	0	
21	12	28	21	220.6	0	
21	12	28	22	359.8	0	
21	12	28	23	103.8	1	
21	12	28	24	310.7	0	2
21	12	29	1	145.5	0	
21	12	29	2	122.9	0	
21	12	29	3	208.7	0	
21	12	29	4	308.1	0	
21	12	29	5	326.9	0	
21	12	29	6	330.8	0	
21	12	29	7	337.1	0	
21	12	29	8	335.6	0	
21	12	29	9	338.7	0	
21	12	29	10	314.8	0	
21	12	29	11	262.2	0	
21	12	29	12	283.2	0	
21	12	29	13	303.3	0	
21	12	29	14	303.1	0	
21	12	29	15	252	0	
21	12	29	16	257.4	0	
21	12	29	17	296.2	0	
21	12	29	18	192.6	0	
21	12	29	19	304.7	0	
21	12	29	20	2.6	0	
21	12	29	21	167.1	0	
21	12	29	22	103.6	1	
21	12	29	23	155.1	0	
21	12	29	24	158.1	0	1
21	12	30	1	143.7	0	
21	12	30	2	143.9	0	
21	12	30	3	163.9	0	

21	12	30	4	145.4	0	
21	12	30	5	131.8	0	
21	12	30	6	143.4	0	
21	12	30	7	113.9	0	
21	12	30	8	115.7	0	
21	12	30	9	116.3	0	
21	12	30	10	123.4	0	
21	12	30	11	150.5	0	
21	12	30	12	180.7	0	
21	12	30	13	194.3	0	
21	12	30	14	200.1	0	
21	12	30	15	152	0	
21	12	30	16	257	0	
21	12	30	17	272.3	0	
21	12	30	18	356.9	0	
21	12	30	19	140.6	0	
21	12	30	20	142.9	0	
21	12	30	21	91.4	1	
21	12	30	22	121.1	0	
21	12	30	23	30.4	1	
21	12	30	24	167.2	0	2
21	12	31	1	167.9	0	
21	12	31	2	169.9	0	
21	12	31	3	236.7	0	
21	12	31	4	298.2	0	
21	12	31	5	178.1	0	
21	12	31	6	167.2	0	
21	12	31	7	198.5	0	
21	12	31	8	161	0	
21	12	31	9	144.1	0	
21	12	31	10	162.8	0	
21	12	31	11	165.5	0	
21	12	31	12	146.5	0	
21	12	31	13	121.5	0	
21	12	31	14	103.7	1	
21	12	31	15	276.7	0	
21	12	31	16	286	0	
21	12	31	17	325.4	0	
21	12	31	18	9.2	0	
21	12	31	19	118.8	0	
21	12	31	20	195.6	0	
21	12	31	21	231	0	
21	12	31	22	19.2	1	
21	12	31	23	180.6	0	
21	12	31	24	204.6	0	2

	A	B	C	D	E	F	G	H	I	J	K	L
1	**ASARCO LLC - Hayden Operations**											
2												
3												
4	Particulate matter speciated as outlined in "PM Speciation" worksheet.											
5												
6	**PM Calculations (Method 5 Basis -- Filterable only)**											
7	**Year**	**Acid Plant**	**SHBH**	**R&R**	**FF Fug**	**Convt'r Fug**	**Anode**	**Anode BH**	**Anode Ref Area Fug**	**Converter**	**Slag Dump**	**Brick Crusher Baghouse**
8	2004	18.54	40.43	12.81	25.03	16.97	46.71	0.00	0.28	61.19	4.53	
9	2005	13.74	11.21	42.57	22.17	9.20	38.74	0.00	0.27	23.22	3.91	
10	2006	9.05	3.82	133.71	25.61	14.76	58.21	0.00	0.35	20.43	5.12	0.001180503
11	2007	31.37	16.70	78.16	26.62	18.74	69.55	0.00	0.39	41.86	6.07	0.002394
12	2008	52.42	24.05	15.28	26.94	20.20	75.67	0.00	0.40	54.98	6.35	0.000603
13	2009	29.91	17.11	15.33	24.20	20.72	67.61	0.00	0.35	43.95	5.77	0.00324
14	2010	56.86	37.45	85.31	27.56	23.59	75.98	0.00	0.42	72.67	6.36	0.0030105
15	2011	35.17	18.85	32.80	26.55	20.58	69.71	0.00	0.38	46.62	6.29	0.0004878
16	2012	14.75	19.57	18.45	28.11	18.11	20.15	0.50	0.38	40.70	6.64	0.0066447
17	2013	26.20	34.98	18.10	25.06	15.79	1.82	6.09	0.34	56.13	5.60	0.000225
18	2014	13.46	40.82	49.60	27.33	16.30	2.10	6.55	0.36	59.87	6.33	0
19	2015	18.43	43.01	20.32	24.52	13.35	1.81	8.85	0.30	60.13	6.93	0
20												
21	**PM10 Calculations (Filterable + Condensable)**											
22	**Year**	**Acid Plant**	**SHBH**	**R&R**	**FF Fug**	**Convt'r Fug**	**Anode**	**Anode BH**	**Anode Ref Area Fug**	**Converter**		
23	2004	199.22	335.19	87.86	111.54	141.28	372.65	0.00	0.28	517.22		
24	2005	147.64	92.94	291.98	98.80	76.59	309.11	0.00	0.27	199.73		
25	2006	97.24	31.67	917.09	114.13	122.88	464.44	0.00	0.35	174.44		
26	2007	337.08	138.45	536.08	118.63	156.02	554.91	0.00	0.39	363.42		
27	2008	563.27	199.42	104.78	120.05	168.17	603.71	0.00	0.40	482.80		
28	2009	321.39	141.87	105.12	107.84	172.50	539.41	0.00	0.35	380.11		
29	2010	610.98	310.45	585.15	122.82	196.39	606.19	0.00	0.42	631.82		
30	2011	377.91	156.27	224.99	118.29	171.30	556.16	0.00	0.38	404.87		
31	2012	158.49	162.25	126.54	125.27	150.77	160.73	3.99	0.38	345.44		
32	2013	281.53	290.00	124.14	111.68	131.46	14.52	48.59	0.38	479.04		
33	2014	144.63	338.42	340.20	121.79	135.70	16.75	52.26	0.36	503.71		
34	2015	198.04	356.58	139.37	109.27	111.14	14.44	70.61	0.30	508.23		
35												
36	**PM2.5 Calculations (Filterable + Condensable)**											
37	**Year**	**Acid Plant**	**SHBH**	**R&R**	**FF Fug**	**Convt'r Fug**	**Anode**	**Anode BH**	**Anode Ref Area Fug**	**Converter**		
38	2004	192.18	315.90	79.03	101.71	88.30	332.15	0.00	0.28	443.51		
39	2005	142.43	87.59	262.62	90.09	47.87	275.51	0.00	0.27	164.59		
40	2006	93.81	29.85	824.89	104.06	76.80	413.96	0.00	0.35	125.84		
41	2007	325.17	130.49	482.19	108.17	97.51	494.60	0.00	0.39	294.51		
42	2008	543.37	187.94	94.24	109.47	105.11	538.09	0.00	0.40	404.19		
43	2009	310.04	133.71	94.55	98.33	107.81	480.78	0.00	0.35	304.94		
44	2010	589.40	292.59	526.31	111.99	122.75	540.30	0.00	0.42	535.89		
45	2011	364.56	147.28	202.37	107.86	107.06	495.71	0.00	0.38	328.91		
46	2012	152.90	152.91	113.82	114.22	94.23	143.26	3.56	0.38	278.42		
47	2013	271.58	273.32	111.66	101.83	82.16	12.94	43.31	0.38	411.03		
48	2014	139.52	318.95	305.99	111.05	84.81	14.93	46.58	0.36	432.30		
49	2015	191.04	336.06	125.36	99.63	69.46	12.87	62.93	0.30	444.60		
50												

Primary Process Emissions

51	A	B	C	D	E	H	I	J	K	L	N
52	**Potential To Emit Calculation:**										
53	693500	tons concentrate									
54	140	lb/ton PM, AP-42, Ch. 12.3-3, Flash Furnace									
55	10	lb/ton PM, AP-42, Ch. 12.3-3, Concentrate Dryers									
56	36	lb/ton PM, AP-42, Ch. 12.3-3, Converters									
57	0.45	lb/ton PM, Engineering Estimate, Anode Furnace									
58											
59											
60											
61		**Flash Furnace PM Emissions**								**Notes:**	
62		Flash Furnace emissions = tons concentrate * 140 lb/ton * 1.0 Capture * (1/2000) = FF to WGH system						48545.00		Flash is hard piped without opening.	
63										Lower openings under MT/SS	
64		**Flash Furnace Matte and Slag Tapping (Partial Building fugitives)**								**Notes:**	
65		Matte tapping emissions = tons concentrate * 0.3 lb/ton conc for matte * 0.965 Capture * 0.9 to VGBH * (1/2000) = MT to VGBH						90.35		AP-42, Table 12.3-11, Flash Furnace, Matte Tapping 50% (1/95) adjusted upward per GCT; capture from GCT post Uptake Project	
66		Slag skimming emissions = tons concentrate * 0.3 lb/ton conc for slag * 0.75 fraction * 0.965 Capture * 0.9 to VGBH * (1/2000) = SS to VGBH						67.76		AP-42, Table 12.3-11, Flash Furnace, Slag Tapping 50% (1/95) adjusted upward per GCT; fraction apportioned between in shop (0.75) versus slag pour at dump (0.25); capture from GCT post-Uptake Project	
67		Matte tapping emissions = tons concentrate * 0.3 lb/ton conc for matte * 0.965 Capture * 0.1 to CSHBH * (1/2000) = MT to CSHBH						10.04		AP-42, Table 12.3-11, Flash Furnace, Matte Tapping 50% (1/95), adjusted per GCT, 10% to CSHBH post UIP	
68		Slag skimming emissions = tons concentrate * 0.3 lb/ton conc for matte * 0.965 Capture * 0.1 to CSHBH * (1/2000) = SS to CSHBH						7.53		AP-42, Table 12.3-11, Flash Furnace, Slag skimming 50% (1/95), adjusted per GCT, 10% to CSHBH post UIP	
69		Matte tapping fugitives = tons concentrate * 0.3 lb/ton conc for matte * (1-0.965) not capture * (1/2000) = MT Fug						3.64		AP-42, Table 12.3-11, Flash Furnace, Matte Tapping 50% (1/95) adjusted upward per GCT; capture from GCT post-Uptake Project	
70		Slag skimming fugitives = tons concentrate * 0.3 lb/ton conc for slag * 0.75 fraction * (1-0.965) not captured * (1/2000) = released (SS Fug)						2.73		AP-42, Table 12.3-11, Flash Furnace, Slag Tapping 50% (1/95) adjusted upward per GCT; fraction apportioned between in shop (0.75) versus slag pour at dump (0.25); capture from GCT post-Uptake Project	
71		Combined emissions (MT Fug + SS Fug)				**1.45**	lb/hr PM	**6.37**	tons TSP	Calculation, PPH based on 100 tph capacity	
72		PM to PM10:		4.456370149	ratio (from PM Speciation)	**6.48**	lb/hr PM10	**28.39**	tons PM10	Calculated, see PM Speciation, PPH based on 100 tph capacity	
73		PM to PM2.5:		4.063379104	ratio (from PM Speciation)	**5.91**	lb/hr PM2.5	**25.89**	tons PM2.5	Calculated, see PM Speciation, PPH based on 100 tph capacity	
74											
75		**Concentrate Dryer PM Emissions (Partial Building Fugitives)**								**Notes:**	
76		Tons concentrate * 10 lb/ton * (1-0.99) Capture * 1 ton/2000 lbs = tons lost from concentrate dryers						34.68		Calculation and Estimate	
77		34.68	tons uncaptured * 0.96 Capture = tons to VGBH					33.29		Estimate	
78		Building fugitives = (tons lost from concentrate dryers - tons to VGBH) (CD Fug)				**0.32**	lb/hr TSP	**1.39**	tons TSP	Calculation (J74-J75)	
79		PM to PM10:		0.885	ratio (from PM Speciation)	**0.28**	lb/hr PM10	**1.23**	tons PM10	Calculated, see PM Speciation	
80		PM to PM2.5:		0.462	ratio (from PM Speciation)	**0.15**	lb/hr PM2.5	**0.64**	tons PM2.5	Calculated, see PM Speciation	
81											
82	**HP-25b**	**Flash Furnace Building Fugitives**									
83		Flash Furnace Building Fugitives TSP = MT Fug + SS Fug + CD Fug = FF Fug TSP				1.77	lb/hr TSP	7.76	tons TSP	Calculation (J69+J76)	
84		Flash Furnace Building Fugitives PM10 = MT Fug + SS Fug + CD Fug = FF Fug PM10				6.76	lb/hr PM10	29.62	tons PM10	Calculation (J70+J77)	
85		Flash Furnace Building Fugitives PM2.5 = MT Fug + SS Fug + CD Fug = FF Fug PM2.5				6.06	lb/hr PM2.5	26.53	tons PM2.5	Calculation (J71+J78)	
86		Flash Furnace Building Fugitives Lead = FF Fug TSP * Lead Speciation * 2 Safety Factor = FF Fug Lead				0.10	lb/hr PM	0.42	tons Lead	J83*Lead Speciation FF Fugs	
87											
88	**HP-2b-1**	**VGBH PM and Lead Emissions**									
89		PM to VGBH = MT to VGHB + SS to VGBH + CD to VGBH						191.39	tons TSP	0.9 MT/SS to VGBH, Balance to CSHBH	
90		PM calculations:	0.003 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 gr =			**7.071**	lb/hr TSP	**30.97**	tons TSP	CFM and grain loading from GCT	
91		PM10 calculations:	0.0134 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 gr =			**31.586**	lb/hr PM10	**138.35**	tons PM10	Calculated, see PM Speciation	0.01336911
92		PM2.5 calculations:	0.0122 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 gr =			**28.757**	lb/hr PM2.5	**125.96**	tons PM2.5	Calculated, see PM Speciation	0.01219014
93		Lead calculations	TSP * Lead VGBH Speciation			**0.462**	lb/hr Lead	**2.02**	tons Lead	TSP * VGBH Lead Speciation	
94											
95		**Converter PM Emissions (Partial Building Fugitives from Blowing)**									
96		Tons concentrate * 36 lb/ton * 0.99 blow * 0.97 Capture * (1/2000) = C Blowing PH to WGH						11987.42	tons TSP	From GCT	
97		Tons concentrate * 36 lb/ton * 0.99 blow * (1-0.97) Not Captured * (1/2000) = C Blowing PM to CSH						370.75	tons TSP	From GCT	
98		370.75	C Blowing PM to CSH * 0.97 Capture = CSH Blowing to WGH					359.62	tons TSP	Calculation	
99		11.12	C Blowing PM to available to tertiary * (1-0.97) Capture = C Blowing PM available to TV					11.12	tons TSP	Calculation	
100		11.12	C Blowing PM avaliable to TV * 0.95 TV capture = PM to TV					10.57	tons TSP	Calculation	
101		Converter fugitives to atmosphere	C Blowing PM available to TV * (1-0.95) capture = Conv Fug to Atm			**0.13**	lb/hr TSP	**0.56**	tons TSP	Calculation, PPH based on 100 tph capacity of furnace	
102		PM to PM10:		8.325245902	ratio (from PM Speciation)	**1.06**	lb/hr PM10	**4.63**	tons PM10	Calculated, see PM Speciation	
103		PM to PM2.5:		5.203278689	ratio (from PM Speciation)	**0.66**	lb/hr PM2.5	**2.89**	tons PM2.5	Calculated, see PM Speciation	
104											
105		**Converter Secondary Operations (Partial Building Fugitives from Secondary Operations)**									
106		Converter Secondary Ops + tons concentrate * 36 lb/ton * 0.01 secondary fraction * 0.95 Capture * (1/2000) = CSH PM to CSHBH						112.35		From GCT	
107		Converter Secondary Ops = tons concentrate * 36 lb/ton * 0.01 secondary fraction * (1-0.95) not captured * 1/2000 = CSO available to TV						12.48		From GCT	
108		12.48	CSO available to TV * 0.95 capture = CSO TV					11.86	tons TSP	Calculation	
109		12.48	CSO available to TV * (1-0.95) capture = CSO fugitives			**0.14**	lb/hr TSP	**0.59**	tons TSP	Calculation	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	AC	AD	AE	AF	AG	AH
110		PM to PM10:		8.325245902	ratio (from PM Speciation)			**1.13**	lb/hr PM10	**4.94**	tons PM10	Calculated, see PM Speciation															
111		PM to PM2.5:		5.203278689	ratio (from PM Speciation)			**0.70**	lb/hr PM2.5	**3.09**	tons PM2.5	Calculated, see PM Speciation															
112																											
113	**HP-41**	**Converter Building Fugitives**																									
114		TSP Conv Fugs = Conv Fug to Atm + CSO Fug TSP						**0.26**	lb/hr TSP	**1.15**	tons TSP	Calculation J101_J109															
115		PM10 Conv Fugs = Conv Fug to Atm + CSO Fug PM10						**2.18**	lb/hr PM10	**9.57**	tons PM10	Calculation J102+J110															
116		PM2.5 Conv Fugs = Conv Fug to Atm + CSO Fug PM2.5						**1.37**	lb/hr PM2.5	**5.98**	tons PM2.5	Calculation J103_J111															
117		Lead Conv Fugs = TSP Conv Fug * Lead Speciation factor 2 Safey Factor						**0.04**	lb/hr Lead	**0.17**	tons Lead	Calculation J114*Conv Fug Lead Spec															
118																											
119	**HP-2b-2**	**Secondary Hood Baghouse Emissions**																									
120		PM to Converter SHBH = CSH to CSHBH + MT to CSHBH + SS to CSHBH								129.91	tons TSP	Calculations J106+J67+J68															
121		TSP calculation:	0.003 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 lb =					**7.071**	lb/hr TSP	**30.97**	tons TSP	CFM from GCT; grain loading proposed limit															
122		PM10 calculation:	0.0249 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 lb =					**58.693**	lb/hr PM10	**257.07**	tons PM10	Calculated, see PM Speciation		0.02487167													
123		PM2.5 calculation:	0.0235 gr/scf * 275,000 scf/min * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 lb					**55.393**	lb/hr PM2.5	**242.62**	tons PM2.5	Calculated, see PM Speciation		0.02344077													
124		Lead calculation	TSP * CSHBH Lead Fraction					**0.087**	lb/hr Lead	**0.38**	tons Lead	Calculated TSP * CSHBH Lead Fraction															
125																											
126	**HP-2b-3**	**Tertiary Evacuation to Main Stack**																									
127		Tertiary PM to Main Stack = PM to TV + CSO TV, as TSP						**6.47**	lb/hr PM	**22.43**	tons TSP																
128		PM to PM10:		8.325245902	ratio (from PM Speciation)			**53.84**	lb/hr PM10	**186.69**	tons PM10	Calculated, see PM Speciation															
129		PM to PM2.5:		5.203278689	ratio (from PM Speciation)			**33.65**	lb/hr PM2.5	**116.68**	tons PM2.5	Calculated, see PM Speciation															
130		Lead emissions = TSP * Tertiary Lead Speciation						**0.48**	lb/hr Lead	**1.67**	tons Lead	Calculated TSP * Tertiary Lead Spec															
131																											
132		**Anode Furnace Emissions (Anode Furnace Baghouse)**																									
133		Total PM from Anodes = 0.45 lb/ton * 660 anodes tons/day * 365 days * 1 ton/2000 pounds = AF PM								54.20	tons TSP	AP-42, see assumptions															
134		Total PM to AF Primary BH = AF PM * 0.85 capture = AFBH to Main Stack Center								46.07	tons TSP																
135	**HP-1b-2**	TSP calculation:	69,500 scfm * 0.003 gr/scf * 60 min/1 hour * 8760 hour/1 year * 1 lb/7000 gr * 1 ton/2000 lb =					**1.787**	lb/hr PM	**7.83**	tons TSP	Permit 54251															
136		PM10 calculation:	69,500 scfm * 0.024 gr/scf * 60 min/1 hour * 8760 hour/1 year * 1 lb/7000 gr * 1 ton/2000 lb =					**14.297**	lb/hr PM10	**62.62**	tons PM10	Permit 54251															
137		PM2.5 calculation:	69,500 scfm * 0.021 gr/scf * 60 min/1 hour * 8760 hour/1 year * 1 lb/7000 gr * 1 ton/2000 lb =					**12.510**	lb/hr PM2.5	**54.79**	tons PM2.5	Permit 54251															
138		Lead calculations	TSP * AFBH Lead Speciation					**0.041**	lb/hr Lead	**0.18**	tons Lead	Calculation, TSP & AFBH Lead Speciation															
139																											
140		**Anode Secondary Hood Baghouse**																									
141		Total PM available for Anode Secondary Hood Baghouse = AF PM - AFBH to Main Stack							lb/hr TSP	**8.13**	tons TSP	Calculation, J132-J133															
142		Total PM to Anode Secondary BH * 0.7 ASH Capture = ASBH to Main Stack Annulus							lb/hr TSP	**5.69**	tons TSP	Calculation															
143		ASBH tons TSP = Lower of (1) 0.002 gr/scf * 150,000 scfm * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 lbs or (2) Total PM to Anode Secondary BH * (1-0.7) reduction						**0.557**	lb/hr TSP	**2.44**	tons TSP			0.016													
144		ASBH tons PM10 = Lower of (1) 0.002/0.003 gr/scf * 0.024 gr/scf * 150,000 scf/hr * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1 ton/2000 lbs or (2) TSP * PM10 Spec * (1-0.7)						**3.110**	lb/hr PM10	**13.62**	tons PM10	Calculation															
145		ASBH tons PM2.5 = 0.002/0.003 gr/scf * 0.21 gr/scf * 150,000 scf/hr * 60 min/hr * 8760 hr/yr * 1 lb/7000 gr * 1/ton/2000 lbs						**2.772**	lb/hr PM2.5	**12.14**	tons PM2.5	Calculation															
146		ASBH tons lead = ASBH TSP * AFBH Lead Speciation						**0.013**	lb/hr Lead	**0.06**	tons Lead	Calculation, TSP * AFBH Lead Speciation															
147																											
148	**HP-24b-1**	**Anode Furnace Fugitives**																									
149		Anode Fugitives TSP = Total PM to Anode Secondary BH - ASBH to Main Stack Annulus						**0.5569**	lb/hr TSP	**2.44**	tons TSP	Calculation															
150		PM to PM10:		7.978360656	ratio (from PM Speciation)			**4.4429**	lb/hr PM10	**19.46**	tons PM10	Calculation * PM Speciation															
151		PM to PM2.5:		7.111147541	ratio (from PM Speciation)			**3.9600**	lb/hr PM2.5	**17.34**	tons PM2.5	Calculation * PM Speciation															
152		Lead emissions = TSP * Anode Fug Lead Speciation * 1.5 Safey Factor						**0.0257**	lb/hr Lead	**0.11**	tons Lead	Calculation * Lead Anode Fug Speciation															
153																											
154	**HP-1b-1**	**WGH System/Acid Plant PM Emissions (Acid Plant emissions)**										**Notes:**															
155		WGH System PM Input = FF PM + Conv PH PM + CSH Blowing								60892.0	tons TSP	Calculation															
156		TSP calculation:	106000 scf/min * 60 min/hr * 8760 hr/yr * 0.02 gr/scf * 1 lb/7000 gr * 1 ton/2000 lbs =					**18.171**	lb/hr PM	**79.59**	tons TSP	CFM from GCT; grain loading NESHAP Subpart EEEEEE															
157		PM10 calculation:	106000 scf/min * 60 min/hr * 8760 hr/yr * 0.215 gr/scf * 1 lb/7000 gr * 1 ton/2000 lbs =					**195.343**	lb/hr PM10	**855.60**	tons PM10	Calculated, see PM Speciation															
158		PM2.5 calculation:	106000 scf/min * 60 min/hr * 8760 hr/yr * 0.20 gr/scf * 1 lb/7000 gr * 1 ton/2000 lbs =					**181.714**	lb/hr PM2.5	**795.91**	tons PM2.5	Calculated, see PM Speciation															
159		Lead calculation	TSP * Acid Plant Lead Speciation					**0.029**	lb/hr Lead	**0.13**	tons Lead	TSP * Acid Plant lead speciation															
160																											
161																											
162																											
163		**Main Stack Emissions**																									
164		Main Stack Center = WGH + AFBH as TSP								87.42	tons TSP	Calculation J135+J156															
165		Main Stack Center = WGH + AFBH as PM10								918.22	tons PM10	Calculation															
166		Main Stack Center = WGH + AFBH as PM2.5								850.70	tons PM2.5	Calculation															
167		Main Stack Center = WGH + AFBH as Lead								0.31	tons Lead	Calculation															
168		Main Stack Annulus = VGBH + CSHBH + TV + ASHBH as TSP								86.81	tons TSP	Calculation J90+J121+J127+J143															
169		Main Stack Annulus = VGBH + CSHBH + TV + ASHBH as PM10								595.74	tons PM10	Calculation															
170		Main Stack Annulus = VGBH + CSHBH + TV + ASHBH as Pm2.5								497.40	tons PM2.5	Calculation															
171		Main Stack Annulus = VGBH + CSHBH + TV + ASHBH as Lead								4.13	tons lead	Calculation															
172		Main Stack Total, TSP								174.23	tons TSP	Calculation J164+J168															
173		Main Stack Total, PM10								1513.96	Tons PM10	Calcluation															
174		Main Stack Total, PM2.5								1348.10	tons PM2.5	Calculaiton															
175		Main Stack Total, Lead								4.44	tons Lead	**Note: Limit is 3.0**															
176																											
177																											
178	**HP-52b**	**Anode Casting Combustion**																									
179		The anode area consists of the following natural gas burners: anode casting, receiving ladles, launders,																									
180		intermediate ladles, casting ladle #1 & 2 wheels and a molds preheater.																									
181		Capacity unknown, so worst-case historic usage has been scaled up to 693,500 tons concentrate																									
182		**Concentrate**	**Actual Natural gas usage (ft3)**	**Natural Gas Usage @ 693,500 Tons Concentrate**																							
183	2006	499311	91,623,000	127,256,460.40																							
184																											
185		127,256,460.4 cfm natural gas * 1mmscf/1000000 scf * 7.6 lb/mmscf * 1 ton/2000 lb =						**0.138**	lb/hr PM	**0.48**	TPY PM, PM1	lb/hr estimate, with 25% safety factor															
186																											
187	**HP-40b**	**Slag Pouring Fugitives**																									
188		Slag pouring PM (0.066 lb/ton * tons concentrate * 0.25 fraction * 1 ton/2000 lbs) (SP Fug)						**1.65**	lb/hr PM	**5.72**	tons TSP	AP-42, Table 12.3.15; fraction from estimate,															
189		Slag pouring PM10 (0.056 lb/ton * tons concentrate * 0.25 fraction * ton/2000 lbs) (SP Fug)						**1.40**	lb/hr PM10	**4.85**	tons PM10	AP-42, Table 12.3.15; fraction from estimate,															
190		Slag pouring PM2.5 (0.044 lb/ton * tons concentrate * 0.25 fraction * ton/2000 lbs) (SP Fug)						**1.10**	lb/hr PM2.5	**3.81**	tons PM2.5	AP-42, Table 12.3.15; fraction from estimate,															
191																											
192	**HP-26b**	**#2 Acid plant preheater**																									
193		Max Hourly NG	196800	ft3																							
194		Max Annual NG	460000000	ft3																							
195		196800 ft3 gas * 7.6 lb/mmscf * 1/10^6 =								**1.50**	lbs/hr PM, PM10, PM2.5																
196		460000000 ft3 gas * 7.6 lb/mmscf * 1 ton/2000 lbs * 1/10^6=								**1.75**	TPY PM, PM10, PM2.5, based on 460 mmscf/year limit																
197																											
198	**HP-27b**	**Truck wash heater**																									
199		Max Hourly Fuel	4.371584699	gallons																							
200		Max Annual Fuel	38295.08197	gallons									AP-42, 1.5-1														
201		4.37 gallons* .7 lb/10*3 * 1/1000 =								**0.00**	lbs/hr PM, PM10, PM2.5		See SO2 calc notes for additional info														
202		38295.08 gallons* .7 lb/10*3 * 1/1000 * 1 ton/2000 lbs =								**0.01**	TPY PM, PM10, PM2.5																
203																											
204	**HP-28b**	**Oxygen plant boiler**																									
205		Max Hourly NG	8740	ft3																							
206		Max Annual NG	76562400	ft3																							
207		8740 ft3 gas * 7.6 lb/mmscf * 1/10^6 =								**0.07**	lbs/hr PM, PM10, PM2.5																
208		76562400 ft3 gas * 7.6 lb/mmscf * 1 ton/2000 lbs * 1/10^6=								**0.29**	TPY PM, PM10, PM2.5																
209																											
210	**HP-50b**	**Anode boiler**																									
211		Max Hourly NG	3705.882353	ft3																							
212		Max Annual NG	32463529.41	ft3																							
213		3705.88235294118 ft3 gas * 7.6 lb/mmscf * 1/10^6 =								**0.03**	lbs/hr PM, PM10, PM2.5																
214		32463529.4117647 ft3 gas * 7.6 lb/mmscf * 1 ton/2000 lbs * 1/10^6=								**0.12**	TPY PM, PM10, PM2.5																
215																											
216	**HP-3b**	**Power Screen #3 Diesel Engine**																									
217		Max Hourly HI	0.19338808	mmBTU	(76 HP, 1 HP=2544.48 BTU/HR)																						
218		Max Annual HI	1694.079581	mmBTU																							

	A	B	C	D	F	G	H	I	J	K	M	N	O
219		0.19 mmBTUs* .31 lb/mmBTU =							**0.06**	lbs/hr PM, PM10, PM2.5			
220		1694.08 mmBTU * .31 lb/mmBTU * 1 ton/2000 lbs =							**0.263**	TPY PM, PM10, PM2.5			
221													
222	**HP-63b**	**Small Boilers & Heaters**											
223		Max Hourly NG	9534.313725	ft3									
224		Max Annual NG	83520588.24	ft3									
225		9534.3137254902 ft3 gas * 7.6 lb/mmscf * 1/10^6 =							**0.07**	lbs/hr PM, PM10, PM2.5			
226		83520588.2352941 ft3 gas * 7.6 lb/mmscf * 1 ton/2000 lbs * 1/10^6=							**0.32**	TPY PM, PM10, PM2.5			
227													
228	**HP-64b**	**Emergency Diesel Generator @ Powerhouse**											
229		Max Hourly HP	760	HP-hr									
230		Max Annual HP	380000	HP-hr									500 hours per EPA Guidance
231		Emission Factor	0.0022	lb/hp-hr									AP-42, 3.3
232		760.00 HP-HR* 0.0022 lb/hp-hr =									**1.67**	lbs/hr	
233		380000.00 HP-HR* 0.0022 lb/hp-hr * 1 ton/2000 lb =									**0.418**	TPY	
234													
235	**HP-65b**	**Emergency Diesel Generator @ Powerhouse**											
236		Max Hourly HP	760	HP-hr									
237		Max Annual HP	380000	HP-hr									500 hours per EPA Guidance
238		Emission Factor	0.0022	lb/hp-hr									AP-42, 3.3
239		760.00 HP-HR* 0.0022 lb/hp-hr =									**1.67**	lbs/hr	
240		380000.00 HP-HR* 0.0022 lb/hp-hr * 1 ton/2000 lb =									**0.418**	TPY	
241													
242	**HP-66b**	**Emergency Diesel Generator @ Cooling Tower**											
243		Max Hourly HP	760	HP-hr									
244		Max Annual HP	380000	HP-hr									
245		Emission Factor	0.0022	lb/hp-hr									
246		760.00 HP-HR* 0.0022 lb/hp-hr =									**1.67**	lbs/hr	500 hours per EPA Guidance
247		380000.00 HP-HR* 0.0022 lb/hp-hr * 1 ton/2000 lb =									**0.418**	TPY	AP-42, 3.3
248													
249	**HP-67b**	**Emergency Natural Gas Generator**											4,230 scf/hr * l020 btu/scf = 4,314,600 btu/hr
250		Max Hourly HI	4.3146	MMBtu									500 hours per EPA Guidance
251		Max Annual HI	2157.3	MMBtu									AP-42, 3.2, 4-stroke, lean burn
252		Emission Factor	0.0099871	lb/MMBtu									EF is condensable +filterable
253		4.31 mmBTUs* 0.0099871 lb/mmBTU =									**0.04**	lbs/hr	
254		2157.30 mmBTU * 0.0099871 lb/mmBTU * 1 ton/2000 lbs =									**0.011**	TPY	
255													
256	**HP-68b**	**Emergency Natural Gas Generator**											4,230 scf/hr * l020 btu/scf = 4,314,600 btu/hr
257		Max Hourly HI	4.3146	MMBtu									500 hours per EPA Guidance
258		Max Annual HI	2157.3	MMBtu									AP-42, 3.2, 4-stroke, lean burn
259		Emission Factor	0.0099871	lb/MMBtu									EF is condensable +filterable
260		4.31 mmBTUs* 0.0099871 lb/mmBTU =									**0.04**	lbs/hr	
261		2157.30 mmBTU * 0.0099871 lb/mmBTU * 1 ton/2000 lbs =									**0.011**	TPY	
262													
263													
264	**Material Storage & Handling**												
265	HP-4b	**Brick Crusher Baghouse**								**Notes**			
266		**Stack Emissions**											
267		32000 scfm * 0.022 gr/scf * 60 min/1 hour * 420 hours/1 year * 1 lb/7000 gr * 1 ton/2000 lb =				**6.034285714**	lb/hr PM	**1.27**	tons TSP	EF from NSPS limit			
268		32000 scfm * 0.022 gr/scf * 60 min/1 hour * 420 hour/1 year * 1 lb/7000 gr * 1 ton/2000 lb * 99% (Speciation) =				**5.973942857**	lb/hr PM10	**1.25**	tons PM10	42,000 TPY permit limit; 200 tons per hour			
269		32000 scfm * 0.022 gr/scf * 60 min/1 hour * 420 hour/1 year * 1 lb/7000 gr * 1 ton/2000 lb * 99% (Speciation) =				**5.973942857**	lb/hr PM2.5	**1.25**	tons PM2.5	Conservatively assume operation at half capacity			
270										42,000 TPY limit / 100 TPH = 420 Hours			
271		**Fugitives: Asarco estimates approximately 90% is captured and routed to the brick crusher baghouse.**											
272		**Material Handling**											
273		42,000 tons/year * .01 lb/ton PM * 1 ton/2000 lb. * 4 transfers (Material handling) * (1-.9 capture)				**0.08**	lb/hr PM	**0.08**	tons TSP	EF from AP-42 11.24			
274		42,000 tons/year * .004 lb/ton PM10 * 1 ton/2000 lb. * 4 transfers (Material handling) * (1-.9 capture)				**0.32**	lb/hr PM10	**0.03**	tons PM10				
275		42,000 tons/year * .004 lb/ton PM2.5 * 1 ton/2000 lb. * 4 transfers (Material handling) * (1-.9 capture)				**0.32**	lb/hr PM2.5	**0.03**	tons PM2.5				
276													
277		**Primary crushing**											
278		42,000 tons/year *.02 lb/ton * 1 ton/2000 lb (primary crushing) * (1-.9 capture)				**0.4**	lb/hr PM	**0.042**	tons TSP				
279		42,000 tons/year *.009 lb/ton * 1 ton/2000 lb (primary crushing) * (1-.9 capture)				**0.18**	lb/hr PM10	**0.0189**	tons PM10				
280		42,000 tons/year *.009 lb/ton * 1 ton/2000 lb (primary crushing) * (1-.9 capture)				**0.18**	lb/hr PM2.5	**0.0189**	tons PM2.5				
281													
282		**Secondary Crushing**											
283		42,000 tons/year *.05 lb/ton * 1 ton/2000 lb (secondary crushing) * (1-.9 capture)				**1**	lb/hr PM	**0.105**	tons TSP				
284		42,000 tons/year *.02 lb/ton * 1 ton/2000 lb (secondary crushing) * (1-.9 capture)				**0.4**	lb/hr PM10	**0.042**	tons PM10				
285		42,000 tons/year *.02 lb/ton * 1 ton/2000 lb (secondary crushing) * (1-.9 capture)				**0.4**	lb/hr PM2.5	**0.042**	tons PM2.5				
286													
287					Total Fugitives	**1.48**	lb/hr PM	**0.23**	tons TSP				
288						**0.9**	lb/hr PM10	**0.09**	tons PM10				
289						**0.9**	lb/hr PM2.5	**0.09**	tons PM2.5				
290	**HP-5b**	**Bedding Plant Area Wind Erosion**											
291		Parameters for Wind Erosion calculation											
292		Silt content	54.9										
293		Days w/ .01+ Inches of Rain	30										
294		% of Time Wind Speed >12 mph	6.41										
295		Emission Factor	37.90301191										
296		Calculations											
297		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 86.8% (speciation) * 75% efficiency (water spray) * 50% (wind break) * 80% (moist material) =				**0.044894538**	lb/hr PM	**0.20**	tons TSP	AP-42, Section 11.2.3 (May, 1983)			
298		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 11.9% (speciation) * 75% efficiency (water spray) * 50% (wind break) * 80% (moist material) =				**0.00534245**	lb/hr PM10	**0.03**	tons PM10				
299		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 1.3% (speciation) * 75% efficiency (water spray) * 50% (wind break) * 80% (moist material) =				**0.000583629**	lb/hr PM2.5	**0.003**	tons PM2.5				
300													
301	**HP-5b**	**Bedding Plant Area Unloading**								**Notes**			
302		Parameters for Unloading calculation								AP-42, Section 13.2.4			
303		Mean annual wind speed	5.32										
304		Material moisture content	10										
305		Emission Factor (PM)	0.000316327										
306		Emission Factor (PM10)	4.33674E-05										
307		Emission Factor (PM2.5)	4.73761E-06										
308		Throughput	869096.96							Used the PTE furnace feed rate from the 2003 HAPS PTE Documentation			
309		Efficiency (water spray & windbrea	0.88										
310		Calculations											
311		869,096 tons * .0003 * 1 lton/2,000 lbs * (1-.88)				**0.003922925**	lb/hr PM	**0.0172**	tons TSP				
312		869,096 tons * .000043 * 1 ton/2,000 lbs * (1-.88)				**0.00053782**	lb/hr PM10	**0.0024**	tons PM10				
313		869,096 tons * .0000047 * 1 ton/2,000 lbs * (1-.88)				**5.87535E-05**	lb/hr PM2.5	**0.0003**	tons PM2.5				
314													
315	**HP-5b**	**Bedding Plant Area Loading**											
316		Parameters for loading calculation								AP-42, Section 13.2.4			
317		Mean annual wind speed	5.32										
318		Material moisture content	10										
319		Emission Factor (PM)	3.16E-04							Hazen Sample			
320		Emission Factor (PM10)	4.33674E-05							Hazen Sample			
321		Emission Factor (PM2.5)	4.73761E-06							Hazen Sample			
322		Throughput	869096.96							Used the PTE furnace feed rate from the 2003 HAPS PTE Documentation			
323		# of Transfers	2.00										
324		Calculations											
325		869,096 tons * .0003 * 1 ton/2,000 lbs * 2 transfers				**0.062766792**	lb/hr PM	**0.2749**	tons TSP				
326		869,096 tons * .000043 * 1 ton/2,000 lbs * 2 transfers				**0.008605125**	lb/hr PM10	**0.0377**	tons PM10				
327		869,096 tons * .0000047 * 1 lb/2,000 tons * 2 transfers				**0.000940056**	lb/hr PM2.5	**0.0041**	tons PM2.5				

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	AC	AD	AE	AF	AG	AH
328																											
329	**HP-62b**	**Dryer Bin Feed System**																									
330		869096.96 tons * .0003 lb/ton * 1 ton/2,000 lb * 3 transfers					**0.094150188**	lb/hr PM	**0.4124**	tons TSP	**AP-42, section 11.24**																
331		869096.96 tons * .00004 lb/ton * 1 ton/2,000 lb * 3 transfers					**0.012907687**	lb/hr PM10	**0.0565**	tons PM10																	
332		869096.96 tons * .0000047 lb/ton * 1 ton/2,000 lb * 3 transfers					**0.001410083**	lb/hr PM2.5	**0.0062**	tons PM2.5	**AP-42, Section 13.2.4 because ch. 11.24 does not provide PM2.5 data**																
333																											
334	**HP-6b**	**Concentrate Storage Wind Erosion**																									
335		Parameters for Wind Erosion calculation																									
336		Silt content	54.9																								
337		Days w/ .01+ Inches of Rain	30																								
338		% of Time Wind Speed >12 mph	6.41																								
339		Emission Factor	37.90301191																								
340		Acres	1.32																								
341		Efficiency																									
342		Calculations																									
343		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 86.8% (speciation) =					**1.809489789**	lb/hr PM	**7.93**	tons TSP	AP-42, Section 11.2.3 (May, 1983)																
344		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 11.9% (speciation) =					**0.215329285**	lb/hr PM10	**1.09**	tons PM10																	
345		1.31 acres * 37.9 lb/day-acre * 365 day/year * 1 ton/2,000 lb * 1.3% (speciation) =					**0.023523367**	lb/hr PM2.5	**0.119**	tons PM2.5																	
346																											
347	**HP-6b**	**Concentrate Storage Unloading**									**Notes**																
348		Parameters for Unloading calculation									AP-42, Section 13.2.4																
349		Mean annual wind speed	5.32																								
350		Material moisture content	10																								
351		Emission Factor (PM)	0.000316327								Hazen Sample																
352		Emission Factor (PM10)	4.33674E-05								Hazen Sample																
353		Emission Factor (PM2.5)	4.73761E-06								Hazen Sample																
354		Throughput	693500.00																								
355		Efficiency																									
356		Calculations																									
357		693500 tons * 0.0003 lbs/ton * 1 ton/2000 lbs =					**0.025042528**	lb/hr PM	**0.1097**	tons TSP																	
358		693500 tons * 0.00004 lbs/ton * 1 ton/2000 lbs =					**0.00343325**	lb/hr PM10	**0.0150**	tons PM10																	
359		693500 tons * 0.000005 lbs/ton * 1 ton/2000 lbs =					**0.000375061**	lb/hr PM2.5	**0.0016**	tons PM2.5																	
360																											
361	**HP-6b**	**Concentrate Storage Loading**																									
362		Parameters for loading calculation									AP-42, Section 13.2.4																
363		Mean annual wind speed	5.32																								
364		Material moisture content	10																								
365		Emission Factor (PM)	0.000316327								Hazen Sample																
366		Emission Factor (PM10)	4.33674E-05								Hazen Sample																
367		Emission Factor (PM2.5)	4.73761E-06								Hazen Sample																
368		Throughput	693500.00																								
369		# of Transfers	2																								
370		Calculations																									
371		693500 tons * 0.0003 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**0.050085057**	lb/hr PM	**0.2194**	tons TSP																	
372		693500 tons * 0.00004 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**0.0068665**	lb/hr PM10	**0.0301**	tons PM10																	
373		693500 tons * 0.000005 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**0.000750122**	lb/hr PM2.5	**0.0033**	tons PM2.5																	
374																											
375																											
376	**HP-9B**	**Furnace Silica Storage Wind Erosion**									**Notes**																
377		Parameters for Wind Erosion calculation									AP-42, Section 11.2.3 (May, 1983)																
378		Silt content	11.13																								
379		Days w/ .01+ Inches of Rain	30																								
380		% of Time Wind Speed >12 mph	6																								
381		Emission Factor	7.801530686																								
382		Acres	0.17																								
383		Control Efficiency																									
384		Calculations																									
385		0.17 acres * 7.80 lb/day-acre * 365 day/year * 1 ton/2000 lb =					**0.055260842**	lb/hr PM	**0.24**	tons TSP																	
386																											
387	**HP-9B**	**Furnace Silica Storage Transfer of silica sand to outdoor storage**									**Notes**																
388		Parameters for Unloading calculation									AP-42, Section 13.2.4																
389		Mean annual wind speed	5.32																								
390		Material moisture content	0.92																								
391		Emission Factor (PM)	0.007612808																								
392		Emission Factor (PM10)	0.003600652																								
393		Emission Factor (PM2.5)	5.45242E-05																								
394		Throughput	89725.90								Used 2007 furnace flux number 81569 tpy (highest value in 10 years) and rolled it up by a factor of 10%																
395		Efficiency																									
396		Calculations																									
397		89726 tons * 0.0076 lbs/ton * 1 ton/2000 lbs =					**0.077975572**	lb/hr PM	**0.3415**	tons TSP																	
398		89726 tons * 0.00360 lbs/ton * 1 ton/2000 lbs =					**0.036880338**	lb/hr PM10	**0.1615**	tons PM10																	
399		89726 tons * 0.000055 lbs/ton * 1 ton/2000 lbs =					**0.000558474**	lb/hr PM2.5	**0.0024**	tons PM2.5																	
400																											
401	**HP-9B**	**Furnace Silica Storage Load out of silica sand in outdoor storage**																									
402		Parameters for loading calculation									AP-42, Section 13.2.4																
403		Mean annual wind speed	5.32																								
404		Material moisture content	10																								
405		Emission Factor (PM)	0.000316327																								
406		Emission Factor (PM10)	4.33674E-05																								
407		Emission Factor (PM2.5)	4.73761E-06																								
408		Throughput	89725.90								Used 2007 furnace flux number 81569 tpy (highest value in 10 years) and rolled it up by a factor of 10%																
409		# of Transfers	2																								
410		Calculations																									
411		89726 tons * 0.0003 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**0.006480067**	lb/hr PM	**0.0284**	tons TSP																	
412		89726 tons * 0.00004 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**0.000888396**	lb/hr PM10	**0.0039**	tons PM10																	
413		89726 tons * 0.000005 lbs/ton * 1 ton/2000 lbs * 2 transfers =					**9.70517E-05**	lb/hr PM2.5	**0.0004**	tons PM2.5																	
414																											
415	**HP-10b**	**Converter silica south storage wind erosion**									**Notes**																
416		Parameters for Wind Erosion calculation									AP-42, Section 11.2.3 (May, 1983)																
417		Silt content	0.45																								
418		Days w/ .01+ Inches of Rain	30																								
419		% of Time Wind Speed >12 mph	6																								
420		Emission Factor	0.310680426																								
421		Acres	1.25																								
422		Control Efficiency																									
423		Calculations																									
424		1.25 acres * 0.31 lb/day-acre * 365 day/year * 1 ton/2000 lb =					**0.016181272**	lb/hr PM	**0.07**	tons TSP																	
425																											
426	**HP-10b**	**Converter silica south storage transfer to outdoor storage**									**Notes**																
427		Parameters for Unloading calculation									AP-42, Section 13.2.4																
428		Mean annual wind speed	5.32																								
429		Material moisture content	0.14																								
430		Emission Factor (PM)	0.106235229																								
431		Emission Factor (PM10)	0.050246392																								
432		Emission Factor (PM2.5)	0.000760874																								

	A	B	C	G	H	I	J	K
433		Throughput	37762					Used 2011 tpy value 34329 tpy since it was the highest over a 10 year period and rolled it up by 10%
434		Efficiency						
435		Calculations						
436		37762 tons * 0.1062 lbs/ton * 1 ton/2000 lbs =		**0.457950239**	lb/hr PM	**2.0058**	tons TSP	
437		37762 tons * 0.05025 lbs/ton * 1 ton/2000 lbs =		**0.216598086**	lb/hr PM10	**0.9487**	tons PM10	
438		37762 tons * 0.000761 lbs/ton * 1 ton/2000 lbs =		**0.003279914**	lb/hr PM2.5	**0.0144**	tons PM2.5	
439								
440	**HP-10b**	**Converter silica south storage load out of converter silica in outdoor storage**						
441		Parameters for loading calculation						AP-42, Section 13.2.4
442		Mean annual wind speed	5.32					
443		Material moisture content	0.14					
444		Emission Factor (PM)	0.106235229					
445		Emission Factor (PM10)	0.050246392					
446		Emission Factor (PM2.5)	0.000760874					
447		Throughput	37762					Used 2011 tpy value 34329 tpy since it was the highest over a 10 year period and rolled it up by 10%
448		# of Transfers	2					
449		Calculations						
450		37762 tons * 0.1062 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.915900478**	lb/hr PM	**4.0116**	tons TSP	
451		37762 tons * 0.05025 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.433196172**	lb/hr PM10	**1.8974**	tons PM10	
452		37762 tons * 0.000761 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.006559828**	lb/hr PM2.5	**0.0287**	tons PM2.5	
453								
454	**HP-11b**	**Converter silica north storage wind erosion**						**Notes**
455		Parameters for Wind Erosion calculation						AP-42, Section 11.2.3 (May, 1983)
456		Silt content	0.45					
457		Days w/ .01+ Inches of Rain	30					
458		% of Time Wind Speed >12 mph	6					
459		Emission Factor	0.310680426					
460		Acres	0.25					
461		Control Efficiency						
462		Calculations						
463		0.25 acres * 0.31 lb/day-acre * 365 day/year * 1 ton/2000 lb =		**0.003236254**	lb/hr PM	**0.0142**	tons TSP	
464								
465	**HP-11b**	**Converter silica north storage from truck to storage pile**						**Notes**
466		Parameters for Unloading calculation						AP-42, Section 13.2.4
467		Mean annual wind speed	5.32					
468		Material moisture content	0.14					
469		Emission Factor (PM)	0.106235229					
470		Emission Factor (PM10)	0.050246392					
471		Emission Factor (PM2.5)	0.000760874					
472		Throughput	5543					Used 2007's value of 5039 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
473		Efficiency						
474		Calculations						
475		5543 tons * 0.1062 lbs/ton * 1 ton/2000 lbs =		**0.067220462**	lb/hr PM	**0.2944**	tons TSP	
476		5543 tons * 0.05025 lbs/ton * 1 ton/2000 lbs =		**0.031793462**	lb/hr PM10	**0.1393**	tons PM10	
477		5543 tons * 0.000761 lbs/ton * 1 ton/2000 lbs =		**0.000481444**	lb/hr PM2.5	**0.0021**	tons PM2.5	
478								
479	**HP-11b**	**Converter silica north storage load out of converter silica in outdoor storage**						
480		Parameters for loading calculation						AP-42, Section 13.2.4
481		Mean annual wind speed	5.32					
482		Material moisture content	0.14					
483		Emission Factor (PM)	0.106235229					
484		Emission Factor (PM10)	0.050246392					
485		Emission Factor (PM2.5)	0.000760874					
486		Throughput	5543					Used 2007's value of 5039 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
487		# of Transfers	2					
488		Calculations						
489		5543 tons * 0.1062 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.134440925**	lb/hr PM	**0.5889**	tons TSP	
490		5543 tons * 0.05025 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.063586924**	lb/hr PM10	**0.2785**	tons PM10	
491		5543 tons * 0.000761 lbs/ton * 1 ton/2000 lbs * 2 transfers =		**0.000962888**	lb/hr PM2.5	**0.0042**	tons PM2.5	
492								
493	**HP-53b**	**CRP Flux System, Silica**						
494		37761.9 tons silica * .00007 lb/ton * 1 ton/2000 lb * 8 transfers =		**0.0024**	lb/hr PM	**0.0106**	tons TSP	AP-42, section 11.19.2
495		37761.9 tons silica * .000023 lb/ton * 1 ton/2000 lb * 8 transfers =		**0.0008**	lb/hr PM10	**0.0035**	tons PM10	
496		37761.9 tons silica * .0000065 lb/ton * 1 ton/2000 lb * 8 transfers =		**0.0002**	lb/hr PM2.5	**0.0010**	tons PM2.5	
497								
498								
499	**HP-21b**	**Reverts pile south wind erosion**						**Notes**
500		Parameters for Wind Erosion calculation						AP-42, Section 11.2.3 (May, 1983)
501		Silt content	14.4					
502		Days w/ .01+ Inches of Rain	30					
503		% of Time Wind Speed >12 mph	6					
504		Emission Factor	9.941773617					
505		Acres	1.02					
506		Control Efficiency	0.75					
507		Calculations						
508		1.02 acres * 9.94 lb/day-acre * 365 day/year * 1 ton/2000 lb * (1-0.75) =		**0.422525379**	lb/hr PM	**0.46**	tons TSP	
509								
510	**HP-21b**	**Reverts pile south transfer of reverts to outdoor storage**						**Notes**
511		Parameters for Unloading calculation						AP-42, Section 13.2.4
512		Mean annual wind speed	5.32					
513		Material moisture content	0.49					
514		Emission Factor (PM)	0.018389643					
515		Emission Factor (PM10)	0.008697804					
516		Emission Factor (PM2.5)	0.00013171					
517		Throughput	44492					Used 2014's value of 40447 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
518		Efficiency	0.75					
519		Calculations						
520		44492 tons * 0.0184 lbs/ton * 1 ton/2000 lbs * (1-0.75) =		**0.023350071**	lb/hr PM	**0.1023**	tons TSP	
521		44492 tons * 0.00870 lbs/ton * 1 ton/2000 lbs * (1-0.75) =		**0.011043952**	lb/hr PM10	**0.0484**	tons PM10	
522		44492 tons * 0.000132 lbs/ton * 1 ton/2000 lbs * (1-0.75) =		**0.000167237**	lb/hr PM2.5	**0.0007**	tons PM2.5	
523								
524	**HP-21b**	**Reverts pile south load out of reverts in outdoor storage**						
525		Parameters for loading calculation						AP-42, Section 13.2.4
526		Mean annual wind speed	5.32					
527		Material moisture content	0.49					

	A	B	C	D	G	H	I	J	K
528		Emission Factor (PM)	0.018389643						
529		Emission Factor (PM10)	0.008697804						
530		Emission Factor (PM2.5)	0.00013171						
531		Throughput	44492						Used 2014's value of 40447 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
532		# of Transfers	2						
533		Calculations							
534		44492 tons * 0.0184 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.186800565**	lb/hr PM	**0.8182**	tons TSP	
535		44492 tons * 0.0087 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.088351619**	lb/hr PM10	**0.3870**	tons PM10	
536		44492 tons * 0.0001 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.001337896**	lb/hr PM2.5	**0.0059**	tons PM2.5	
537									
538	**HP-22b**	**Reverts pile north wind erosion**							**Notes**
539		Parameters for Wind Erosion calculation							AP-42, Section 11.2.3 (May, 1983)
540		Silt content	1						
541		Days w/ .01+ Inches of Rain	30						
542		% of Time Wind Speed >12 mph	6						
543		Emission Factor	0.690400946						
544		Acres	0.2						
545		Control Efficiency	0.875						
546		Calculations							
547		0.2 acres * 0.69 lb/day-acre * 365 day/year * 1 ton/2000 lb * (1-0.88) =			**0.005753341**	lb/hr PM	**0.0031**	tons TSP	
548									
549	**HP-22b**	**Reverts pile north unloading**							**Notes**
550		Parameters for Unloading calculation							AP-42, Section 13.2.4
551		Mean annual wind speed	5.32						
552		Material moisture content	0.49						
553		Emission Factor (PM)	0.018389643						
554		Emission Factor (PM10)	0.008697804						
555		Emission Factor (PM2.5)	0.00013171						
556		Throughput	44492						Used 2014's value of 40447 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
557		Efficiency	0.875						
558		Calculations							
559		44492 tons * 0.0184 lbs/ton * 1 ton/2000 lbs * (1-0.88) =			**0.011675035**	lb/hr PM	**0.0511**	tons TSP	
560		44492 tons * 0.00870 lbs/ton * 1 ton/2000 lbs * (1-0.88) =			**0.005521976**	lb/hr PM10	**0.0242**	tons PM10	
561		44492 tons * 0.000132 lbs/ton * 1 ton/2000 lbs * (1-0.88) =			**8.36185E-05**	lb/hr PM2.5	**0.0004**	tons PM2.5	
562									
563	**HP-22b**	**Reverts pile north loading**							
564		Parameters for calculation							AP-42, Section 13.2.4
565		Mean annual wind speed	5.32						
566		Material moisture content	0.49						
567		Emission Factor (PM)	0.018389643						
568		Emission Factor (PM10)	0.008697804						
569		Emission Factor (PM2.5)	0.00013171						
570		Throughput	44492						Used 2014's value of 40447 tpy since it was the highest over a 10 year period and rolled it up by a factor of 10%
571		# of Transfers	2						
572		Calculations							
573		44492 tons * 0.0184 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.186800565**	lb/hr PM	**0.8182**	tons TSP	
574		44492 tons * 0.0087 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.088351619**	lb/hr PM10	**0.3870**	tons PM10	
575		44492 tons * 0.0001 lbs/ton * 1 ton/2000 lbs * 2 transfers =			**0.001337896**	lb/hr PM2.5	**0.0059**	tons PM2.5	
576									
577	**HP-54b**	**CRP Flux System, Reverts**							
578		44,492 tons reverts * .0005 lb/ton * 1 ton/2000 lb * 8 transfers =			**0.7472**	lb/hr PM	**3.2728**	tons TSP	**AP-42, section 11.24**
579		44,492 tons reverts * .0002 lb/ton * 1 ton/2000 lb * 8 transfers =			**0.3534**	lb/hr PM10	**1.5479**	tons PM10	
580		44,492 tons reverts * .00013 lb/ton * 1 ton/2000 lb * 8 transfers =			**0.0054**	lb/hr PM2.5	**0.0234**	tons PM2.5	**AP-42, Section 13.2.4 because ch. 11.24 does not provide PM2.5 data**
581									
582	**Paved Roads**								
583	**HP-7b**	Concentrate & blister copper delivery							
584		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
585		Silt content	19						
586		Days w/ .01+ Inches of Rain	30						
587		Trips per year	21148						
588		Distance of each trip	1.6						
589		Round trips per hour	2.5						
590		Emission Factor (PM)	4.460883825						
591		Emission Factor (PM10)	0.892176765						
592		Emission Factor (PM2.5)	0.202767447						
593		VMT	33836.8						Used 2007's value of 19225 trips per year (highest over 10 year period)
594		Control Efficiency (watering & swe	0.91						and increased it by a factor of 10% to get PTE
595		Calculations							
596		33836.8 VMT * 4.46 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			1.605918177	**lb/hr**	**6.7924**	tons TSP	
597		33836.8 VMT * 0.89 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.321183635	**lb/hr**	**1.3585**	tons PM10	
598		33836.8 VMT * 0.20 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.072996281	**lb/hr**	**0.3087**	tons PM2.5	
599									
600	**HP-12b**	**General plant traffic**							
601		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
602		Silt content	9.5	%					
603		Days w/ .01+ Inches of Rain	30	days					
604		Trips per year							
605		Distance of each trip	1.0	mile					
606		Round trips per hour	17.5						
607		Mean vehicle weight	2.8	tons					
608		Emission Factor (PM)	0.238894164	lb/VMT					
609		Emission Factor (PM10)	0.047778833	lb/VMT					
610		Emission Factor (PM2.5)	0.011727532	lb/VMT					
611		VMT	153300	miles					
612		Control Efficiency (watering & swe	0.91	%					
613		Calculations							
614		153300 VMT * 0.24 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.376258308	**lb/hr**	**1.6480**	tons TSP	
615		153300 VMT * 0.05 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.075251662	**lb/hr**	**0.3296**	tons PM10	
616		153300 VMT * 0.01 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.018470862	**lb/hr**	**0.0809**	tons PM2.5	
617									
618	**HP-13b**	**Water truck**							
619		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
620		Silt content	9.5	%					
621		Days w/ .01+ Inches of Rain	30	days					
622		Trips per year							
623		Distance of each trip	1.5	mile					
624		Round trips per hour	3.0						
625		Mean vehicle weight	17.0	tons					
626		Emission Factor (PM)	1.503703628	lb/VMT					

	A	B	C	D	G	H	I	J	K
627		Emission Factor (PM10)	0.300740726	lb/VMT					
628		Emission Factor (PM2.5)	0.073818178	lb/VMT					
629		VMT	39420	miles					
630		Control Efficiency (watering & swe	0.91	%					
631		Calculations							
632		39420 VMT * 1.50 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.608999969	**lb/hr**	**2.6674**	tons TSP	
633		39420 VMT * 0.30 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.121799994	**lb/hr**	**0.5335**	tons PM10	
634		39420 VMT * 0.07 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.029896362	**lb/hr**	**0.1309**	tons PM2.5	
635									
636	**HP-14b**	**Street sweeper**							
637		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
638		Silt content	9.5	%					
639		Days w/ .01+ Inches of Rain	30	days					
640		Trips per year							
641		Distance of each trip	1.3	mile					
642		Round trips per hour	1.0						
643		Mean vehicle weight	18.0	tons					
644		Emission Factor (PM)	1.593977926	lb/VMT					
645		Emission Factor (PM10)	0.318795585	lb/VMT					
646		Emission Factor (PM2.5)	0.078249825	lb/VMT					
647		VMT	11650.8	miles					
648		Control Efficiency (watering & swe	0.91	%					
649		Calculations							
650		11650.8 VMT * 1.59 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.190799158	**lb/hr**	**0.8357**	tons TSP	
651		11650.8 VMT * 0.32 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.038159832	**lb/hr**	**0.1671**	tons PM10	
652		11650.8 VMT * 0.08 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.009366504	**lb/hr**	**0.0410**	tons PM2.5	
653									
654	**HP-15b**	**Plant service haul truck**							
655		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
656		Silt content	9.5	%					
657		Days w/ .01+ Inches of Rain	30	days					
658		Trips per year	24180						Trips per year based on loads
659		Distance of each trip	0.5	mile					per day (93 loads), 5 days per week, 52 weeks/year
660		Round trips per hour	2.0						
661		Mean vehicle weight	33.0	tons					
662		Emission Factor (PM)	2.957934592	lb/VMT					
663		Emission Factor (PM10)	0.591586918	lb/VMT					
664		Emission Factor (PM2.5)	0.145207698	lb/VMT					
665		VMT	12090	miles					
666		Control Efficiency (watering & swe	0.91	%					
667		Calculations							
668		12090 VMT * 2.96 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.266214113	**lb/hr**	**1.6093**	tons TSP	
669		12090 VMT * 0.59 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.053242823	**lb/hr**	**0.3219**	tons PM10	
670		12090 VMT * 0.15 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.013068693	**lb/hr**	**0.0790**	tons PM2.5	
671									
672	**HP-16b**	**Scrap handling forklifts**							
673		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
674		Silt content	9.5	%					
675		Days w/ .01+ Inches of Rain	30	days					
676		Trips per year							
677		Distance of each trip	0.8	mile					
678		Round trips per hour	6.0						
679		Mean vehicle weight	21.9	tons					
680		Emission Factor (PM)	1.949681864	lb/VMT					
681		Emission Factor (PM10)	0.389936373	lb/VMT					
682		Emission Factor (PM2.5)	0.095711655	lb/VMT					
683		VMT	39420	miles					
684		Control Efficiency (watering & swe	0.91	%					
685		Calculations							
686		39420 VMT * 1.95 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.789621155	**lb/hr**	**3.4585**	tons TSP	
687		39420 VMT * 0.39 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.157924231	**lb/hr**	**0.6917**	tons PM10	
688		39420 VMT * 0.10 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.03876322	**lb/hr**	**0.1698**	tons PM2.5	
689									
690	**HP-17b**	**Misc. use forklifts**							
691		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
692		Silt content	9.5	%					
693		Days w/ .01+ Inches of Rain	30	days					
694		Trips per year							
695		Distance of each trip	0.5	mile					
696		Round trips per hour	4.0						
697		Mean vehicle weight	6.9	tons					
698		Emission Factor (PM)	0.600304994	lb/VMT					
699		Emission Factor (PM10)	0.120060999	lb/VMT					
700		Emission Factor (PM2.5)	0.029469518	lb/VMT					
701		VMT	17520	miles					
702		Control Efficiency (watering & swe	0.91	%					
703		Calculations							
704		17520 VMT * 0.60 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.108054899	**lb/hr**	**0.4733**	tons TSP	
705		17520 VMT * 0.12 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.02161098	**lb/hr**	**0.0947**	tons PM10	
706		17520 VMT * 0.03 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.005304513	**lb/hr**	**0.0232**	tons PM2.5	
707									
708	**HP-18b**	**Misc Delivery Trucks**							
709		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
710		Silt content	9.5	%					
711		Days w/ .01+ Inches of Rain	30	days					
712		Trips per year	575						Used 2013's value of 523 since it was
713		Distance of each trip	1.7	mile					the highest in a 10 year period and increased it by a 10%
714		Round trips per hour	1.0						
715		Mean vehicle weight	26.4	tons					
716		Emission Factor (PM)	2.359451353	lb/VMT					
717		Emission Factor (PM10)	0.471890271	lb/VMT					
718		Emission Factor (PM2.5)	0.115827612	lb/VMT					
719		VMT	977.5	miles					
720		Control Efficiency (watering & swe	0.91	%					
721		Calculations							
722		977.5 VMT * 2.36 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.360996057	**lb/hr**	**0.1038**	tons TSP	
723		977.5 VMT * 0.47 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.072199211	**lb/hr**	**0.0208**	tons PM10	
724		977.5 VMT * 0.12 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.017721625	**lb/hr**	**0.0051**	tons PM2.5	
725									
726	**HP-18b**	**Sulfuric acid trucks**							
727		Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
728		Silt content	9.5	%					
729		Days w/ .01+ Inches of Rain	30	days					
730		Trips per year	12266						Used 2012's value of 11151 trips per year since
731		Distance of each trip	0.7	mile					it was the highest in a 10 year period and increased it by 10%
732		Round trips per hour	1.0						
733		Mean vehicle weight	26.4	tons					
734		Emission Factor (PM)	2.359451353	lb/VMT					
735		Emission Factor (PM10)	0.471890271	lb/VMT					

A	B	C	D	G	H	I	J	K
	Emission Factor (PM2.5)	0.115827612	lb/VMT					
	VMT	8586.2	miles					
	Control Efficiency (watering & swe	0.91	%					
	Calculations							
	8586.2 VMT * 2.36 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.148645435	**lb/hr**	**0.9116**	tons TSP	
	8586.2 VMT * 0.47 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.029729087	**lb/hr**	**0.1823**	tons PM10	
	8586.2 VMT * 0.12 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.00729714	**lb/hr**	**0.0448**	tons PM2.5	
HP-19b	**Storage pile front-end loaders**							
	Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
	Silt content	9.5	%					
	Days w/ .01+ Inches of Rain	30	days					
	Trips per year							
	Distance of each trip	0.3	mile					
	Round trips per hour	12.0						
	Mean vehicle weight	30.0	tons					
	Emission Factor (PM)	2.683910488	lb/VMT					
	Emission Factor (PM10)	0.536782098	lb/VMT					
	Emission Factor (PM2.5)	0.131755606	lb/VMT					
	VMT	26280	miles					
	Control Efficiency (watering & swe	0.91	%					
	Calculations							
	26280 VMT * 2.68 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.724655832	**lb/hr**	**3.1740**	tons TSP	
	26280 VMT * 0.54 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.144931166	**lb/hr**	**0.6348**	tons PM10	
	26280 VMT * 0.13 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.035574014	**lb/hr**	**0.1558**	tons PM2.5	
HP-20b	**Misc. use front-end loaders**							
	Parameters for calculation							AP-42, Section 13.2.1.3 Equation 3
	Silt content	9.5	%					
	Days w/ .01+ Inches of Rain	30	days					
	Trips per year							
	Distance of each trip	0.3	mile					
	Round trips per hour	10.0						
	Mean vehicle weight	30.0	tons					
	Emission Factor (PM)	2.683910488	lb/VMT					
	Emission Factor (PM10)	0	lb/VMT					
	Emission Factor (PM2.5)	0.131755606	lb/VMT					
	VMT	21900	miles					
	Control Efficiency (watering & swe	0.91	%					
	Calculations							
	21900 VMT * 2.68 lb/VMT* 1 ton/2000 lbs * (1-0.91) =			0.60387986	**lb/hr**	**2.6450**	tons TSP	
	21900 VMT * 0.00 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0	**lb/hr**	**0.0000**	tons PM10	
	21900 VMT * 0.13 lb/VMT * 1 ton/2000 lbs * (1-0.91) =			0.029645011	**lb/hr**	**0.1298**	tons PM2.5	
Unpaved Roads								
HP-29b	**Flux truck traffic**							
	Parameters for calculation							**Notes**
	Silt content	9.5	%					
	Days w/ .01+ Inches of Rain	30	days					
	Trips per year	13483						Used 2008's value (12257 trips per year) since it was
	Distance of each trip	2.5	mile					the highest over a 10 year period and increased it by 10%
	Round trips per hour	4.0						
	Mean vehicle weight	29.0	tons					
	Emission Factor (PM)	10.59991075	lb/VMT					AP-42, Section 13.2.2-4 Equation 1a
	Emission Factor (PM10)	3.096747954	lb/VMT					
	Emission Factor (PM2.5)	0.309674795	lb/VMT					
	VMT	33707.5	miles					
	Control Efficiency (suppressant and	0.961	%					
	Calculations							
	33707.5 VMT * 10.60 lb/VMT* 1 ton/2000 lbs * (1-0.96) =			105.9991075	**lb/hr**	**6.9673**	tons TSP	
	33707.5 VMT * 3.10 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			30.96747954	**lb/hr**	**2.0355**	tons PM10	
	33707.5 VMT * 0.31 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			3.096747954	**lb/hr**	**0.2035**	tons PM2.5	
HP-30b	**Slag haulage truck traffic**							
	Parameters for calculation							**Notes**
	Silt content	9.5	%					
	Days w/ .01+ Inches of Rain	30	days					
	Trips per year	9324						Used 2007's value of 8476 trips per year since it was
	Distance of each trip	3.2	mile					the highest value over a 10 year period and increased by 10%
	Round trips per hour	2.0						
	Mean vehicle weight	95.0	tons					
	Emission Factor (PM)	18.08001273	lb/VMT					AP-42, Section 13.2.2-4 Equation 1a
	Emission Factor (PM10)	5.282048477	lb/VMT					
	Emission Factor (PM2.5)	0.528204848	lb/VMT					
	VMT	29836.8	miles					
	Control Efficiency (suppressant and	0.961	%					
	Calculations							
	29836.8 VMT * 18.08 lb/VMT* 1 ton/2000 lbs * (1-0.96) =			115.7120814	**lb/hr**	**10.5193**	tons TSP	
	29836.8 VMT * 5.28 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			33.80511025	**lb/hr**	**3.0732**	tons PM10	
	29836.8 VMT * 0.53 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			3.380511025	**lb/hr**	**0.3073**	tons PM2.5	
HP-31b	**Slag hauler traffic**							
	Parameters for calculation							**Notes**
	Silt content	3.3	%					
	Days w/ .01+ Inches of Rain	30	days					
	Trips per year	12433						Used 2012's value of 11303 trips per year since it was
	Distance of each trip	1.4	mile					the highest value over a 10 year period and increased it by 10%
	Round trips per hour	2.0	estimate					
	Mean vehicle weight	85.0	tons					
	Emission Factor (PM)	8.203796147	lb/VMT					AP-42, Section 13.2.2-4 Equation 1a
	Emission Factor (PM10)	1.939887649	lb/VMT					
	Emission Factor (PM2.5)	0.193988765	lb/VMT					
	VMT	17406.2	miles					
	Control Efficiency (suppressant and	0.961	%					
	Calculations							
	17406.2 VMT * 8.20 lb/VMT* 1 ton/2000 lbs * (1-0.96) =			22.97062921	**lb/hr**	**2.7845**	tons TSP	
	17406.2 VMT * 1.94 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			5.431685418	**lb/hr**	**0.6584**	tons PM10	
	17406.2 VMT * 0.19 lb/VMT * 1 ton/2000 lbs * (1-0.96) =			0.543168542	**lb/hr**	**0.0658**	tons PM2.5	
Cooling Towers								
Accoding to a USGS study, TDS concentration is typically between 55% and 75% of conductivity. See John Hem, USGS, Study and Interpretation of the Chemical Characteristics of Natural Water, Paper 2254 (1985).								
Because all of Asarco's cooling towers are non-contact, Asarco asusmes the natural water value is representative of the circulating water value.								
Asarco conservatively assumes that TDS is 75% of conductivity. Where conductivity data is not available, Asarco used the average of TDS concentrations for known values.								
HP-55b (new)	**Acid Plant Cooling Tower (replacing existing Lily Hofman in CRP)**							**Notes**
	21,000 GPM * 8.34 lb/gal * .002% drift * 3000 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =			0.630504	**lb/hr**	2.76160752	**TPY PM**	

	A	B	C	D	E	F	G	H	I	J	K
844		PM10 = PM * 50.0 %					0.315227894	**lb/hr**	1.380698176	**TPY PM10**	
845		PM2.5 = PM * 0.2 %					0.001283917	**lb/hr**	0.005623558	**TPY PM2.5**	
846											
847	**HP-56b**	**Acid Plant Cooling Tower (Marley)**									
848		12,000 GPM * 8.34 lb/gal * .2% drift * 3150 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					37.83024	**lb/hr**	165.6964512	**TPY PM**	
849		PM10 = PM * 48.0 %					18.15658969	**lb/hr**	79.52586284	**TPY PM10**	
850		PM2.5 = PM * 0.2 %					0.076622286	**lb/hr**	0.335605614	**TPY PM2.5**	
851											
852	**HP-57b**	**Flash Cooling Tower**									
853		5,300 GPM * 8.34 lb/gal * .02% drift * 2,437.5 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					1.292443425	**lb/hr**	5.660902202	**TPY PM**	Drift from AP 42
854		PM10 = PM * 56.7 %					0.732608163	**lb/hr**	3.208823753	**TPY PM10**	
855		PM2.5 = PM * 0.2 %					0.002694491	**lb/hr**	0.011801872	**TPY PM2.5**	
856											
857	**HP-58b**	**Anode Cooling Tower**									
858		2,273 GPM * 8.34 lb/gal * .02% drift * 3750 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					0.852750045	**lb/hr**	3.735045197	**TPY PM**	Drift from AP 42
859		PM10 = PM * 40.9 %					0.348480591	**lb/hr**	1.526344989	**TPY PM10**	
860		PM2.5 = PM * 0.2 %					0.001695142	**lb/hr**	0.007424723	**TPY PM2.5**	
861											
862	**HP-59b**	**Oxygen Plant Cooling Tower**									
863		4,400 GPM * 8.34 lb/gal * .02% drift *3750 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					1.65132	**lb/hr**	7.2327816	**TPY PM**	
864		PM10 = PM * 40.9 %					0.674820216	**lb/hr**	2.955712547	**TPY PM10**	
865		PM2.5 = PM * 0.2 %					0.003282582	**lb/hr**	0.014377711	**TPY PM2.5**	
866											
867	**HP-60b**	**Powerhouse cooling tower**									
868		5,300 GPM * 8.34 lb/gal * .02% drift * 2,437.5 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					1.292443425	**lb/hr**	5.660902202	**TPY PM**	Drift from AP 42
869		PM10 = PM * 56.7 %					0.732608163	**lb/hr**	3.208823753	**TPY PM10**	
870		PM2.5 = PM * 0.2 %					0.002694491	**lb/hr**	0.011801872	**TPY PM2.5**	
871											
872	**HP-61b**	**Converter cooling tower**									
873		3,000 GPM * 8.34 lb/gal * .001% drift * 3000 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					0.045036	**lb/hr**	0.19725768	**TPY PM**	
874		PM10 = PM * 50.0 %					0.022516278	**lb/hr**	0.098621298	**TPY PM10**	
875		PM2.5 = PM * 0.2 %					9.17084E-05	**lb/hr**	0.000401683	**TPY PM2.5**	
876											
877	**HP-69b**	**Portable oxygen plant cooling tower**									
878		950 GPM * 8.34 lb/gal * .02% drift * 3000 lb solids/1,000,000 lb water * 60 min/hr * 8,760 hr/year * 1 ton/2,000 lb =					0.285228	**lb/hr**	1.24929864	**TPY PM**	Drift from AP 42
879		PM10 = PM * 40.9 %					0.116559856	**lb/hr**	0.510532167	**TPY PM10**	
880		PM2.5 = PM * 0.2 %					0.000566992	**lb/hr**	0.002483423	**TPY PM2.5**	
881											
882	**PM, PM10, PM2.5 EMISSIONS SUMMARY**			**PM (TPY)**	**PM10 (TPY)**	**PM2.5 (TPY)**					
883	HP-1b	Main Stack Center (FF process, Converter primary hood, Converter Secondary Hood blowing, Anode BH)		87.42	918.22	850.70					
884	HP-2b	Main Stack Annulus (VGBH + Secondary Hood Baghouse + tertiary evacuation)		84.37	582.11	485.26					
885	Hp-25b	Flash Furnace fugitives (MT/SS + CD fug)		7.76	29.62	26.53					
886	HP-41b	Converter Aisle fugitives		1.15	9.57	5.98					
887	HP-24b	Anode furnace fugitives		0.00	19.46	17.34					
888	HP-52b	Anode Casting Combustion		0.48	0.48	0.48					
889	HP-40b	Slag pouring fugitives		5.72	4.85	3.81					
890	HP-26b	#2 Acid plant preheater		1.75	1.75	1.75					
891	HP-27b	Truck wash heater		0.01	0.01	0.01					
892	HP-28b	Oxygen plant boiler		0.29	0.29	0.29					
893	HP-50b	Anode boiler		0.12	0.12	0.12					
894	HP-3b	Power Screen #3 Diesel Engine		0.26	0.26	0.3					
895	HP-4b	Brick Crusher Baghouse & Fugitives		1.50	1.35	1.35					
896	HP-5b	Bedding Plant Area		0.49	0.07	0.01					
897	HP-6b	Concentrate Storage		8.25	1.13	0.12					
898	HP-9b	Furnace Silica Storage		0.61	0.17	0.00					
899	HP-10b	Converter Silica South Storage		6.09	2.85	0.04					
900	HP-11b	Converter Silica North Storage		0.90	0.42	0.01					
901	HP-21b	Reverts pile south		1.38	0.44	0.01					
902	HP-22b	Reverts pile north		0.87	0.41	0.01					
903	HP-7b	Concentrate & blister copper delivery		6.79	1.36	0.31					
904	HP-12b	General plant traffic		1.65	0.33	0.08					
905	HP-13b	Water truck		2.67	0.53	0.13					
906	HP-14b	Street sweeper		0.84	0.17	0.04					
907	HP-15b	Plant service haul truck		1.61	0.32	0.08					
908	HP-16b	Scrap handling forklifts		3.46	0.69	0.17					
909	HP-17b	Misc. use forklifts		0.47	0.09	0.02					
910	HP-18b	Misc Delivery Trucks		0.10	0.02	0.01					
911	HP-18b	Sulfuric acid trucks		0.91	0.18	0.04					
912	HP-19b	Storage pile front-end loaders		3.17	0.63	0.16					
913	HP-20b	Misc. use front-end loaders		2.64	0.00	0.13					
914	HP-29b	Flux truck traffic		6.97	2.04	0.20					
915	HP-30b	Slag haulage truck traffic		10.52	3.07	0.31					
916	HP-31b	Slag hauler traffic		2.78	0.66	0.07					
917	HP-53b	CRP Flux System, Silica		0.01	0.00	0.00					
918	HP-54b	CRP Flux System, Reverts		3.27	1.55	0.02					
919	HP-55b (new)	Acid Plant Cooling Tower		2.76	1.38	0.01					
920	HP-56b	Acid Plant Cooling Tower (Marley)		165.70	79.53	0.34					
921	HP-57b	Flash Cooling Tower		5.66	3.21	0.01					
922	HP-58b	Anode Cooling Tower		3.74	1.53	0.01					
923	HP-59b	Oxygen Plant Cooling Tower		7.23	2.96	0.01					
924	HP-60b	Powerhouse cooling tower		5.66	3.21	0.01					
925	HP-61b	Converter cooling tower		0.20	0.10	0.00					
926	HP-62b	Dryer Bin Feed System		0.41	0.06	0.01					
927	HP-63b	Small Boilers and Heaters		0.32	0.32	0.32					
928	HP-64b	Emergency Diesel Generator @ Powerhouse		0.42	0.42	0.42					
929	HP-65b	Emergency Diesel Generator @ Powerhouse		0.418	0.42	0.42					
930	HP-66b	Emergency Diesel Generator @ Cooling Tower		0.418	0.42	0.42					
931	HP-67b	Emergency Natural Gas Generator		0.011	0.01	0.01					
932	HP-68b	Emergency Natural Gas Generator		0.011	0.01	0.01					
933	HP-69b	Portable oxygen plant cooling tower		1.249	0.51	0.00					
934			**Total**	451.51	1679.30	1397.86					

ASARCO LLC - Hayden Smelter

Lead EMISSIONS

Year	SHBH	Conv Fug	Acid Plant	FF Fug	R&R Cottrell	Anode Furnace	Anode BH	Conv	Flash	F+C	Slag pour	Main Stack	Brick crusher ba
2004	0.000	0.534	0.000	0.285	0.049	0.566		0.534	0.334	0.868	0.033	0.049	
2005	0.030	0.234	0.005	0.227	0.342	0.379		0.265	0.573	0.838	0.028	0.377	
2006	0.035	0.584	0.006	0.336	0.395	0.887		0.620	0.735	1.355	0.037	0.435	4.42689E-05
2007	0.036	1.120	0.006	0.571	0.410	1.602		1.157	0.986	2.144	0.044	0.453	0.000089775
2008	0.140	1.538	0.051	0.781	0.040	2.220		1.688	0.862	2.550	0.046	0.231	2.26125E-05
2009	0.136	1.083	0.006	0.437	0.450	1.362		1.221	0.893	2.113	0.042	0.593	0.0001215
2010	0.291	1.106	0.024	0.487	0.518	1.373		1.402	1.024	2.426	0.045	0.833	0.000112894
2011	0.171	0.934	0.053	0.422	1.033	1.218		1.115	1.497	2.612	0.045	1.256	1.82925E-05
2012	0.229	0.969	0.011	0.495	0.841	0.416	0.011	1.200	1.345	2.545	0.048	1.081	0.000249176
2013	0.322	0.558	0.011	0.322	0.322	0.025	0.014	0.882	0.653	1.535	0.040	0.655	8.4375E-06
2014	0.046	0.639	0.021	0.407	0.545	0.032	0.049	0.689	0.968	1.656	0.046	0.611	0
2015	0.051	0.744	0.018	0.474	1.565	0.022	0.004	0.798	2.054	2.852	0.050	1.634	0

Potential To Emit Calculations

Process Emissions & Fuel Combustion

Lead for process sources is calculated by dividing actual historical lead emissions by actual historical PM emissions to derive a lead fraction.
A conservative fraction is then selected, with minor adjustments based on engineering judgment.
Finally, the lead fraction is multiplied by the potential particulate matter emissions.

Lead Fraction, Actual, 2004-2015 (tons lead/tons PM)

Year	SHBH	Conv Fug	Acid Plant	FF Fug	Anode Furnace	Anode BH	R&R/VGBH	Brick Crusher Baghouse
2004	0.000	0.031	0.000	0.011	0.012		0.004	
2005	0.003	0.025	0.000	0.010	0.010		0.008	
2006	0.009	0.040	0.001	0.013	0.015		0.003	0.03750
2007	0.002	0.060	0.000	0.021	0.023		0.005	0.03750
2008	0.006	0.076	0.001	0.029	0.029		0.003	0.03750
2009	0.008	0.052	0.000	0.018	0.020		0.029	0.03750
2010	0.008	0.047	0.000	0.018	0.018		0.006	0.03750
2011	0.009	0.045	0.002	0.016	0.017		0.031	0.03750
2012	0.012	0.054	0.001	0.018	0.021	0.022	0.046	0.03750
2013	0.009	0.035	0.000	0.013	0.005	0.002	0.018	0.03750
2014	0.001	0.039	0.002	0.015	0.009	0.007	0.011	0.00000
2015	0.001	0.056	0.001	0.019	0.002	0.000	0.077	0.00000
Mean	0.0056	0.0467	0.0007	0.0168	0.0152	0.0080	0.0201	0.0300
Max	0.0117	0.0761	0.0015	0.0290	0.0293	0.0220	0.0770	0.0375
Std Dev	0.0040	0.0139	0.0005	0.0051	0.0078	0.0098	0.0226	0.0158
Max + 5%	0.0123	0.0799	0.0016	0.0304	0.0308	0.0231	0.0809	0.0394
Mean + 2 SD	0.0137	0.0745	0.0017	0.0270	0.0308	0.0276	0.0653	0.0616
Used	0.0123	0.0745	0.0016	0.0270	0.0308	0.0231	0.0653	0.0616

Potential Lead = Potential PM * Lead Fraction

Primary Processes

	Acid Plant (HP-1)	**CSHBH (HP-2)**	**Tertiary (HP-2)**	**Conv Fug (HP-41)**	**FF Fug (HP-25)**	**VGBH (HP-2)**	**Anode Furnace Fug (HP-24)**	**Anode BH (HP-1)**	ASHBH	**Brick Crusher BH (HP-4)**	Main Stack	
PM (TPY)	79.59	30.97	22.43	1.15	7.76	30.97	0.00	7.8277		1.50	1.10	lb/hr
PM (lb/hr)	18.17	7.07	6.47	0.26	1.77	7.07	0.00	1.7871		7.51		tpy
Lead Fraction	0.0016	0.0123	0.0745	0.0745	0.0270	0.0653	0.0308	0.0231		0.0616		
0.12 lb/	0.03	0.09	0.48	0.02	0.05	0.46	0.00	0.04		0.46	Pb PTE, lb/hr	
Lead PTE (TPY)	0.13	0.38	1.67	0.09	0.21	2.02	0.00	0.18		0.09	Pb PTE, Tons	

	FF (HP-1)	**Dryer Burners (HP-2)**	**Converters (HP-2, HP-41)**	**Anode BH & Fug (HP-1, 24)**	**Anode Casting (HP-52)**	**Anode boiler (HP-50)**	**#2 Acid Plant PH (HP-26)**	**Oxygen plant boiler (HP-28)**	**Truck Wash Heater (HP-27)***	**Small Boilers & Heaters (HP-63)**
Max Hourly NG (ft3)	91,113	76000	47,059	59019.60784	18,159	3,706	196800	8740	160.7717042	9534.313725
Max Annual NG (ft3)	798,149,880	665,760,000	412,235,294	517,011,765	127,256,460	32,463,529	460000000	76,562,400	1408360.129	83,520,588
Emission Factor	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
lb/hr	0.000045557	0.000038000	0.000023529	0.000029510	0.000009079	0.000001853	0.000098400	0.000004370	0.000080386	0.000004767
TPY	0.000199537	0.000166440	0.000103059	0.000129253	0.000031814	0.000008116	0.000115000	0.000019141	0.000352090	0.000020880

*NG factor is used for propane combustion in Truck Wash Heater because no lead factor is available for propane. Assumed 2,488 btu/scf for propane.

Per Lead SIP, Main Stack/Annulus is subject to a limit of 2.99 TPY. These emission are apportioned below based on portions calculated above. These are presented as estimates only, since the limit applies to the stack collectively.

		PTE calculated	Percentage of total emitted	Apportioned estimates
HP-1h	Main Stack	0.308	0.07	0.21
HP-2h	Annulus	4.074	0.93	2.78

HP-40h Slag dump fugitives

693,500 tons * .072 lb/ton * .41 (FF adjustment) * .02 (slag skimming portion) * .25 (slag dumping site portion) * 1 ton/2000 lb = 0.0512 Pb PTE, tons per year

0.0117 Pb PTE, lb/hr

Notes

AP-42 provides a smelter fugitive Pb emissions factor of .072 lbs/ton of concentrate for conventional smelting processes, but AP-42 indicates the factor for flash furnaces may be lower than this. Therefore the slag dump fugitive emission factor was adjusted to reflect the characteristics of the flash furnace technology by taking into consideration relative differences in the process.
For equal quantities of anode copper produced, the ConTop process releases 41% as much SO2 from oxidation in the slag as does the conventional reverberatory process (source: Asarco El Paso PM Emission Calculation F-RSS.WP 11/18/91). Due to the similarities in technology this statement should also apply to flash furnace metal oxide fumes produced in the smelting process.
According to AP-42 fugitive emissions from matte tapping and slag skimming operations amount to about 35% and 2%, respectively. Slag skimming emissions are allocated 75% to the furnace area and 25% to the slag dumping site.

All NG sources use AP-42, Table 1.4-1
97% to SHBH, 2.8% to Tertiary, and .2% as fugitives
97% capture vented to HP-1, and 3% released as fugitives

Material Storage & Handling

Number	Name	TPM (PPH)	TPM (TPY)	Lead Fraction	lb/hr	TPY
HP-5h	Bedding Plant Area Wind Erosion	0.044894538	0.20	0.55	0.000245124	0.001073644
HP-5h	Bedding Plant Area Unloading	0.003922925	0.017182409	0.55	2.14192E-05	9.3816E-05
HP-5h	Bedding Plant Area Loading	0.062766792	0.27491855	0.55	0.000342707	0.001501055
HP-62h	Dry bin feed system	0.094150188	0.412377825	0.55	0.00051406	0.002251583
HP-6h	Concentrate Storage Wind Erosion	1.809489789	7.93	0.49	0.008929832	0.039112665
HP-6h	Concentrate Storage Unloading	0.025042528	0.109686274	0.49	0.000123585	0.000541302
HP-6h	Concentrate Storage Loading	0.050085057	0.219372548	0.49	0.00024717	0.001082604
HP-21h	Reverts pile south wind erosion	0.422525379	0.46	1.18	0.004968898	0.005440944
HP-21h	Reverts pile south transfer of reverts to outdoor stor	0.023350071	0.102273309	1.18	0.000274597	0.001202734
HP-21h	Reverts pile south load out of reverts in outdoor stor	0.186800565	0.818186476	1.18	0.002196775	0.009621873
HP-22h	Reverts pile north wind erosion	0.005753341	0.003149954	1.18	6.76593E-05	3.70435E-05
HP-22h	Reverts pile north unloading	0.011675035	0.051136655	1.18	0.000137298	0.000601367
HP-22h	Reverts pile north loading	0.186800565	0.818186476	1.18	0.002196775	0.009621873
HP-54h	CRP Flux System, Reverts	0.747207299	3.27276797	1.18	0.008787158	0.038487751

Roads

Unpaved Roads	Name	Total PM (PPH)	Total PM (TPY)	Lead Fraction	lb/hr	TPY		
HP-7h	Concentrate & blister copper delivery	1.61E+00	6.79E+00	0.47	7.58E-03	3.20E-02	Unpaved roads total	
HP-12h	General plant traffic	3.76E-01	1.65E+00	0.47	1.78E-03	7.77E-03		
HP-13h	Water truck	6.09E-01	2.67E+00	0.47	2.87E-03	1.26E-02	2.73E-02	lb/hr
HP-14h	Street sweeper	1.91E-01	8.36E-01	0.47	9.00E-04	3.94E-03		tpy
HP-15h	Plant service haul truck	2.66E-01	1.61E+00	0.47	1.26E-03	7.59E-03		
HP-16h	Scrap handling forklifts	7.90E-01	3.46E+00	0.47	3.73E-03	1.63E-02		
HP-17h	Misc. use forklifts	1.08E-01	4.73E-01	0.47	5.10E-04	2.23E-03		
HP-18h	Misc Delivery Trucks	3.61E-01	1.04E-01	0.47	1.70E-03	4.90E-04		
HP-18h	Sulfuric acid trucks	1.49E-01	9.12E-01	0.47	7.01E-04	4.30E-03		
HP-19h	Storage pile front-end loaders	7.25E-01	3.17E+00	0.47	3.42E-03	1.50E-02		
HP-20h	Misc. use front-end loaders	6.04E-01	2.64E+00	0.47	2.85E-03	1.25E-02		

Paved Roads	Name	Total PM (PPH)	Total PM (TPY)				Paved Roads	
HP-29h	Flux truck traffic	1.06E+02	6.97E+00	0.47	5.00E-01	3.29E-02	1.15E+00	lb/hr
HP-30h	Slag haulage truck traffic	1.16E+02	1.05E+01	0.47	5.46E-01	4.96E-02		tpy
HP-31h	Slag hauler traffic	2.30E+01	2.78E+00	0.47	1.08E-01	1.31E-02		

Lead Emissions Summary

HP-1h	Main Stack	0.2104
HP-2h	Annulus	2.7796
HP-4h	Brick Crusher Baghouse	0.0923
HP-24h	Anode Furnace Fugitives	0.0000
HP-25h	Flash Furnace fugitives (MT/SS + CD fug)	0.2095
HP-40h	SP Fug	0.0512
HP-41h	Converter Fugitives	0.0856
HP-5h	Bedding plant area	0.0027
HP-62h	Dry bin feed system	0.0023
HP-6h	Concentrate storage	0.0407
HP-21h	Reverts pile south	0.0163
HP-22h	Reverts pile north	0.0103
HP-26h	#2 Acid plant preheater	0.0001
HP-27h	Truck wash heater	0.0004
HP-28h	Oxygen plant boiler	0.0000
HP-50h	Anode boiler	0.0000
HP-52h	Anode Casting Combustion	0.0000
HP-54h	CRP flux system	0.0385
HP-7h	Concentrate & blister copper delivery	0.032
HP-12h	General plant traffic	0.008
HP-13h	Water truck	0.013
HP-14h	Street sweeper	0.004
HP-15h	Plant service haul truck	0.008
HP-16h	Scrap handling forklifts	0.016
HP-17h	Misc. use forklifts	0.002
HP-18h	Misc Delivery Trucks	0.000
HP-18h	Sulfuric acid trucks	0.004
HP-19h	Storage pile front-end loaders	0.015
HP-20h	Misc. use front-end loaders	0.012
HP-29h	Flux truck traffic	3.29E-02
HP-30h	Slag haulage truck traffic	4.96E-02
HP-31h	Slag hauler traffic	1.31E-02
HP-63h	Small Boilers and Heaters	2.09E-05

	Total	3.750											

Assay data for bedding plant area

Met Composite No.	Sample		% Pb	% As	% Sb	% Cd	% Ni	% Se	% Cr	% Mn
1	Baghouse	2014	0.19	0.06	0.02	0.005	0.01	0.01	0.005	0.07
2	Baghouse	2014	0.23	0.005	0.005	0.01	0.005	0.005	0.005	0.06
3	Baghouse	2014	0.24	0.03	0.04	0.01	0.005	0.005	0.005	0.02
4	Baghouse	2014	0.25	0.07	0.02	0.005	0.01	0.02	0.01	0.04
5	Baghouse	2014	0.29	0.06	0.02	0.02	0.01	0.02	0.005	0.03
6	Baghouse	2014	0.22	0.03	0.05	0.01	0.005	0.005	0.005	0.03
7	Baghouse	2014	0.26	0.04	0.02	0.01	0.005	0.02	0.005	0.03
8	Baghouse	2014	0.17	0.11	0.1	0.005	0.005	0.03	0.005	0.02
9	Baghouse	2014	0.21	0.06	0.01	0.02	0.01	0.005	0.005	0.02
10	Baghouse	2014	0.21	0.08	0.005	0.02	0.03	0.005	0.005	0.16
11	Baghouse	2014	0.2	0.18	0.03	0.02	0.005	0.005	0.02	0.35
12	Baghouse	2014	0.28	0.2	0.03	0.02	0.01	0.02	0.005	0.02
1	Baghouse	2013	0.15	0.04	0.02	0.005	0.02	0.01	0.05	0.14
2	Baghouse	2013	0.19	0.07	0.02	0.01	0.005	0.01	0.03	0.07
3	Baghouse	2013	0.27	0.05	0.02	0.01	0.005	0.02	0.005	0.04
4	Baghouse	2013	0.17	0.04	0.01	0.005	0.005	0.005	0.01	0.02
5	Baghouse	2013	0.16	0.04	0.005	0.005	0.005	0.005		
6	Baghouse	2013	0.24	0.09	0.03	0.01	0.01	0.02	0.005	0.02
7	Baghouse	2013	0.26	0.08	0.02	0.02	0.005	0.005	0.005	0.03
8	Baghouse	2013	0.24	0.09	0.005	0.01	0.005	0.01	0.005	0.07
9	Baghouse	2013	0.18	0.06	0.02	0.005	0.005	0.01	0.01	0.02
10	Baghouse	2013	0.15	0.06	0.02	0.005	0.01	0.02	0.005	0.03
11	Baghouse	2013	0.18	0.15	0.02	0.02	0.005	0.04	0.005	0.04
12	Baghouse	2013	0.18	0.06	0.01	0.01	0.01	0.005	0.005	0.04
1	Baghouse	2012	0.36	0.12	0.03	0.03	0.01	0.02	0.03	0.03
2	Baghouse	2012	0.27	0.21	0.03	0.01	0.005	0.005	0.03	0.06
3	Baghouse	2012	0.46	0.11	0.04	0.03	0.01	0.02	0.06	0.11
4	Baghouse	2012	0.27	0.15	0.005	0.02	0.01	0.005	0.01	0.03
5	Baghouse	2012	0.33	0.13	0.04	0.02	0.01	0.005	0.04	0.02
6	Baghouse	2012	0.2	0.11	0.02	0.01	0.005	0.005	0.03	0.03
7	Baghouse	2012	0.29	0.06	0.02	0.005	0.005	0.005	0.005	0.03

8	**Baghouse**	**2012**	0.25	0.06	0.02	0.005	0.005	0.005	0.03	0.02			
9	**Baghouse**	**2012**	0.29	0.06	0.02	0.005	0.005	0.02	0.005	0.03			
10	**Baghouse**	**2012**	0.23	0.05	0.01	0.005	0.005	0.01	0.02	0.03			
11	**Baghouse**	**2012**	0.15	0.04	0.005	0.005	0.01	0.005	0.01	0.06			
12	**Baghouse**	**2012**	0.15	0.11	0.03	0.005	0.005	0.005	0.02	0.03			
1	**Baghouse**	**2011**	0.19	0.11	0.02	0.01	0.01	0.01	0.01	0.04			
2	**Baghouse**	**2011**	0.34	0.16	0.05	0.02	0.01	0.01	0.0	0.0			
4	**Baghouse**	**2011**	0.27	0.23	0.03	0.02	0.01	0.04	0.0	0.0			
5	**Baghouse**	**2011**	0.24	0.19	0.03	0.03	0.005	0.005	0.01	0.04			
6	**Baghouse**	**2011**	0.26	0.28	0.03	0.04	0.005	0.02	0.005	0.01			
7	**Baghouse**	**2011**	0.28	0.24	0.02	0.03	0.005	0.01	0.005	0.03			
8	**Baghouse**	**2011**	0.24	0.3	0.04	0.03	0.01	0.02	0.02	0.03			
9	**Baghouse**	**2011**	0.19	0.16	0.02	0.03	0.03	0.005					
10	**Baghouse**	**2011**	0.15	0.08	0.005	0.03	0.04	0.005	0.02	0.1			
11	**Baghouse**	**2011**	0.26	0.16	0.005	0.005	0.04	0.005	0.005	0.03			
12	**Baghouse**	**2011**	0.27	0.17	0.05	0.02	0.005	0.005	0.03	0.02			
1	**Baghouse**	**2010**	0.40	0.08	0.02	0.01	0.01	0.01	0.01	0.04			
2	**Baghouse**	**2010**	0.25	0.10	0.03	0.01	0.01	0.03					
3	**Baghouse**	**2010**	0.27	0.09	0.03	0.01	0.01	0.03					
4	**Baghouse**	**2010**	0.31	0.08	0.03	0.005	0.01	0.01	0.01	0.04			
5	**Baghouse**	**2010**	0.29	0.13	0.03	0.01	0.01	0.005	0.005	0.02			
6	**Baghouse**	**2010**	0.39	0.1	0.04	0.01	0.03	0.06					
7	**Baghouse**	**2010**	0.21	0.1	0.03	0.01	0.005	0.005	0.005	0.05			
8	**Baghouse**	**2010**	0.17	0.11	0.03	0.01	0.005	0.01	0.01	0.05			
9	**Baghouse**	**2010**	0.28	0.16	0.04	0.02	0.005	0.03	0.01	0.04			
10	**Baghouse**	**2010**	0.25	0.11	0.03	0.01	0.005	0.04	0.01	0.02			
11	**Baghouse**	**2010**	0.21	0.18	0.04	0.01	0.01	0.03	0.0	0.1			
12	**Baghouse**	**2010**	0.23	0.14	0.03	0.01	0.005	0.02	0.02	0.05			
1	**Baghouse**	**2009**	0.25	0.1300	0.02	0.01	0.01	0.03					
2	**Baghouse**	**2009**	0.42	0.1200	0.02	0.02	0.01	0.01	0.01	0.03			
3	**Baghouse**	**2009**	0.37	0.1300	0.02	0.01	0.01	0.02	0.0	0.0			
4	**Baghouse**	**2009**	0.32	0.1400	0.02	0.01	0.01	0.09					
5	**Baghouse**	**2009**	0.38	0.1700	0.01	0.03	0.01	0.02	0.0	0.0			
7	**Baghouse**	**2009**	0.37	0.1000	0.03	0.01	0.01	0.01					
8	**Baghouse**	**2009**	0.3	0.0900	0.02	0.01	0.005	0.02					

9	**Baghouse**	**2009**	0.31	0.0600	0.04	0.01	0.005	0.05					
10	**Baghouse**	**2009**	0.15	0.0900	0.02	0.005	0.02	0.005	0.005	0.02			
11	**Baghouse**	**2009**	0.22	0.1100	0.02	0.005	0.005	0.03					
12	**Baghouse**	**2009**	0.38	0.0800	0.02	0.01	0.03	0.02					
1	**Baghouse**	**2008**	0.46	0.09	0.03	0.01	0.01	0.02	0.01	0.03			
2	**Baghouse**	**2008**	0.45	0.12	0.03	0.01	0.01	0.02	0.01	0.04			
3	**Baghouse**	**2008**	0.39	0.08	0.03	0.01	0.01	0.02					
4	**Baghouse**	**2008**	0.51	0.12	0.03	0.01	0.01	0.02	0.01	0.04			
5	**Baghouse**	**2008**	0.39	0.10	0.02	0.01	0.03	0.03	0.02	0.04			
6	**Baghouse**	**2008**	0.45	0.11	0.01	0.01	0.01	0.01	0.02	0.04			
7	**Baghouse**	**2008**	0.47	0.13	0.01	0.01	0.01	0.005	0.01	0.00			
8	**Baghouse**	**2008**	0.52	0.19	0.01	0.02	0.005	0.05	0.01	0.07			
9	**Baghouse**	**2008**	0.47	0.19	0.03	0.02	0.005	0.03					
10	**Baghouse**	**2008**	0.4	0.15	0.03	0.02	0.005	0.03					
11	**Baghouse**	**2008**	0.43	0.15	0.02	0.02	0.005	0.02	0.01	0.02			
12	**Baghouse**	**2008**	0.41	0.14	0.02	0.02	0.005	0.02	0.01	0.07			
1	**Baghouse**	**2007**	0.25	0.11	0.02	0.01	0.01	0.01					
2	**Baghouse**	**2007**	0.14	0.06	0.03	0.01	0.03	0.02	0.02	0.04			
3	**Baghouse**	**2007**	0.26	0.09	0.03	0.01	0.01	0.02					
4	**Baghouse**	**2007**	0.28	0.09	0.02	0.01	0.04	0.01					
5	**Baghouse**	**2007**	0.30	0.09	0.02	0.01	0.01	0.02					
6	**Baghouse**	**2007**	0.30	0.08	0.02	0.01	0.01	0.01					
7	**Baghouse**	**2007**	0.35	0.06	0.01	0.01	0.005	0.02					
8	**Baghouse**	**2007**	0.35	0.09	0.03	0.02	0.005	0.02					
9	**Baghouse**	**2007**	0.32	0.09	0.02	0.02	0.005	0.02					
10	**Baghouse**	**2007**	0.47	0.12	0.03	0.02	0.005	0.02					
11	**Baghouse**	**2007**	0.52	0.05	0.03	0.01	0.005	0.02					
12	**Baghouse**	**2007**	0.42	0.09	0.03	0.01	0.005	0.02	0.01	0.02			
1	**Baghouse**	**2006**	0.21	0.12	0.04	0.01	0.01	0.02	0.01	0.04			
2	**Baghouse**	**2006**	0.25	0.11	0.03	0.005	0.01	0.01					
3	**Baghouse**	**2006**	0.25	0.03	0.02	0.01	0.01	0.01	0.01	0.10			
4	**Baghouse**	**2006**	0.21	0.07	0.02	0.01	0.01	0.02	0.01	0.10			
5	**Baghouse**	**2006**	0.21	0.07	0.02	0.01	0.01	0.01					
6	**Baghouse**	**2006**	0.14	0.05	0.02	0.005	0.02	0.02	0.005	0.04			
7	**Baghouse**	**2006**	0.1	0.13	0.06	0.005	0.01	0.04	0.005	0.01			

8	**Baghouse**	**2006**	0.15	0.06	0.03	0.005	0.005	0.02				
9	**Baghouse**	**2006**	0.15	0.07	0.03	0.01	0.02	0.03				
10	**Baghouse**	**2006**	0.21	0.08	0.02	0.01	0.005	0.01				
11	**Baghouse**	**2006**	0.22	0.11	0.05	0.01	0.02	0.01				
12	**Baghouse**	**2006**	0.32	0.08	0.02	0.005	0.005	0.01	0.01	0.03		
1	**Baghouse**	**2005**	0.15									
2	**Baghouse**	**2005**	0.12									
3	**Baghouse**	**2005**	0.11									
4	**Baghouse**	**2005**	0.17									
5	**Baghouse**	**2005**	0.18									
6	**Baghouse**	**2005**	0.22									
7	**Baghouse**	**2005**	0.1									
8	**Baghouse**	**2005**	0.08									
9	**Baghouse**	**2005**	0.09									
11	**Baghouse**	**2005**	0.12									
12	**Baghouse**	**2005**	0.39									
1	**Baghouse**	**2004**	0.13									
2	**Baghouse**	**2004**	0.12									
3	**Baghouse**	**2004**	0.16									
4	**Baghouse**	**2004**	0.16									
5	**Baghouse**	**2004**	0.17									
6	**Baghouse**	**2004**	0.21									
7	**Baghouse**	**2004**	0.36									
8	**Baghouse**	**2004**	0.23									
9	**Baghouse**	**2004**	0.2									
10	**Baghouse**	**2004**	0.14									
11	**Baghouse**	**2004**	0.1									
12	**Baghouse**	**2004**	0.12									
No.	**Sample**		**Pb**	**As**	**Sb**	**Cd**	**Ni**	**Se**	**Cr**	**Mn**		
	Statistical Outlier Analysis using Interquartile Range Method											
	Quartile 1		0.18	0.07	0.02	0.005	0.005	0.005	0.005	0.02		
	Quartile 3		0.32	0.13	0.03	0.02	0.01	0.02	0.0175	0.045		
	IQR		0.14	0.06	0.01	0.015	0.005	0.015	0.0125	0.025		
	Lower Fence		-0.03	-0.02	0.005	-0.0175	-0.0025	-0.0175	-0.01375	-0.0175		
	Upper Fence		0.53	0.22	0.045	0.0425	0.0175	0.0425000	0.03625	0.0825		

	Mean		0.2584961	0.0996569	0.0230000	0.0123113	0.0066848	0.0153431	0.0105556	0.0341013			
	Max		0.52	0.21	0.04	0.04	0.01	0.04	0.03	0.07			
	Std Dev		0.104155242	0.0550518	0.0093744	0.0085802	0.0034235	0.0105804	0.0080577	0.0206178			
	Max + 5%		0.55	0.22	0.04	0.04	0.01	0.04	0.03	0.07			
	Mean + 2 SD		0.47	0.21	0.04	0.03	0.01	0.04	0.03	0.08			
	Used		0.55	0.22	0.04	0.04	0.01	0.0420	0.03	0.08			
Assay data for concentrate storage													
Ore Composite			**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
No.	**Sample**		**Pb**	**As**	**Sb**	**Cd**	**Ni**	**Se**	**Cr**	**Mn**	**Co**	**Hg**	**Be**
1	**Mineral Park**	**2014**	0.24	0.06	0.02	0.01	0.01	0.01					
2	**Mineral Park**	**2014**	0.15	0.04	0.01	0.01	0.01	0.01					
3	**Mineral Park**	**2014**	0.15	0.00	0.01	0.01	0.01	0.01					
4	**Mineral Park**	**2014**	0.20	0.05	0.01	0.01	0.01	0.01					
5	**Mineral Park**	**2014**	0.37	0.06	0.01	0.06	0.01	0.01					
6	**Mineral Park**	**2014**	0.54	0.01	0.02	0.02	0.01	0.01					
7	**Mineral Park**	**2014**	0.53	0.03	0.01	0.02	0.02	0.01					
8	**Mineral Park**	**2014**	0.31	0.03	0.01	0.01	0.01	0.01					
9	**Mineral Park**	**2014**	0.46	0.05	0.01	0.03	0.01	0.02					
10	**Mineral Park**	**2014**	0.32	0.01	0.04	0.02	0.01	0.01					
11	**Mineral Park**	**2014**	0.40	0.04	0.02	0.03	0.01	0.01					
12	**Mineral Park**	**2014**	0.31	0.01	0.03	0.02	0.01	0.01					
1	**Mission North**	**2014**	0.16	0.01	0.02	0.01	0.01	0.01					
2	**Mission North**	**2014**	0.23	0.03	0.03	0.01	0.01	0.01					
3	**Mission North**	**2014**	0.20	0.01	0.03	0.01	0.01	0.01					
4	**Mission North**	**2014**	0.20	0.02	0.01	0.01	0.01	0.01					
5	**Mission North**	**2014**	0.18	0.04	0.02	0.05	0.01	0.01					
6	**Mission North**	**2014**	0.28	0.01	0.02	0.01	0.04	0.01					
7	**Mission North**	**2014**	0.11	0.11	0.02	0.01	0.01	0.01					
8	**Mission North**	**2014**	0.17	0.02	0.02	0.01	0.01	0.01					
9	**Mission North**	**2014**	0.13	0.01	0.01	0.01	0.01	0.02					
10	**Mission North**	**2014**	0.18	0.01	0.04	0.01	0.01	0.01					
11	**Mission North**	**2014**	0.25	0.03	0.02	0.01	0.01	0.01					
12	**Mission North**	**2014**	0.06	0.01	0.02	0.01	0.01	0.01					

1	**Mission South**	**2014**	0.14	0.01	0.02	0.01	0.01	0.01
2	**Mission South**	**2014**	0.23	0.03	0.02	0.01	0.01	0.01
3	**Mission South**	**2014**	0.19	0.01	0.03	0.01	0.01	0.01
4	**Mission South**	**2014**	0.34	0.02	0.01	0.01	0.01	0.01
5	**Mission South**	**2014**	0.26	0.04	0.01	0.05	0.01	0.01
6	**Mission South**	**2014**	0.15	0.01	0.01	0.01	0.01	0.02
7	**Mission South**	**2014**	0.08	0.04	0.02	0.01	0.01	0.01
8	**Mission South**	**2014**	0.10	0.15	0.01	0.03	0.01	0.01
9	**Mission South**	**2014**	0.13	0.02	0.01	0.01	0.01	0.02
10	**Mission South**	**2014**	0.12	0.24	0.04	0.01	0.01	0.01
11	**Mission South**	**2014**	0.22	0.29	0.03	0.01	0.01	0.01
12	**Mission South**	**2014**	0.08	0.11	0.03	0.01	0.01	0.01
1	**Pinto Valley**	**2014**	0.05	0.01	0.03	0.01	0.01	0.02
2	**Pinto Valley**	**2014**	0.04	0.01	0.10	0.01	0.01	0.01
4	**Pinto Valley**	**2014**	0.04	0.01	0.01	0.01	0.01	0.02
5	**Pinto Valley**	**2014**	0.10	0.01	0.01	0.05	0.01	0.02
6	**Pinto Valley**	**2014**	0.05	0.01	0.01	0.01	0.01	0.01
7	**Pinto Valley**	**2014**	0.03	0.01	0.01	0.01	0.03	0.01
8	**Pinto Valley**	**2014**	0.08	0.01	0.01	0.01	0.01	0.03
9	**Pinto Valley**	**2014**	0.03	0.01	0.01	0.01	0.03	0.03
10	**Pinto Valley**	**2014**	0.03	0.01	0.03	0.01	0.01	0.02
11	**Pinto Valley**	**2014**	0.05	0.01	0.02	0.01	0.01	0.02
12	**Pinto Valley**	**2014**	0.03	0.01	0.02	0.01	0.01	0.01
1	**Ray**	**2014**	0.06	0.01	0.02	0.01	0.01	0.01
2	**Ray**	**2014**	0.03	0.02	0.01	0.01	0.02	0.01
2	**Ray**	**2014**	0.03	0.02	0.01	0.01	0.01	0.01
3	**Ray**	**2014**	0.03	0.03	0.01	0.01	0.01	0.01
4	**Ray**	**2014**	0.07	0.03	0.01	0.01	0.01	0.03
5	**Ray**	**2014**	0.14	0.05	0.02	0.05	0.01	0.01
5	**Ray**	**2014**	0.06	0.02	0.02	0.01	0.03	0.01
6	**Ray**	**2014**	0.07	0.01	0.02	0.01	0.02	0.01
7	**Ray**	**2014**	0.07	0.05	0.02	0.01	0.01	0.01
8	**Ray**	**2014**	0.11	0.01	0.01	0.01	0.02	0.02
9	**Ray**	**2014**	0.03	0.02	0.01	0.01	0.01	0.03
9	**Ray**	**2014**	0.05	0.02	0.01	0.01	0.02	0.02

10	**Ray**	**2014**	0.03	0.02	0.02	0.01	0.01	0.01					
10	**Ray**	**2014**	0.05	0.06	0.01	0.01	0.02	0.02					
11	**Ray**	**2014**	0.04	0.04	0.02	0.01	0.01	0.02					
11	**Ray**	**2014**	0.05	0.06	0.02	0.01	0.01	0.01					
12	**Ray**	**2014**	0.05	0.01	0.02	0.01	0.01	0.01					
12	**Ray**	**2014**	0.04	0.01	0.02	0.01	0.01	0.01					
1	**Mineral Park**	**2013**	0.48	0.05	0.005	0.005	0.005	0.005	0.01	0.02	0.0084	0.000374	0.000024
2	**Mineral Park**	**2013**	0.84	0.06	0.02	0.02	0.01	0.005	0.03	0.12			
4	**Mineral Park**	**2013**	0.18	0.07	0.005	0.005	0.005	0.005	0.005	0.04			
5	**Mineral Park**	**2013**	0.38	0.07	0.02	0.005	0.01	0.005	0.01	0.13			
6	**Mineral Park**	**2013**	0.32	0.05	0.01	0.01	0.02	0.01	0.005	0.05			
7	**Mineral Park**	**2013**	0.35	0.07	0.005	0.01	0.01	0.005	0.005	0.08			
8	**Mineral Park**	**2013**	0.16	0.07	0.005	0.005	0.005	0.005	0.02	0.04			
9	**Mineral Park**	**2013**	0.14	0.06	0.02	0.005	0.01	0.005					
10	**Mineral Park**	**2013**	0.13	0.08	0.01	0.005	0.005	0.005	0.01	0.08			
11	**Mineral Park**	**2013**	0.12	0.07	0.01	0.005	0.005	0.04	0.01	0.08			
12	**Mineral Park**	**2013**	0.31	0.05	0.005	0.005	0.005	0.005	0.02	0.07			
1	**Mission North**	**2013**	0.17	0.03	0.02	0.005	0.005	0.005	0.03	0.01	0.0021	0.000175	0.00001
2	**Mission North**	**2013**	0.34	0.01	0.01	0.005	0.01	0.005	0.03	0.04	0.0058	0.0000989	0.00001
3	**Mission North**	**2013**	0.16	0.02	0.02	0.005	0.005	0.02	0.005	0.03			
7	**Mission North**	**2013**	0.16	0.07	0.005	0.005	0.005	0.005	0.02	0.02			
8	**Mission North**	**2013**	0.19	0.03	0.01	0.005	0.01	0.005	0.005	0.02			
9	**Mission North**	**2013**	0.14	0.04	0.02	0.005	0.005	0.005	0.005	0.03			
10	**Mission North**	**2013**	0.16	0.03	0.03	0.005	0.005	0.04	0.005	0.04			
11	**Mission North**	**2013**	0.1	0.02	0.02	0.005	0.005	0.005	0.02	0.02			
12	**Mission North**	**2013**	0.18	0.01	0.005	0.005	0.005	0.005	0.005	0.04			
1	**Mission South**	**2013**	0.21	0.02	0.005	0.005	0.005	0.005	0.02	0.02	0.0038	0.0000757	0.00001
3	**Mission South**	**2013**	0.18	0.01	0.02	0.005	0.005	0.01	0.005	0.03	0.0051	0.0000285	0.00001
4	**Mission South**	**2013**	0.15	0.02	0.005	0.005	0.005	0.005	0.005	0.02			
4	**Mission South**	**2013**	0.7	0.02	0.005	0.005	0.005	0.005	0.005	0.005			
5	**Mission South**	**2013**	0.13	0.01	0.03	0.005	0.01	0.01	0.005	0.02			
6	**Mission South**	**2013**	0.07	0.005	0.01	0.005	0.005	0.01	0.005	0.01			
7	**Mission South**	**2013**	0.17	0.04	0.02	0.005	0.005	0.02	0.01	0.02			
8	**Mission South**	**2013**	0.12	0.03	0.01	0.005	0.005	0.005	0.005	0.005			
9	**Mission South**	**2013**	0.16	0.02	0.02	0.005	0.03	0.01					

10	**Mission South**	**2013**	0.09	0.05	0.02	0.005	0.005	0.04	0.005	0.02			
11	**Mission South**	**2013**	0.08	0.04	0.03	0.005	0.005	0.005	0.01	0.02			
12	**Mission South**	**2013**	0.11	0.02	0.01	0.005	0.005	0.005	0.005	0.03			
1	**Ray**	**2013**	0.07	0.01	0.005	0.005	0.005	0.005	0.01	0.03	0.0085	0.00016	0.00001
2	**Ray**	**2013**	0.06	0.04	0.005	0.005	0.005	0.005	0.03	0.01			
3	**Ray**	**2013**	0.03	0.005	0.005	0.005	0.005	0.02	0.005	0.01			
4	**Ray**	**2013**	0.06	0.02	0.01	0.005	0.01	0.03	0.005	0.1			
5	**Ray**	**2013**	0.05	0.04	0.01	0.005	0.01	0.02	0.005	0.09			
6	**Ray**	**2013**	0.04	0.02	0.005	0.005	0.005	0.03	0.005	0.06			
7	**Ray**	**2013**	0.03	0.01	0.005	0.005	0.005	0.005	0.005	0.02			
8	**Ray**	**2013**	0.03	0.01	0.005	0.005	0.005	0.03	0.01	0.01			
9	**Ray**	**2013**	0.1	0.03	0.01	0.005	0.005	0.03					
10	**Ray**	**2013**	0.03	0.03	0.01	0.005	0.005	0.02	0.005	0.02			
10	**Ray**	**2013**	0.04	0.02	0.01	0.005	0.005	0.02	0.005	0.05			
10	**Ray**	**2013**	0.03	0.03	0.005	0.005	0.005	0.05	0.005	0.02			
11	**Ray**	**2013**	0.03	0.02	0.01	0.005	0.005	0.02	0.005	0.02			
12	**Ray**	**2013**	0.04	0.01	0.005	0.005	0.005	0.005	0.005	0.02			
12	**Ray**	**2013**	0.06	0.02	0.02	0.005	0.005	0.005	0.005	0.01			
1	**Mineral Park**	**2012**	0.69	0.1	0.04	0.01	0.005	0.005	0.005				
2	**Mineral Park**	**2012**	0.59	0.07	0.03	0.03	0.01	0.01	0.005				
3	**Mineral Park**	**2012**	0.45	0.07	0.005	0.02	0.02	0.01	0.005				
4	**Mineral Park**	**2012**	0.68	0.05	0.03	0.005	0.01	0.01	0.005				
5	**Mineral Park**	**2012**	0.96	0.1	0.02	0.005	0.005	0.005	0.005				
6	**Mineral Park**	**2012**	0.41	0.04	0.05	0.04	0.005	0.005	0.005				
7	**Mineral Park**	**2012**	0.85	0.06	0.005	0.01	0.005	0.02	0.005				
8	**Mineral Park**	**2012**	0.59	0.005	0.01	0.005	0.02	0.005	0.005				
9	**Mineral Park**	**2012**	0.34	0.09	0.02	0.01	0.02	0.02	0.005				
10	**Mineral Park**	**2012**	0.28	0.05	6	0.02	0.005	0.01	0.05				
11	**Mineral Park**	**2012**	0.44	0.09	0.02	0.01	0.01	0.005	0.005				
12	**Mineral Park**	**2012**	0.06	0.07	0.01	0.02	0.01	0.005	0.005				
1	**Mission North**	**2012**	0.12	0.005	0.04	0.02	0.005	0.005	0.005				
2	**Mission North**	**2012**	0.12	0.06	0.03	0.005	0.005	0.005	0.005				
4	**Mission North**	**2012**	0.18	0.15	0.04	0.03	0.005	0.005	0.005				
4	**Mission North**	**2012**	0.2	0.17	0.02	0.03	0.005	0.005	0.03				
5	**Mission North**	**2012**	0.21	0.03	0.02	0.05	0.01	0.01	0.01				

6	**Mission North**	**2012**	0.21	0.01	0.13	0.08	0.01	0.01	0.03				
7	**Mission North**	**2012**	0.15	0.02	0.02	0.02	0.01	0.01	0.01				
8	**Mission North**	**2012**	0.16	0.03	0.01	0.03	0.01	0.01	0.01				
8	**Mission North**	**2012**	0.21	0.02	0.01	0.04	0.01	0.01	0.01				
9	**Mission North**	**2012**	0.34	0.01	0.01	0.06	0.01	0.01	0.01				
9	**Mission North**	**2012**	0.34	0.01	0.01	0.06	0.01	0.01	0.01				
9	**Mission North**	**2012**	0.59	0.07	0.03	0.06	0.01	0.02	0.01				
10	**Mission North**	**2012**	0.13	0.03	0.01	0.04	0.01	0.01	0.01				
11	**Mission North**	**2012**	0.11	0.04	0.03	0.02	0.01	0.01	0.01				
12	**Mission North**	**2012**	0.09	0.05	0.03	0.05	0.005	0.01	0.005				
1	**Mission South**	**2012**	0.14	0.34	0.06	0.02	0.01	0.01	0.02				
2	**Mission South**	**2012**	0.22	0.19	0.03	0.06	0.01	0.01	0.01				
3	**Mission South**	**2012**	0.57	0.06	0.01	0.03	0.005	0.005	0.01				
4	**Mission South**	**2012**	0.37	0.03	0.06	0.03	0.005	0.005	0.005				
5	**Mission South**	**2012**	0.16	0.02	0.01	4.00	0.01	0.01	0.01				
6	**Mission South**	**2012**	0.15	0.01	0.09	0.06	0.01	0.01	0.02				
7	**Mission South**	**2012**	0.18	0.01	0.01	0.05	0.01	0.01	0.01				
8	**Mission South**	**2012**	0.16	0.03	0.02	0.03	0.01	0.01	0.01				
9	**Mission South**	**2012**	0.21	0.01	0.02	0.03	0.01	0.01	0.01				
10	**Mission South**	**2012**	0.23	0.01	0.06	0.02	0.01	0.01	0.06				
11	**Mission South**	**2012**	0.09	0.05	0.03	0.02	0.01	0.01	0.01				
12	**Mission South**	**2012**	0.09	0.02	0.03	2	0.005	0.005	0.005				
1	**Ray**	**2012**	0.07	0.04	0.02	0.01	0.01	0.01	0.02				
2	**Ray 212**	**2012**	0.08	0.07	0.04	0.005	0.005	0.005	0.05				
3	**Ray**	**2012**	0.04	0.005	0.02	0.005	0.005	0.005	0.02				
3	**Ray 298 prod**	**2012**	0.06	0.5	0.02	0.005	0.005	0.02	0.03				
4	**Ray**	**2012**	0.31	0.005	0.04	0.005	0.005	0.01	0.005				
5	**Ray**	**2012**	0.17	0.11	0.03	0.01	0.01	0.01	0.02				
6	**Ray**	**2012**	0.10	0.01	0.03	0.06	0.03	0.01	0.01				
7	**Ray 610**	**2012**	0.23	0.05	0.01	0.01	0.005	0.005	0.01				
7	**Ray production**	**2012**	0.09	0.005	0.005	0.005	0.005	0.01	0.02				
8	**Ray**	**2012**	0.07	0.02	0.01	0.01	0.01	0.01	0.03				
9	**Ray**	**2012**	0.08	0.005	0.01	0.01	0.005	0.01	0.01				
9	**Ray 808**	**2012**	0.09	0.005	0.01	0.01	0.005	0.01	0.01				
10	**Ray**	**2012**	0.11	0.03	0.05	0.005	0.005	0.01	0.06				

11	**Ray**	**2012**	0.06	0.02	0.01	0.005	0.005	0.005	0.005				
12	**Ray**	**2012**	0.02	0.02	0.02	0.01	0.005	0.01	0.02				
3	**Troy**	**2012**	1.17	0.1	0.07	0.005	0.005	0.005	0.005				
4	**Troy**	**2012**	1.5	0.06	0.05	0.005	0.005	0.005	0.02				
5	**Troy**	**2012**	0.90	0.12	0.10	0.01	0.01	0.01	0.01				
6	**Troy**	**2012**	0.57	0.04	0.05	0.02	0.01	0.01	0.01				
7	**Troy**	**2012**	3.82	0.09	0.09	0.01	0.01	0.01	0.01				
8	**Troy**	**2012**	1.16	0.01	0.10	0.01	0.01	0.01	0.01				
9	**Troy**	**2012**	0.98	0.10	0.13	0.01	0.01	0.01	0.02				
7	**Buena Vista**	**2011**	0.11	0.14	0.03	0.005	0.005	0.005					
8	**Buena Vista**	**2011**	0.12	0.36	0.07	0.005	0.005	0.04					
9	**Buena Vista**	**2011**	0.33	0.19	0.04	0.005	0.005	0.01					
4	**Desert Hawk**	**2011**	0.05	0.11	0.02	0.005	0.04	0.005					
5	**Desert Hawk**	**2011**	0.01	0.16	0.06	0.005	0.03	0.02					
6	**Desert Hawk**	**2011**	0.03	0.13	0.03	0.005	0.03	0.02					
1	**Mineral Park**	**2011**	0.22	0.12	0.02	0.01	0.01	0.01					
4	**Mineral Park**	**2011**	0.53	0.07	0.02	0.01	0.03	0.005					
5	**Mineral Park**	**2011**	0.2	0.08	0.01	0.005	0.01	0.005					
6	**Mineral Park**	**2011**	0.32	0.12	0.01	0.03	0.005	0.01					
7	**Mineral Park**	**2011**	0.23	0.08	0.01	0.02	0.01	0.005					
8	**Mineral Park**	**2011**	0.33	0.16	0.02	0.02	0.01	0.04					
9	**Mineral Park**	**2011**	0.32	0.12	0.03	0.02	0.01	0.005					
10	**Mineral Park**	**2011**	0.61	0.05	0.01	0.02	0.005	0.005					
11	**Mineral Park**	**2011**	0.73	0.07	0.005	0.02	0.005	0.005					
12	**Mineral Park**	**2011**	0.57										
1	**Mission North**	**2011**	0.18	0.04	0.03	0.01	0.01	0.01					
2	**Mission North**	**2011**	0.15	0.05	0.02	0.01	0.01	0.01					
3	**Mission North**	**2011**	0.12	0.02	0.02	0.005	0.005	0.005					
4	**Mission North**	**2011**	0.06	0.03	0.02	0.005	0.005	0.02					
5	**Mission North**	**2011**	0.08	0.02	0.01	0.01	0.005	0.005					
6	**Mission North**	**2011**	0.08	0.01	0.01	0.005	0.005	0.03					
7	**Mission North**	**2011**	0.04	0.01	0.07	0.01	0.005	0.005					
8	**Mission North**	**2011**	0.05	0.01	0.01	0.01	0.005	0.005					
9	**Mission North**	**2011**	0.14	0.08	0.02	0.005	0.005	0.02					
10	**Mission North**	**2011**	0.16	0.005	0.005	0.005	0.005	0.005					

1	**Mission South**	**2011**	0.25	0.04	0.02	0.01	0.01	0.01					
2	**Mission South**	**2011**	0.15	0.04	0.03	0.01	0.01	0.02					
3	**Mission South**	**2011**	0.13	0.03	0.02	0.005	0.005	0.005					
4	**Mission South**	**2011**	0.08	0.02	0.01	0.005	0.02	0.005					
5	**Mission South**	**2011**	0.08	0.04	0.01	0.005	0.005	0.005					
6	**Mission South**	**2011**	0.09	0.02	0.02	0.005	0.005	0.03					
7	**Mission South**	**2011**	0.04	0.49	0.05	0.005	0.005	0.005					
8	**Mission South**	**2011**	0.05	0.06	0.02	0.01	0.005	0.04					
9	**Mission South**	**2011**	0.06	0.005	0.02	0.005	0.005	0.02					
10	**Mission South**	**2011**	0.11	0.4	0.03	0.005	0.005	0.01					
12	**Mission South**	**2011**	0.17										
1	**Ray**	**2011**	0.14	0.08	0.02	0.01	0.01	0.02					
3	**Ray**	**2011**	0.14	0.25	0.03	0.005	0.02	0.02					
4	**Ray**	**2011**	0.17	0.19	0.03	0.005	0.02	0.01					
5	**Ray**	**2011**	0.1	0.3	0.03	0.005	0.01	0.005					
6	**Ray**	**2011**	0.12	0.13	0.02	0.005	0.005	0.03					
7	**Ray**	**2011**	0.1	0.2	0.03	0.005	0.02	0.005					
8	Ray	**2011**	0.03	0.1	0.02	0.005	0.01	0.05					
9	Ray	**2011**	0.06	0.04	0.01	0.005	0.01	0.03					
10	Ray	**2011**	0.16	0.11	0.02	0.005	0.01	0.03					
11	Ray	**2011**	0.09	0.08	0.01	0.005	0.005	0.005					
6	**Ray Prod 454**	**2011**	0.07	0.09	0.01	0.005	0.01	0.03					
4	**Ray 278 prod**	**2011**	0.11	0.05	0.005	0.005	0.02	0.02					
11	Ray 883	**2011**	0.11	0.03	0.005	0.005	0.01	0.005					
11	Ray 914	**2011**	0.07	0.005	0.005	0.005	0.005	0.01					
3	**Ray prod 188**	**2011**	0.2	0.49	0.05	0.005	0.02	0.02					
7	**Ray prod 537**	**2011**	0.08	0.24	0.08	0.005	0.03	0.005					
2	**Ray 137 Prod**	**2011**	0.15	0.40	0.05	0.01	0.01	0.02					
9	Ray Prod 761	**2011**	0.14	0.06	0.01	0.005	0.02	0.02					
8	Ray prod 640	**2011**	0.1	0.28	0.02	0.005	0.005	0.05					
1	**Mineral Park**	**2010**	0.23	0.08	0.01	0.01	0.01	0.01					
2	**Mineral Park**	**2010**	0.03	0.07	0.03	0.005	0.005	0.02					
3	**Mineral Park**	**2010**	0.04	0.06	0.02	0.005	0.01	0.04					
4	**Mineral Park**	**2010**	0.10	0.06	0.02	0.005	0.01	0.02					
5	**Mineral Park**	**2010**	0.35	0.81	0.05	0.01	0.02	0.005					

10	**Mineral Park**	**2010**	0.52	0.12	0.02	0.01	0.005	0.005					
11	**Mineral Park**	**2010**	0.12	0.07	0.02	0.005	0.01	0.02					
12	**Mineral Park**	**2010**	0.23	0.11	0.02	0.01	0.005	0.005					
2	**Mission North**	**2010**	0.11	0.07	0.03	0.01	0.01	0.02					
3	**Mission North**	**2010**	0.27	0.03	0.07	0.005	0.02	0.005					
3	**Mission North**	**2010**	0.08	0.04	0.03	0.005	0.005	0.04					
4	**Mission North**	**2010**	0.10	0.1	0.02	0.005	0.005	0.005					
5	**Mission North**	**2010**	0.12	0.03	0.02	0.005	0.005	0.005					
6	**Mission North**	**2010**	0.11	0.07	0.02	0.005	0.005	0.005					
7	**Mission North**	**2010**	0.21	0.06	0.05	0.005	0.005	0.005					
8	**Mission North**	**2010**	0.12	0.03	0.03	0.005	0.005	0.02					
9	**Mission North**	**2010**	0.10	0.05	0.03	0.005	0.005	0.005					
10	**Mission North**	**2010**	0.10	0.02	0.03	0.005	0.005	0.03					
11	**Mission North**	**2010**	0.09	0.05	0.03	0.005	0.005	0.01					
12	**Mission North**	**2010**	0.12	0.03	0.03	0.005	0.005	0.02					
1	**Mission South**	**2010**	0.34	0.05	0.01	0.01	0.01	0.01					
2	**Mission South**	**2010**	0.07	0.06	0.05	0.01	0.01	0.01					
3	**Mission South**	**2010**	0.23	0.02	0.05	0.005	0.01	0.005					
5	**Mission South**	**2010**	0.12	0.06	0.02	0.005	0.005	0.02					
6	**Mission South**	**2010**	0.14	0.07	0.02	0.005	0.005	0.005					
7	**Mission South**	**2010**	0.11	0.05	0.02	0.005	0.005	0.005					
8	**Mission South**	**2010**	0.10	0.03	0.03	0.01	0.005	0.01					
9	**Mission South**	**2010**	0.10	0.07	0.03	0.005	0.005	0.005					
10	**Mission South**	**2010**	0.13	0.03	0.02	0.005	0.005	0.005					
11	**Mission South**	**2010**	0.12	0.03	0.02	0.005	0.005	0.005					
12	**Mission South**	**2010**	0.12	0.01	0.02	0.005	0.005	0.005					
1	**Ray**	**2010**	0.28	0.01	0.01	0.01	0.01	0.01					
1	**Ray 98**	**2010**	0.20	0.01	0.01	0.01	0.01	0.01					
2	**Ray**	**2010**	0.07	0.02	0.02	0.01	0.01	0.03					
2	**Ray 149**	**2010**	0.15	0.04	0.05	0.01	0.01	0.02					
3	**Ray**	**2010**	0.33	0.02	0.06	0.005	0.02	0.005					
4	**Ray**	**2010**	0.04	0.03	0.02	0.005	0.01	0.03					
4	**Ray 288**	**2010**	0.04	0.02	0.02	0.005	0.01	0.03					
5	**Ray**	**2010**	0.09	0.03	0.005	0.005	0.005	0.02					
5	**Ray 353**	**2010**	0.13	0.02	0.005	0.005	0.01	0.04					

6	Ray	2010	0.1	0.06	0.01	0.005	0.005	0.005					
7	Ray	2010	0.08	0.11	0.03	0.005	0.02	0.005					
8	Ray	2010	0.2	0.16	0.02	0.005	0.005	0.01					
9	Ray	2010	0.17	0.04	0.005	0.005	0.005	0.005					
10	Ray	2010	0.13	0.24	0.05	0.005	0.01	0.04					
10	Ray 704	2010	0.08	0.08	0.02	0.005	0.005	0.02					
11	Ray	2010	0.16	0.31	0.05	0.005	0.01	0.03					
11	Ray 786	2010	0.12	0.06	0.01	0.005	0.005	0.02					
12	Ray	2010	0.13	0.11	0.02	0.005	0.005	0.01					
12	Ray 6	2010	0.06	0.09	0.02	0.005	0.005	0.01					
3	Sierrita	2010	0.09	0.02	0.04	0.005	0.005	0.05					
4	Sierrita	2010	0.14	0.03	0.02	0.005	0.005	0.03					
5	Sierrita	2010	0.11	0.04	0.03	0.005	0.03	0.03					
2	Troy	2010	1.83	0.23	0.12	0.01	0.01	0.01					
3	Troy	2010	1.21	0.15	0.06	0.005	0.02	0.005					
1	Western Utah Copper	2010	0.26	0.03	0.02	0.01	0.01	0.01					
5	Bagdad	2009	0.03	0.05	0.04	0.005	0.005	0.005					
11	Mineral Park	2009	0.03	0.05	0.005	0.005	0.02	0.005					
12	Mission	2009	0.06	0.02	0.01	0.005	0.03	0.005					
1	Mission 101 prod	2009	0.35	0.04	0.01	0.01	0.01	0.02					
2	Mission North	2009	0.23	0.06	0.01	0.01	0.01	0.05					
4	Mission North	2009	0.21	0.04	0.02	0.005	0.005	0.08					
5	Mission North	2009	0.28	0.06	0.02	0.005	0.005	0.02					
7	Mission North	2009	0.21	0.03	0.02	0.005	0.005	0.02					
8	Mission North	2009	0.1	0.03	0.01	0.005	0.005	0.005					
9	Mission North	2009	0.005	0.03	0.02	0.005	0.005	0.005					
10	Mission North	2009	0.13	0.02	0.005	0.005	0.03	0.01					
11	Mission North	2009	0.08	0.02	0.01	0.005	0.005	0.005					
12	Mission North	2009	0.08	0.02	0.01	0.005	0.005	0.005					
12	Mission North	2009	0.14	0.01	0.005	0.005	0.005	0.005					
1	Mission North	2009	0.14	0.04	0.01	0.01	0.01	0.01					
1	Mission North 5	2009	0.34	0.06	0.02	0.01	0.01	0.01					
5	Mission South	2009	0.18	0.04	0.02	0.005	0.005	0.005					
5	Mission South	2009	0.24	0.03	0.02	0.005	0.01	0.02					
7	Mission South	2009	0.15	0.02	0.01	0.005	0.005	0.02					

8	**Mission South**	**2009**	0.21	0.03	0.02	0.005	0.005	0.01					
9	**Mission South**	**2009**	0.12	0.03	0.02	0.005	0.005	0.02					
10	**Mission South**	**2009**	0.14	0.005	0.005	0.005	0.005	0.005					
11	**Mission South**	**2009**	0.09	0.02	0.005	0.005	0.005	.0.1					
2	**Mission South 162**	**2009**	0.20	0.05	0.02	0.01	0.01	0.02					
2	**Mission South 102**	**2009**	0.30	0.04	0.01	0.01	0.01	0.01					
3	**Mission South 229**	**2009**	0.19	0.05	0.02	0.005	0.005	0.04					
4	**Mission South 230**	**2009**	0.22	0.03	0.02	0.005	0.005	0.02					
3	**Mission South 163**	**2009**	0.22	0.07	0.02	0.005	0.005	0.02					
4	**Mission South 290**	**2009**	0.32	4	0.02	0.005	0.01	0.02					
1	**Morenci**	**2009**	0.08	0.05	0.01	0.01	0.01	0.01					
2	**Morenci**	**2009**	0.05	0.01	0.01	0.01	0.01	0.01					
3	**Pinto Valley**	**2009**	0.04	0.005	0.005	0.005	0.005	0.06					
6	**Ray**	**2009**	0.02	0.005	0.02	0.005	0.005	0.005					
7	**Ray**	**2009**	0.03	0.03	0.01	0.005	0.005	0.02					
8	**Ray**	**2009**	0.04	0.04	0.01	0.005	0.005	0.02					
9	**Ray**	**2009**	0.05	0.04	0.02	0.005	0.005	0.005					
10	**Ray**	**2009**	0.08	0.05	0.02	0.005	0.005	0.005					
11	**Ray**	**2009**	0.13	0.03	0.005	0.005	0.02	0.03					
12	**Ray**	**2009**	0.06	0.03	0.01	0.005	0.03	0.005					
2	**Ray 166**	**2009**	0.06	0.03	0.01	0.01	0.01	0.02					
11	**Ray 728**	**2009**	0.12	0.02	0.005	0.005	0.02	0.005					
2	**Ray 106**	**2009**	0.10	0.02	0.11	0.01	0.01	0.04					
5	**Ray 328**	**2009**	0.03	0.03	0.02	0.005	0.005	0.005					
12	**Ray 5**	**2009**	0.11	0.01	0.02	0.01	0.02	0.005					
1	**Ray 105**	**2009**	0.13	0.05	0.02	0.01	0.01	0.02					
1	**Ray 14**	**2009**	0.09	0.06	0.01	0.01	0.01	0.02					
3	**Ray 167**	**2009**	0.03	0.05	0.02	0.005	0.01	0.07					
4	**Ray 233**	**2009**	0.02	0.04	0.02	0.005	0.005	0.02					
4	**Ray 296**	**2009**	0.04	0.03	0.02	0.005	0.02	0.02					
5	**Ray 297**	**2009**	0.04	0.03	0.005	0.005	0.005	0.005					
8	**Ray 483 prod**	**2009**	0.03	0.02	0.005	0.005	0.005	0.02					
10	**Ray 561 prod**	**2009**	0.005	0.03	0.02	0.005	0.005	0.005					
10	**Ray 643 Prod**	**2009**	0.09	0.05	0.03	0.005	0.005	0.02					
9	**Ray 560**	**2009**	0.03	0.05	0.02	0.005	0.005	0.005					

1	Chino	2008	0.10	0.01	0.02	0.01	0.01	0.01					
2	Mission	2008	0.21	0.09	0.02	0.01	0.01	0.01					
5	Mission	2008	0.15	0.1	0.02	0.005	0.005	0.005					
2	Mission North	2008	0.33	0.04	0.02	0.01	0.01	0.01					
3	Mission North	2008	0.51	0.05	0.02	0.005	0.01	0.005					
4	Mission North	2008	0.33	0.14	0.04	0.005	0.03	0.03					
5	Mission North	2008	0.42	0.08	0.02	0.005	0.02	0.02					
6	Mission North	2008	0.31	0.08	0.02	0.01	0.005	0.005					
9	Mission North	2008	0.33	0.05	0.02	0.005	0.005	0.03					
10	Mission North	2008	0.32	0.09	0.02	0.005	0.06	0.02					
12	Mission North	2008	0.56	0.09	0.02	0.005	0.005	0.02					
1	Mission North	2008	0.43	0.03	0.04	0.01	0.01	0.01					
7	Mission North	2008	0.34	0.06	0.01	0.005	0.005	0.005					
1	Mission North	2008	0.45	0.05	0.04	0.01	0.01	0.01					
7	Mission North	2008	0.62	0.07	0.005	0.005	0.005	0.005					
8	Mission North	2008	0.32	0.04	0.02	0.005	0.02	0.03					
8	Mission North	2008	0.32	0.09	0.02	0.005	0.01	0.02					
11	Mission North	2008	0.41	0.1	0.02	0.01	0.005	0.02					
11	Mission North	2008	0.39	0.1	0.02	0.01	0.005	0.02					
1	Mission South	2008	0.19	0.01	0.03	0.01	0.01	0.01					
2	Mission South	2008	0.42	0.06	0.02	0.01	0.01	0.01					
2	Mission South	2008	0.32	0.05	0.02	0.01	0.01	0.01					
3	Mission South	2008	0.33	0.04	0.02	0.005	0.005	0.005					
3	Mission South	2008	0.12	0.05	0.02	0.005	0.005	0.005					
4	Mission South	2008	0.12	0.09	0.04	0.005	0.01	0.02					
4	Mission South	2008	0.33	0.08	0.03	0.005	0.005	0.005					
5	Mission South	2008	0.25	0.11	0.03	0.005	0.005	0.03					
6	Mission South	2008	0.21	0.04	0.02	0.005	0.005	0.005					
6	Mission South	2008	0.28	0.06	0.03	0.005	0.005	0.02					
7	Mission South	2008	0.21	0.06	0.005	0.005	0.005	0.005					
7	Mission South	2008	0.09	0.02	0.02	0.005	0.005	0.01					
8	Mission South	2008	0.11	0.06	0.005	0.01	0.005	0.005					
9	Mission South	2008	0.31	0.05	0.02	0.005	0.005	0.02					
9	Mission South	2008	0.13	0.03	0.01	0.005	0.005	0.02					
10	Mission South	2008	0.17	0.1	0.02	0.005	0.005	0.06					

11	Mission South	2008	0.3	0.06	0.04	0.005	0.005	0.005					
11	Mission South	2008	0.22	0.04	0.03	0.01	0.005	0.005					
12	Mission South	2008	0.28	0.05	0.005	0.005	0.005	0.005					
12	Montana Resource ppt	2008	0.01	0.02	0.005	0.13	0.005	0.01					
5	Morenci	2008	0.03	0.03	0.02	0.005	0.03	0.03					
5	Morenci	2008	0.005	0.02	0.02	0.02	0.005	0.02					
6	Morenci	2008	0.02	0.005	0.01	0.02	0.005	0.005					
7	Morenci	2008	0.02	0.01	0.02	0.005	0.005	0.02					
9	Morenci	2008	0.01	0.005	0.005	0.005	0.005	0.02					
10	Morenci	2008	0.01	0.01	0.005	0.005	0.01	0.02					
1	Pinto Valley	2008	0.13	0.01	0.03	0.01	0.01	0.01					
2	Pinto Valley	2008	0.31	0.04	0.05	0.01	0.02	0.08					
8	Pinto Valley	2008	0.05	0.02	0.005	0.005	0.005	0.02					
9	Pinto Valley	2008	0.1	0.005	0.005	0.005	0.005	0.04					
10	Pinto Valley	2008	0.06	0.005	0.005	0.005	0.005	0.03					
11	Pinto Valley	2008	0.11	0.02	0.04	0.005	0.005	0.04					
12	Pinto Valley	2008	0.05	0.005	0.01	0.005	0.005	0.03					
1	Ray	2008	0.12	0.02	0.05	0.01	0.02	0.01					
1	Ray	2008	0.27	0.10	0.04	0.01	0.02	0.01					
2	Ray	2008	0.03	0.02	0.01	0.01	0.01	0.01					
2	Ray	2008	0.03	0.05	0.02	0.01	0.01	0.01					
3	Ray	2008	0.05	0.03	0.01	0.005	0.005	0.02					
3	Ray	2008	0.04	0.09	0.03	0.005	0.01	0.01					
4	Ray	2008	0.06	0.02	0.03	0.005	0.04	0.03					
4	Ray	2008	0.08	0.01	0.02	0.005	0.01	0.02					
5	Ray	2008	0.04	0.04	0.02	0.005	0.005	0.03					
5	Ray	2008	0.04	0.06	0.01	0.005	0.005	0.01					
6	Ray	2008	0.03	0.03	0.02	0.005	0.03	0.02					
6	Ray	2008	0.05	0.04	0.02	0.005	0.02	0.01					
7	Ray	2008	0.03	0.02	0.005	0.005	0.005	0.005					
8	Ray	2008	0.07	0.26	0.03	0.005	0.01	0.005					
8	Ray	2008	0.04	0.06	0.02	0.005	0.02	0.03					
9	Ray	2008	0.06	0.08	0.02	0.005	0.005	0.03					
9	Ray	2008	0.05	0.05	0.01	0.005	0.005	0.03					
10	Ray	2008	0.04	0.04	0.02	0.005	0.005	0.07					

10	Ray	2008	0.03	0.08	0.01	0.005	0.005	0.005					
11	Ray	2008	0.12	0.04	0.04	0.005	0.005	0.03					
11	Ray	2008	0.1	0.02	0.03	0.005	0.005	0.02					
12	Ray 851	2008	0.06	0.13	0.03	0.005	0.005	0.03					
12	Ray 13 Dec Prod	2008	0.05	0.09	0.005	0.005	0.005	0.005					
3	**Chino**	**2007**	0.05	0.005	0.12	0.06	0.005	0.04	0.06				
4	**Chino**	**2007**	0.07	0.005	0.03	0.03	0.005	0.04	0.02				
5	**Chino**	**2007**	0.09	0.005	0.01	0.01	0.005	0.02	0.005				
6	**Chino**	**2007**	0.07	0.005	0.01	0.005	0.005	0.02	0.02				
7	**Chino**	**2007**	0.07	0.005	0.005	0.005	0.005	0.005	0.005				
8	**Chino**	**2007**	0.03	0.005	0.01	0.005	0.005	0.005	0.005				
9	**Chino**	**2007**	0.02	0.005	0.005	0.02	0.005	0.02	0.005				
10	**Chino**	**2007**	0.02	0.005	0.05	0.03	0.005	0.02	0.005				
12	**Chino**	**2007**	0.04	0.005	0.02	0.02	0.005	0.005	0.005				
1	**Mission North**	**2007**	0.27	0.05	0.03	0.02	0.01	0.06	0.02				
2	**Mission North**	**2007**	0.29	0.05	0.02	0.03	0.01	0.01	0.01				
3	**Mission North**	**2007**	0.39	0.04	0.02	0.04	0.005	0.02	0.005				
4	**Mission**	**2007**	0.24	0.04	0.02	0.05	0.005	0.005	0.005				
4	**Mission North**	**2007**	0.09	0.04	0.02	0.02	0.005	0.005	0.02				
5	**Mission North**	**2007**	0.27	0.03	0.02	0.03	0.005	0.005	0.02				
6	**Mission North**	**2007**	0.1	0.03	0.03	0.04	0.005	0.005	0.005				
6	**Mission North**	**2007**	0.32	0.02	0.02	0.02	0.005	0.005	0.02				
7	**Mission North**	**2007**	0.38	0.02	0.06	0.03	0.005	0.005	0.005				
8	**Mission North**	**2007**	0.16	0.005	0.005	0.02	0.005	0.005	0.005				
9	**Mission North**	**2007**	0.46	0.06	0.04	0.03	0.01	0.005	0.01				
10	**Mission North 586**	**2007**	0.27	0.02	0.005	0.03	0.005	0.005	0.02				
10	**Mission Prod**	**2007**	0.42	0.03	0.01	0.06	0.005	0.005	0.04				
11	**Mission North**	**2007**	0.36	0.05	0.02	0.05	0.005	0.005	0.005				
11	**Mission South 648**	**2007**	0.3	0.04	0.02	0.07	0.005	0.005	0.005				
12	**Mission South 11 prod**	**2007**	0.36	0.07	0.36	0.06	0.005	0.005	0.01				
12	**Mission South 770**	**2007**	0.42	0.04	0.02	0.08	0.005	0.005	0.005				
10	**Morenci**	**2007**	0.01	0.005	0.06	0.04	0.005	0.02	0.01				
11	**Morenci**	**2007**	0.01	0.005	0.005	0.05	0.005	0.02	0.005				
12	**Morenci**	**2007**	0.01	0.005	0.03	0.02	0.005	0.005	0.005				
1	**MRI ppt**	**2007**	0.01	0.02	0.01	0.01	0.15	0.01	0.01				

10	**Pinto Valley**	**2007**	0.06	0.005	0.05	0.03	0.005	0.02	0.02				
11	**Pinto Valley**	**2007**	0.04	0.005	0.005	0.03	0.005	0.02	0.01				
1	**Ray**	**2007**	0.04	0.05	0.02	0.01	0.01	0.01	0.02				
2	**Ray**	**2007**	0.03	0.08	0.04	0.01	0.01	0.01	0.03				
3	**Ray**	**2007**	0.05	0.02	0.13	0.07	0.005	0.03	0.07				
4	**Ray**	**2007**	0.07	0.04	0.04	0.03	0.005	0.04	0.04				
5	**Ray**	**2007**	0.04	0.03	0.02	0.01	0.005	0.005	0.02				
6	**Ray**	**2007**	0.07	0.03	0.01	0.03	0.005	0.005	0.02				
7	**Ray**	**2007**	0.04	0.01	0.01	0.005	0.005	0.01	0.01				
8	**Ray 437**	**2007**	0.04	0.03	0.02	0.005	0.005	0.01	0.01				
8	**Ray 503 Aug Prod**	**2007**	0.06	0.01	0.02	0.005	0.005	0.01	0.02				
9	**Ray 504**	**2007**	0.04	0.005	0.005	0.02	0.005	0.03	0.005				
9	**Ray 558 prod**	**2007**	0.05	0.05	0.05	0.04	0.005	0.02	0.02				
10	**Ray 568**	**2007**	0.05	0.02	0.05	0.03	0.005	0.02	0.02				
10	**Ray 646**	**2007**	0.04	0.005	0.005	0.005	0.005	0.005	0.03				
11	**Ray 656**	**2007**	0.04	0.005	0.005	0.02	0.005	0.02	0.005				
11	**Ray Prod 763**	**2007**	0.04	0.005	0.005	0.05	0.005	0.02	0.005				
12	**Ray 4 prod**	**2007**	0.05	0.12	0.03	0.005	0.005	0.02	0.02				
12	**Ray 765**	**2007**	0.04	0.02	0.02	0.02	0.005	0.01	0.005				
1	**Robinson**	**2007**	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
2	**Robinson**	**2007**	0.02	0.02	0.03	0.01	0.01	0.01	0.03				
3	**Robinson**	**2007**	0.07	0.005	0.12	0.07	0.005	0.03	0.06				
4	**Robinson**	**2007**	0.05	0.005	0.03	0.02	0.005	0.02	0.02				
1	**Chino**	**2006**	0.08	0.02	0.02	0.01	0.01	0.01					
2	**Chino**	**2006**	0.07	0.06	0.02	0.01	0.01	0.01					
3	**Chino**	**2006**	0.03	0.005	0.01	0.005	0.01	0.005					
1	**Kennecott**	**2006**	0.32	0.32	0.03	0.01	0.02	0.02					
2	**Kennecott**	**2006**	0.34	0.31	0.02	0.005	0.01	0.01					
3	**Kennecott**	**2006**	0.21	0.24	0.02	0.005	0.02	0.02					
1	**Mission North**	**2006**	0.23	0.04	0.03	0.01	0.01	0.01					
3	**Mission North**	**2006**	0.31	0.01	0.02	0.005	0.005	0.01					
5	**Mission North**	**2006**	0.21	0.01	0.005	0.01	0.005	0.005					
7	**Mission North**	**2006**	0.09	0.05	0.02	0.005	0.005	0.02					
8	**Mission North**	**2006**	0.05	0.03	0.02	0.005	0.005	0.02					
10	**Mission North**	**2006**	0.09	0.03	0.02	0.005	0.005	0.005					

11	**Mission North**	**2006**	0.4	0.03	0.02	0.005	0.005	0.005					
12	**Mission North**	**2006**	0.49	0.13	0.01	0.005	0.005	0.005					
9	**Mission North cars**	**2006**	0.16	0.06	0.02	0.01	0.01	0.01					
9	**Mission North truck**	**2006**	0.05	0.03	0.03	0.005	0.02	0.01					
6	**Mission South**	**2006**	0.12	0.005	0.01	0.005	0.005	0.005					
2	**Montana Resource**	**2006**	0.66	0.11	0.02	0.01	0.01	0.01					
3	**Montana Resource**	**2006**	0.51	0.08	0.03	0.01	0.005	0.02					
7	**Montana Resource**	**2006**	0.57	0.03	0.01	0.01	0.005	0.005					
10	**Montana Resource ppt**	**2006**	0.01	0.01	0.01	0.13	0.005	0.005					
11	**Montana Resource ppt**	**2006**	0.02	0.02	0.005	0.11	0.005	0.005					
12	**Montana Resource ppt**	**2006**	0.01	0.02	0.01	0.12	0.005	0.01					
1	**Ray**	**2006**	0.09	0.02	0.03	0.01	0.02	0.03					
2	**Ray**	**2006**	0.04	0.02	0.02	0.01	0.02	0.01					
3	**Ray**	**2006**	0.04	0.005	0.01	0.005	0.01	0.02					
4	**Ray**	**2006**	0.04	0.1	0.02	0.005	0.01	0.03					
5	**Ray**	**2006**	0.04	0.04	0.02	0.005	0.02	0.02					
6	**Ray**	**2006**	0.04	0.005	0.02	0.005	0.01	0.01					
8	**Ray**	**2006**	0.1	0.04	0.02	0.005	0.02	0.005					
9	**Ray**	**2006**	0.04	0.02	0.02	0.005	0.01	0.02					
10	**Ray**	**2006**	0.1	0.07	0.03	0.005	0.005	0.02					
11	**Ray**	**2006**	0.32	0.16	0.04	0.005	0.01	0.005					
12	**Ray**	**2006**	0.04	0.04	0.02	0.005	0.02	0.01					
7	**Ray 257**	**2006**	0.03	0.005	0.01	0.005	0.005	0.01					
7	**Ray 258**	**2006**	0.06	0.005	0.01	0.005	0.005	0.02					
1	**Robinson**	**2006**	0.09	0.01	0.02	0.01	0.01	0.01					
2	**Robinson**	**2006**	0.08	0.6	0.1	0.005	0.005	0.005					
3	**Robinson**	**2006**	0.08	0.1	0.01	0.005	0.005	0.01					
4	**Robinson**	**2006**	0.02	0.005	0.02	0.005	0.005	0.02					
5	**Robinson**	**2006**	0.04	0.005	0.02	0.005	0.02	0.005					
6	**Robinson**	**2006**	0.005	0.005	0.02	0.005	0.01	0.01					
11	**Robinson**	**2006**	0.02	0.005	0.005	0.005	0.005	0.005					
12	**Robinson**	**2006**	0.02	0.005	0.01	0.005	0.005	0.01					
1	**Ray**	**2005**	0.06										
2	**Ray**	**2005**	0.07										
3	**Ray**	**2005**	0.04										

4	**Ray**	**2005**	0.03										
5	**Ray**	**2005**	0.04										
6	**Ray**	**2005**	0.26										
7	**Ray**	**2005**	0.03										
8	**Ray**	**2005**	0.03										
9	**Ray**	**2005**	0.07										
10	**Ray**	**2005**	0.07										
11	**Ray**	**2005**	0.05										
12	**Ray**	**2005**	0.05										
2	**Ray Con SP to PD**	**2005**	0.04										
1	**Robinson**	**2005**	0.04										
2	**Robinson**	**2005**	0.06										
3	**Robinson**	**2005**	0.05										
4	**Robinson**	**2005**	0.04										
5	**Robinson**	**2005**	0.02										
6	**Robinson**	**2005**	0.03										
7	**Robinson**	**2005**	0.05										
12	**Robinson**	**2005**	0.03										
5	**Montana Resource**	**2005**	0.48										
6	**Montana Resource**	**2005**	0.4										
7	**Montana Resource**	**2005**	0.52										
12	**Montana Resource**	**2005**	0.59										
6	**PD**	**2005**	0.24										
6	**PD Chino**	**2005**	0.02										
7	**PD Mitsui**	**2005**	0.09										
7	**PD Trafigura**	**2005**	0.09										
6	**Cananea**	**2005**	0.08										
1	**Chino**	**2005**	0.03										
2	**Chino**	**2005**	0.04										
7	**Chino**	**2005**	0.02										
10	**Chino**	**2005**	0.04										
11	**Chino**	**2005**	0.02										
12	**Chino**	**2005**	0.05										
12	**KCC**	**2005**	0.3										
1	**Mission North**	**2005**	0.10										

3	**Mission North**	**2005**	0.12										
5	**Mission North**	**2005**	0.22										
6	**Mission North**	**2005**	0.31										
7	**Mission North**	**2005**	0.09										
8	**Mission North**	**2005**	0.12										
9	**Mission North**	**2005**	0.06										
10	**Mission North**	**2005**	0.42										
11	**Mission North**	**2005**	0.47										
12	**Mission North**	**2005**	0.4										
5	**Bagdad**	**2004**	0.03										
6	**Bagdad**	**2004**	0.03										
4	**Cananea**	**2004**	0.14										
7	**Cananea**	**2004**	0.05										
8	**Cananea**	**2004**	0.09										
6	**Cananea/PD**	**2004**	0.12										
11	**Chino**	**2004**	0.04										
12	**Chino**	**2004**	0.06										
4	**Gerald ppt**	**2004**	0.06										
5	**Gerald ppt**	**2004**	0.02										
6	**Gerald ppt**	**2004**	0.01										
1	**Mission North**	**2004**	0.15										
3	**Mission North**	**2004**	0.23										
4	**Mission North**	**2004**	0.14										
5	**Mission North**	**2004**	0.05										
6	**Mission North**	**2004**	0.1										
7	**Mission North**	**2004**	0.03										
8	**Mission North**	**2004**	0.2										
9	**Mission North**	**2004**	0.44										
10	**Mission North**	**2004**	0.12										
11	**Mission North**	**2004**	0.23										
12	**Mission North**	**2004**	0.52										
6	**Montana Resource**	**2004**	0.23										
7	**Montana Resource**	**2004**	0.29										
8	**Montana Resource**	**2004**	0.33										
9	**Montana Resource**	**2004**	0.51										

10	**Montana Resource**	**2004**	0.42										
7	**Montana Resource ppt**	**2004**	0.02										
8	**Montana Resource ppt**	**2004**	0.02										
9	**Montana Resource ppt**	**2004**	0.005										
11	**Montana Resource ppt**	**2004**	0.02										
12	**Oracle Ridge**	**2004**	0.06										
1	**Ray**	**2004**	0.06										
2	**Ray**	**2004**	0.13										
3	**Ray**	**2004**	0.08										
4	**Ray**	**2004**	0.07										
5	**Ray**	**2004**	0.1										
6	**Ray**	**2004**	0.07										
7	**Ray**	**2004**	0.05										
8	**Ray**	**2004**	0.05										
9	**Ray**	**2004**	0.06										
10	**Ray**	**2004**	0.03										
11	**Ray**	**2004**	0.04										
12	**Ray**	**2004**	0.06										
9	**Robinson**	**2004**	0.04										
5	**Sierrita**	**2004**	0.05										
6	**Sierrita**	**2004**	0.05										
9	**Sierrita**	**2004**	0.1										
10	**Sierrita**	**2004**	0.06										
11	**Sierrita**	**2004**	0.06										
	Statistical Outlier Analysis using Interquartile Range Method												
	Quartile 1		0.05	0.02	0.01	0.005	0.005	0.005	0.005	0.02	0.004125	0.0000815	0.00001
	Quartile 3		0.22	0.06	0.03	0.01	0.01	0.02	0.02	0.0425	0.00775	0.00017125	0.00001
	IQR		0.17	0.04	0.02	0.005	0.005	0.015	0.015	0.0225	0.003625	0.00008975	0
	Lower Fence		-0.205	-0.04	-0.02	-0.0025	-0.0025	-0.0175	-0.0175	-0.01375	-0.001313	-0.000053125	0.00001
	Upper Fence		0.475	0.12	0.06	0.0175	0.0175	0.0425	0.0425	0.07625	0.0131875	0.000305875	0.00001
	Mean		0.1330369	0.0375641	0.0194990	0.0054964	0.0057640	0.0123185	0.0109934	0.0256757	0.0056167	0.0001076	0.0000100
	Max		0.47	0.12	0.06	0.01	0.01	0.04	0.04	0.07	0.01	0.00	0.00
	Std Dev		0.109397133	0.0300155	0.0135865	0.002555	0.0027582	0.0099753	0.0064375	0.0072051	0.0006013	1.09055E-05	0

	Max + 5%		0.49	0.13	0.06	0.01	0.01	0.04	0.04	0.07	0.01	0.00018	0.00001
	Mean + 2 SD		0.35	0.10	0.05	0.01	0.01	0.03	0.02	0.04	0.01	0.00013	0.00001
	Used		0.49	0.13	0.06	0.01	0.01	0.04	0.04	0.07	0.01	0.00018	0.00001
Inv. Byproducts													
				%	**%**	**%**	**%**	**%**	**%**				
Year	**No.**	**Stockpile #**	**Sample**	**Pb**	**As**	**Sb**	**Cd**	**Ni**	**Se**				
2016	**1**	**4027**	**Reverts -10**	0.88	0.01	0.03	0.01	0.05	0.01				
2016	**1**	**4028H**	**Reverts -10**	0.86	0.13	0.06	0.01	0.04	0.04				
2016	**2**	**4028H**	**Reverts -10**	0.85	0.02	0.01	0.01	0.04	0.02				
2016	**2**	**4029H**	**Reverts -10**	0.90	0.04	0.02	0.01	0.05	0.02				
2016	**3**	**4028H**	**Reverts -10**	0.74	0.02	0.02	0.01	0.04	0.02				
2016	**3**	**4029H**	**Reverts -10**	0.82	0.02	0.02	0.01	0.03	0.02				
2016	**4**	**4030H**	**Reverts -10**	0.75	0.02	0.01	0.05	0.04	0.02				
2016	**4**	**4031H**	**Reverts -10**	0.77	0.06	0.02	0.01	0.04	0.02				
2016	**4**	**4029H**	**Reverts -10**	0.84	0.02	0.01	0.04	0.04	0.02				
2016	**5**	**4029H**	**Reverts -10**	0.76	0.01	0.02	0.01	0.03	0.06				
2016	**5**	**4030H**	**Reverts -10**	0.82	0.01	0.02	0.01	0.04	0.06				
2016	**5**	**4031H**	**Reverts -10**	0.71	0.01	0.02	0.01	0.03	0.06				
2016	**6**	**4030H**	**Reverts -10**	0.80	0.04	0.02	0.01	0.04	0.02				
2016	**6**	**4031H**	**Reverts -10**	0.77	0.04	0.02	0.01	0.04	0.01				
2016	**8**	**4031**	**Reverts -10**	0.74	0.06	0.01	0.05	0.04	0.02				
2016	**9**	**4031**	**Reverts -10**	0.76	0.01	0.02	0.01	0.04	0.03				
2015	**1**	**4016-H**	**Reverts -10**	0.44	0.03	0.01	0.01	0.06	0.02				
2015	**1**	**176-M**	**Reverts -10**	0.84	0.02	0.02	0.01	0.08	0.03				
2015	**2**	**177-M**	**Reverts -10**	0.64	0.01	0.01	0.01	0.16	0.02				
2015	**2**		**Reverts -10**	0.50	0.01	0.04	0.01	0.08	0.02				
2015	**3**	**4018**	**Reverts -10**	0.62	0.03	0.02	0.01	0.05	0.02				
2015	**4**	**4018-H**	**Reverts -10**	0.9	0.03	0.01	0.01	0.05	0.02				
2015	**4**	**4019-H**	**Reverts -10**	0.81	0.03	0.01	0.01	0.05	0.02				
2015	**6**	**4021-H**	**Reverts -10**	0.64	0.03	0.01	0.01	0.06	0.2				
2015	**7**	**4022-H**	**Reverts -10**	0.9	0.03	0.01	0.01	0.07	0.01				
2015	**8**	**4023**	**Reverts -10**	0.88	0.03	0.01	0.01	0.04	0.01				
2015	**8**	**4023**	**Reverts -10**	0.97	0.03	0.01	0.01	0.04	0.02				
2015	**9**	**4024**	**Reverts -10**	0.75	0.03	0.02	0.01	0.04	0.02				

2015	9	4023	Reverts -10	0.97	0.03	0.01	0.01	0.04	0.02				
2015	10	4024	Reverts -10	0.58	0.01	0.02	0.01	0.03	2				
2015	10	4025	Reverts -10	0.76	0.02	0.04	0.01	0.04	0.03				
2015	11	4025	Reverts -10	0.90	0.03	0.01	0.01	0.05	0.05				
2015	12		Reverts -10	0.73	0.07	0.03	0.04	0.03	0.01				
2015	12		Reverts -10	0.89	0.02	0.02	0.04	0.03	0.01				
2014	1	Stockpile #	Reverts -10	0.54	0.01	0.01	0.01	0.07	0.02				
2014	2	3572-H	Reverts -10	0.45	0.01	0.01	0.01	0.08	0.01				
2014	3	4500H	Reverts -10	0.56	0.01	0.01	0.01	0.06	0.01				
2014	4	4006-H	Reverts -10	0.41	0.02	0.02	0.01	0.08	0.03				
2014	5	4007-H	Reverts -10	0.61	0.01	0.01	0.01	0.07	0.01				
2014	6	4007	Reverts -10	0.63	0.03	0.01	0.01	0.09	0.04				
2014	6	4008-H	Reverts -10	0.37	0.01	0.01	0.01	0.08	0.02				
2014	7	4009-H	Reverts -10	0.53	0.01	0.01	0.01	0.06	0.03				
2014	7	4009-H	Reverts -10	0.42	0.01	0.03	0.01	0.05	0.01				
2014	8	4009-H	Reverts -10	0.41	0.03	0.01	0.01	0.06	0.03				
2014	8		Reverts -10	0.5	0.03	0.01	0.01	0.07	0.03				
2014	9	4012-H	Reverts -10	0.4	0.01	0.01	0.01	0.09	0.02				
2014	10	4013-H	Reverts -10	0.36	0.06	0.02	0	0.06	0.01				
2014	11	4014-H	Reverts -10	0.3	0.05	0.03	0.03	0.03	0.01				
2013	1	3509	Reverts -10	0.33	0.01	0.02	0.01	0.06	0.04				
2013	1	3508	Reverts -10	0.34	0.02	0.02	0.01	0.07	0.02				
2013	3	3512	Reverts -10	0.56	0.02	0.03	0.01	0.07	0.01				
2013	3	3511	Reverts -10	0.80	0.02	0.01	0.01	0.06	0.01				
2013	4	3513-H	Reverts -10	0.45	0.02	0.03	0.01	0.04	0.01				
2013	6	3514-H	Reverts -10	0.52	0.04	0.07	0.01	0.05	0.03				
2013	7	3518-H	Reverts -10	0.52	0.03	0.01	0.01	0.06	0.03				
2013	7	3514-H	Reverts -10	0.38	0.02	0.02	0.01	0.05	0.09				
2013	7	3519	Reverts -10	0.56	0.03	0.02	0.01	0.06	0.03				
2013	8	3518	Reverts -10	0.44	0.03	0.01	0.01	0.06	0.04				
2013	8	3520	Reverts -10	0.51	0.03	0.01	0.01	0.08	0.03				
2013	8	3514	Reverts -10	0.39	0.04	0.01	0.01	0.05	0.04				
2013	8	3519 July S	Reverts -10	0.56	0.03	0.02	0.01	0.06	0.03				
2013	10	3520-H	Reverts -10	0.44	0.03	0.02	0.01	0.04	0.01				
2013	10	3521	Reverts -10	0.42	0.01	0.03	0.01	0.05	0.04				

2013	11	**3523**	**Reverts -10**	0.37	0.02	0.02	0.01	0.07	0.05				
2013	9	**3521**	**Reverts -10 S**	0.38	0.01	0.01	0.01	0.07	0.01				
2013	9	**3520**	**Reverts -10 A**	0.64	0.02	0.02	0.01	0.06	0.02				
2013	9	**3519**	**Reverts -10 Ju**	0.47	0.03	0.02	0.01	0.07	0.02				
2013	9	**3518**	**Reverts -10 Ju**	0.52	0.02	0.02	0.01	0.07	0.03				
2012	1	**Stockpile # 3**	**Reverts -10**	0.77	0.08	0.04	0.02	0.11	0.04				
2012	3		**Reverts -10**	0.92	0.01	0.07	0.06	0.09	0.02				
2012	4		**Reverts -10**	0.69	0.06	0.04	0.01	0.08	0.03				
2012	5	**3501**	**Reverts -10**	0.76	0.04	0.01	0.01	0.05	0.01				
2012	5	**3502**	**Reverts -10**	0.58	0.01	0.04	0.01	0.09	0.02				
2012	6	**Stockpile # 3**	**Reverts -10**	0.45	0.04	0.01	0.01	0.08	0.01				
2012	9	**Stockpile # 3**	**Reverts -10**	0.67	0.04	0.03	0.01	0.06	0.03				
2012	9	**Stockpile # 3**	**Reverts -10**	0.55	0.04	0.03	0.01	0.06	0.02				
2012	9	**Stockpile # 3**	**Reverts -10**	0.42	0.02	0.06	0.01	0.04	0.02				
2012	10	**Stockpile # 3**	**Reverts -10**	0.34	0.03	0.01	0.01	0.03	0.02				
2012	11	**Stockpile # 3**	**Reverts -10**	0.43	0.03	0.01	0.01	0.05	0.01				
2012	7	**3504H**	**Reverts -10 me**	0.6	0.03	0.02	0.01	0.05	0.01				
2012	12	**Stockpile # 3**	**Reverts -10 me**	0.42	0.01	0.01	0.01	0.05	0.03				
2011	7	**Stockpile # 2**	**Reverts -10**	0.5	0.1	0.03	0.01	0.07	0.01				
2011	9	**Stockpile # 2**	**Reverts -10**	0.41	0.08	0.04	0.01	0.09	0.03				
2011	3	**Stockpile # (**	**Reverts -10 Me**	0.45	0.03	0.03	0.01	0.06	0.06				
2011	3	**Stockpile # (**	**Reverts -10 Me**	0.39	0.03	0.03	0.01	0.06	0.07				
2011	6	**Stockpile # 2**	**Reverts -10 Me**	0.49	0.05	0.04	0.01	0.06	0.01				
2011	12	**Stockpile #**	**Reverts -10 me**	0.47	0.04	0.04	0.01	0.05	0.03				
2011	11	**Stockpile #**	**Reverts -10 Ne**	0.65	0.09	0.05	0.01	0.09	0.04				
2011	8	**Stockpile # (**	**Reverts -10 SC**	0.47	0.05	0.04	0.01	0.07	0.03				
2011	2		**Reverts -10 SC**	0.46	0.05	0.03	0.01	0.06	0.03				
2010	3	**Stockpile # (**	**Revert Fines -**	0.95	0.03	0.12	0.01	0.08	0.01				
2010	4	**Stockpile # (**	**Reverts -¼"**	0.55	0.03	0.02	0.01	0.05	0.02				
2010	7	**Stockpile # (**	**Reverts ¼"**	0.61	0.07	0.02	0.01	0.04	0.02				
2010	4	**Stockpile # 3**	**Reverts -10 Lo**	0.6	0.03	0.04	0.01	0.06	0.02				
2010	11	**Stockpile # 2**	**Reverts 2"**	0.54	0.03	0.03	0.01	0.05	0.03				
2010	12	**Stockpile # (**	**Reverts ¼"**	0.52	0.03	0.03	0.01	0.05	0.04				
2010	11	**Stockpile # (**	**Reverts -¼"**	0.57	0.03	0.03	0.01	0.05	0.03				
2010	11	**Stockpile # (**	**Reverts -¼"**	0.49	0.05	0.02	0.01	0.04	0.04				

2010	**11**	**Stockpile # (**	**Reverts -¼"**	0.54	0.03	0.03	0.01	0.05	0.02
2010	**11**	**Stockpile # (**	**Reverts -¼"**	0.55	0.04	0.02	0.01	0.04	0.04
2010	**3**	**Stockpile # 3**	**Reverts -10**	0.82	0.03	0.1	0.01	0.08	0.01
2010	**5**	**Stockpile # 5**	**Reverts -10**	0.45	0.03	0.05	0.01	0.06	0.04
2010	**12**	**Stockpile # 2**	**Reverts -10 SC**	0.45	0.03	0.03	0.01	0.05	0.03
2010	**7**	**Stockpile # (**	**Revets ¼"**	0.59	0.07	0.03	0.01	0.05	0.03
2009	**10**	**Stockpile # -¼ Reverts Loo**		0.51	0.02	0.02	0.01	0.05	0.03
2009	**10**	**Stockpile # -10 Matte & Sla**		0.4	0.1	0.02	0.02	0.02	0.02
2009	**4**	**Stockpile # -10 Reverts Loo**		0.34	0.05	0.05	0.01	0.01	0.07
2009	**7**	**Stockpile # -10 Reverts Loo**		0.34	0.04	0.03	0.01	0.01	0.02
2009	**8**	**Stockpile # -10 Reverts loop**		0.27	0.04	0.04	0.01	0.04	0.01
2009	**12**	**Stockpile # -10 reverts loop**		0.66	0.05	0.03	0.01	0.04	0.03
2009	**10**	**Stockpile # -10 Reverts Loo**		0.3	0.04	0.02	0.01	0.01	0.01
2009	**3**	**Stockpile # -10 Reverts Ter**		0.71	0.03	0.03	0.01	0.04	0.03
2009	**9**	**Stockpile # 3553 -10 Revert**		0.59	0.06	0.03	0.01	0.04	0.04
2009	**9**	**Stockpile # 3554 -¼" Rever**		0.56	0.08	0.05	0.01	0.02	0.02
2009	**11**	**Stockpile # 3554-4 -¼ Reve**		0.47	0.03	0.02	0.01	0.04	0.02
2009	**3**	**Stockpile # 3690 -10 reverts**		0.67	0.02	0.03	0.01	0.05	0.03
2009	**1**	**Stockpile # 3919 -10 Revert**		0.77	0.04	0.03	0.01	0.05	0.02
2009	**2**	**Stockpile # 3919 -10 Revert**		0.21	0.03	0.02	0.01	0.04	0.01
2009	**11**	**Stockpile # 3938-H -10 Rev**		0.54	0.01	0.02	0.01	0.04	0.03
2009	**11**	**Stockpile # 3944-H-5 -10 R**		0.55	0.02	0.02	0.01	0.04	0.02
2008	11	Stockpile # -10 Reverts 3548		0.83	0.03	0.02	0.01	0.03	0.02
2008	10	Stockpile # -10 Reverts loop		0.77	0.03	0.03	0.01	0.03	0.05
2008	9	Stockpile # -10 Reverts SCO		0.41	0.05	0.03	0.01	0.02	0.02
2008	7	Stockpile # 3408 Reverts -10		0.84	0.06	0.03	0.01	0.03	0.02
2008	12	Stockpile # 3547 -10 Reverts		1.11	0.05	0.02	0.01	0.04	0.01
2008	12	Stockpile # 3548 -10 Reverts		1.12	0.05	0.02	0.01	0.03	0.01
2008	2	Stockpile # SCO Terrace -10		0.77	0.05	0.06	0.01	0.07	0.06
2008	11	Stockpile #3478 -10 Reverts		0.87	0.06	0.01	0.01	0.03	0.02
			Statistical Outlier Analysis using Interquartile Range Method						
			Quartile 1	0.45	0.02	0.01	0.005	0.04	0.02
			Quartile 3	0.7625	0.04	0.03	0.005	0.06	0.03
			IQR	0.3125	0.02	0.02	0	0.02	0.01

			Lower Fence	-0.01875	-0.01	-0.02	0.005	0.01	0.005			
			Upper Fence	1.23125	0.07	0.06	0.005	0.09	0.045			
			Mean	0.60	0.03	0.02	0.01	0.05	0.02			
			Max	1.12	0.07	0.06	0.01	0.09	0.04			
			Std Dev	0.19	0.02	0.01	0.00	0.02	0.01			
			Max + 5%	1.18	0.07	0.06	0.01	0.09	0.04			
			Mean + 2 SD	0.99	0.06	0.05	0.01	0.09	0.04			
			Used	1.18	0.07	0.06	0.01	0.09	0.04			
		%	%	%	%	%	%	%	%	%	%	%
Road dust composites		**Pb**	**As**	**Sb**	**Cd**	**Ni**	**Se**	**Cr**	**Mn**	**Co**	**Hg**	**Be**
2003	Plant Clean-up	0.643	0.168	0.0184	0.0332	0.0125	0.0219	0.00822	0.0224	0.00939	0.000746	0.0000051
2004	Plant Clean-up	0.125	0.0139	0.0139	0.00405	0.0134	0.0077	0.0253	0.0347	0.0075	0.000343	0.000109
2006	Sweeper	0.136	0.01	0.01	0.0048	0.0144	0.0134	0.0266	0.0334	0.0106	0.000143	0.00004
2009	Sweeper	0.365	0.106	0.0207	0.0109	0.0223	0	0.0392	0.0317	0.0088	0.000294	0.000016
2011	Sweeper	0.305	0.0917	0.0188	0.026	0.011	0.0185	0.0314	0.0252	0.00903	0.000576	0.000043
2012	Sweeper	0.317	0.0313	0.0082	0.0058	0.0106	0.0076	0.0315	0	0.0064	0.000133	0.000124
	Statistical Outlier Analysis using Interquartile Range Method											
	Quartile 1	0.17825	0.01825	0.010975	0.00505	0.011375	0.007625	0.025625	0.0231	0.007825	0.0001808	0.000022
	Quartile 3	0.353	0.102425	0.0187	0.022225	0.01415	0.017225	0.031475	0.032975	0.0093	0.0005178	0.0000925
	IQR	0.17475	0.084175	0.007725	0.017175	0.002775	0.0096	0.00585	0.009875	0.001475	0.000337	0.0000705
	Lower Fence	-0.083875	-0.1080125	-0.000612	-0.020713	0.0072125	-0.006775	0.01685	0.0082875	0.0056125	-0.000325	-0.00008375
	Upper Fence	0.615125	0.2286875	0.0302875	0.0479875	0.0183125	0.031625	0.04025	0.0477875	0.0115125	0.0010233	0.00019825
	Mean	0.25	0.07	0.02	0.01	0.01	0.01	0.03	0.03	0.01	0.00	0.00
	Max	0.37	0.17	0.02	0.03	0.01	0.02	0.04	0.03	0.01	0.00	0.00
	Std Dev	0.11	0.06	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00
	Max + 5%	0.38	0.18	0.02	0.03	0.02	0.02	0.04	0.04	0.01	0.00	0.00
	Mean + 2 SD	0.47	0.20	0.03	0.04	0.02	0.03	0.04	0.04	0.01	0.00	0.00
	Used	0.47	0.20	0.03	0.04	0.02	0.03	0.04	0.04	0.01	0.00	0.00

Particulate Matter Fractional Speciation

This worksheet explains how Asarco determined the PM fraction for its particulate analyses given the limited information available. In general, Asarco used AP-42 for gaseous pollutants. For process emissions, Asarco calculated a PM10 and PM2.5 ratio to PM ratio based on its one set of stack testing that provides both filterable PM and condensable PM basis. Asarco then assumed that total filterable PM by method 201 = PM by method 5. Asarco then established the ratio of total filterable + condensable PM to former method 5 PM by dividing the filterable + condensable method 201+202 data by the method 201 filterable data. This gives a general ratio, to which Asarco added a 15% safety factor. Then, because there is only one stack test using method 201, Asarco used the method set forth in AP-42, App. B to calculate the percentage of the new "total PM" value that would be PM10 and PM2.5. Asarco validated this sum as being "similar" to the stack test results, but believes that the AP-42 values, which are based on many more tests, are more likely to be representative than the single stack test. In any case, both values were usually similar.

Converting Acid Plant PM Method 5 to PM10 and PM2.5					
Method 201 PM10 + Method 202 = 0.01188 gr/dscf					
Method 201 total PM = Method 5 FPM = 0.00126 gr/dscf					
Ratio PM10/M5 PM +15% safety margin =				10.84285714	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:					
PM to PM10:	10.84285714	x AP-42	0.991	**10.74527143**	PM10
PM to PM2.5	10.84285714	x AP-42	0.956	**10.36577143**	PM2.5
Secondary Hood Baghouse Method 5 to PM10 and PM2.5					
Method 201 PM10 + Method 202 = 0.0046 gr/dscf					
Method 201 total PM = Method 5 FPM = 0.00061					
Ratio PM10/M5 PM + 15% safety margin =				8.672131148	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:					
PM to PM10:	8.672131148	x AP-42	0.956	**8.290557377**	PM10
PM to PM2.5	8.672131148	x AP-42	0.901	**7.813590164**	PM2.5
R&R Cottrell Method 5 to PM10 and PM2.5					
R&R Cottrell Method 201 PM10 + Method 202 = 0.00432 gr/dscf					
Method 201 total PM = Method 5 FPM = 0.00067 gr/dscf					
Ratio PM10/M5 PM + 15% safety margin =				7.414925373	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology, using baghouse factors:					
PM to PM10:	7.414925373	x AP-42	0.925	**6.85880597**	PM10
PM to PM2.5	7.414925373	x AP-42	0.832	**6.16921791**	PM2.5
Concentrate Dryers Method 5 to PM10 and PM2.5					
Assume negligible CPM present				1	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:					
PM to PM10:	1	x AP-42	0.885	**0.885**	PM10
PM to PM2.5	1	x AP-42	0.462	**0.462**	PM2.5
Revert Crusher Method 5 to PM10 and PM2.5					
Assume no condensables given nature of process				1	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:					

PM to PM10:		1	x AP-42	0.131	**0.131**	PM10
PM to PM2.5		1	x AP-42	0.068	**0.068**	PM2.5
Anode Furnace Fugitive Study to PM10 and Pm2.5						
Assume anode condensable % similar to converter condensable %						
Method 201 PM10 + Method 202 = 0.0046 gr/dscf						
Method 201 total PM = Method 5 FPM = 0.00061						
Ratio PM10/M5 PM + 15% safety factor =					8.672131148	PM F+C
Assume anode fugitives follow AP-42, App. B., Table B.2.2, Category 8						
PM to PM10:		8.672131148	x AP-42	0.92	**7.978360656**	PM10
PM to PM2.5		8.672131148	x AP-42	0.82	**7.111147541**	PM2.5
Anode Refining Area fugitives						
Based on AP-42 factor that includes condensables						
PM = PM10 = PM2.5						
Flash Furnace Fugitives						
Assume R&R Cottrell data is most accurate						
From R&R Cottrell data above (including 15% safety)					7.414925373	PM F+C
Use flash furnace emissions speciation prior to control, AP-42, Ch. 12.3, Tables 12.3-13 & 12.3-15						
PM to PM10:		7.414925373	x AP-42	0.601	**4.456370149**	PM10
PM to PM2.5		7.414925373	x AP-42	0.548	**4.063379104**	PM2.5
Converter Fugitives						
Assume converter fugitive condensable % similar to converter condensable %						
Method 201 PM10 + Method 202 = 0.0046 gr/dscf						
Method 201 total PM = Method 5 FPM = 0.00061						
Ratio PM10/M5 PM + 15% safety margin =					8.672131148	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:						
PM to PM10:		8.672131148	x AP-42	0.96	**8.325245902**	PM10
PM to PM2.5		8.672131148	x AP-42	0.6	**5.203278689**	PM2.5
R&R Cottrell Method 5 to PM10 and PM2.5						
Method 201 PM10 + Method 202 = 0.00432 gr/dscf						
Method 201 total PM = Method 5 FPM = 0.00067 gr/dscf						
Ratio PM10/M5 PM + 15% safety margin =					7.414925373	PM F+C
Convert from total PM to fractions using AP-42, App. B methodology:						
PM to PM10:		7.414925373	x AP-42	0.823	**6.102483582**	PM10
PM to PM2.5		7.414925373	x AP-42	0.765	**5.67241791**	PM2.5
Cooling Tower Speciation						
The Reisman-Frisbie method states: "The data consist of water droplet size distributions for a drift eliminator that achieved a tested drift rate of 0.0003 percent. As we are using a 0.0006 percent drift rate,						
it is reasonable to expect that the 0.0003 percent drift rate would produce smaller droplets, therefore, this size distribution data can be assumed to be conservative for predicting the fraction						
of PM10 in the total cooling tower PM emissions." Because Asarco's cooling towers have even higher drift rates, this size distribution data is even more conservative for our application.						

Speciation for Flash and powerhouse cooling tower						
TDS	2437.5					
Droplet Diameter	**Droplet volume**	**Droplet Mass**	**Particle Mass So**	**Solid Particle Volume**	**Solid Particle Dia**	**EPRI % Mass Smaller**
10	524	0.000165877	1.28E-06	0.58	1.03476242	0.000
20	4189	0.001327013	1.02E-05	4.64	2.06952484	0.196
30	14137	0.004478669	3.45E-05	15.66	3.10428726	0.226
40	33510	0.010616104	8.17E-05	37.13	4.13904968	0.514
50	65450	0.020734578	1.60E-04	72.52	5.1738121	1.816
60	113097	0.035829351	2.76E-04	125.31	6.20857452	5.702
70	179594	0.056895682	4.38E-04	198.98	7.24333694	21.348
90	381704	0.120924058	9.30E-04	422.91	9.31286178	49.812
110	696910	0.220781786	1.70E-03	772.14	11.38238662	70.509
130	1150347	0.364430942	2.80E-03	1274.53	13.45191146	82.023
150	1767146	0.559833604	4.31E-03	1957.92	15.5214363	88.012
180	3053628	0.967392468	7.44E-03	3383.28	18.62572356	91.032
210	4849048	1.536183409	1.18E-02	5372.53	21.73001082	92.468
240	7238229	2.293078442	1.76E-02	8019.63	24.83429808	94.091
270	10305995	3.264949578	2.51E-02	11418.57	27.93858534	94.689
300	14137167	4.478668831	3.45E-02	15663.34	31.0428726	96.288
350	22449298	7.111960227	5.47E-02	24872.80	36.2166847	97.011
400	33510322	10.6161039	8.17E-02	37127.91	41.3904968	98.34
450	47712938	15.11550731	1.16E-01	52863.77	46.5643089	99.071
500	65449847	20.73457792	1.60E-01	72515.46	51.738121	99.071
600	113097336	35.82935065	2.76E-01	125306.71	62.0857452	100
		Solid Particle Diameter	**Interpolated Value**			
		2.5	0.208	%		
		10	56.7	%		
Speciation for oxygen plant cooling tower and anode cooling tower						
TDS	3750					
Droplet Diameter	**Droplet volume**	**Droplet Mass**	**Particle Mass So**	**Solid Particle Volume**	**Solid Particle Dia**	**EPRI % Mass Smaller**
10	524	0.000255195	1.96E-06	0.89	1.194545956	0.000
20	4189	0.002041558	1.57E-05	7.14	2.389091912	0.196
30	14137	0.00689026	5.30E-05	24.10	3.583637867	0.226
40	33510	0.016332468	1.26E-04	57.12	4.778183823	0.514
50	65450	0.031899351	2.45E-04	111.56	5.972729779	1.816
60	113097	0.055122078	4.24E-04	192.78	7.167275735	5.702
70	179594	0.087531818	6.73E-04	306.13	8.361821691	21.348
90	381704	0.186037013	1.43E-03	650.63	10.7509136	49.812
110	696910	0.339664286	2.61E-03	1187.91	13.14000551	70.509
130	1150347	0.560662987	4.31E-03	1960.82	15.52909743	82.023
150	1767146	0.861282468	6.63E-03	3012.18	17.91818934	88.012
180	3053628	1.488296104	1.15E-02	5205.05	21.5018272	91.032
210	4849048	2.363359091	1.82E-02	8265.42	25.08546507	92.468

240	7238229	3.527812987	2.71E-02	12337.89	28.66910294	94.091
270	10305995	5.022999351	3.86E-02	17567.04	32.25274081	94.689
300	14137167	6.89025974	5.30E-02	24097.44	35.83637867	96.288
350	22449298	10.94147727	8.42E-02	38265.85	41.80910845	97.011
400	33510322	16.33246753	1.26E-01	57119.87	47.78183823	98.34
450	47712938	23.25462662	1.79E-01	81328.87	53.75456801	99.071
500	65449847	31.89935065	2.45E-01	111562.24	59.72729779	99.071
600	113097336	55.12207792	4.24E-01	192779.55	71.67275735	100
		Solid Particle Diameter	**Interpolated Value**			
		2.5	0.199	%		
		10	40.9	%		
Speciation for acid plant cooling tower (old)						
TDS	3150					
Droplet Diameter	**Droplet volume**	**Droplet Mass**	**Particle Mass So**	**Solid Particle Volume**	**Solid Particle Dia**	**EPRI % Mass Smaller**
10	524	0.000214364	1.65E-06	0.75	1.127100453	0.000
20	4189	0.001714909	1.32E-05	6.00	2.254200906	0.196
30	14137	0.005787818	4.45E-05	20.24	3.381301359	0.226
40	33510	0.013719273	1.06E-04	47.98	4.508401812	0.514
50	65450	0.026795455	2.06E-04	93.71	5.635502265	1.816
60	113097	0.046302545	3.56E-04	161.93	6.762602718	5.702
70	179594	0.073526727	5.66E-04	257.15	7.889703171	21.348
90	381704	0.156271091	1.20E-03	546.53	10.14390408	49.812
110	696910	0.285318	2.20E-03	997.85	12.39810498	70.509
130	1150347	0.470956909	3.62E-03	1647.09	14.65230589	82.023
150	1767146	0.723477273	5.57E-03	2530.23	16.90650679	88.012
180	3053628	1.250168727	9.62E-03	4372.24	20.28780815	91.032
210	4849048	1.985221636	1.53E-02	6942.96	23.66910951	92.468
240	7238229	2.963362909	2.28E-02	10363.83	27.05041087	94.091
270	10305995	4.219319455	3.25E-02	14756.31	30.43171223	94.689
300	14137167	5.787818182	4.45E-02	20241.85	33.81301359	96.288
350	22449298	9.190840909	7.07E-02	32143.31	39.44851585	97.011
400	33510322	13.71927273	1.06E-01	47980.69	45.08401812	98.34
450	47712938	19.53388636	1.50E-01	68316.25	50.71952038	99.071
500	65449847	26.79545455	2.06E-01	93712.28	56.35502265	99.071
600	113097336	46.30254545	3.56E-01	161934.82	67.62602718	100
		Solid Particle Diameter	**Interpolated Value**			
		2.5	0.2025	%		
		10	48.0	%		
Speciation for acid plant cooling tower (new) and Converter cooling tower						
TDS	3000					
Droplet Diameter	**Droplet volume**	**Droplet Mass**	**Particle Mass So**	**Solid Particle Volume**	**Solid Particle Dia**	**EPRI % Mass Smaller**

10	524	0.000204156	1.57E-06	0.71	1.108918234	0.000					
20	4189	0.001633247	1.26E-05	5.71	2.217836468	0.196					
30	14137	0.005512208	4.24E-05	19.28	3.326754702	0.226					
40	33510	0.013065974	1.01E-04	45.70	4.435672936	0.514					
50	65450	0.025519481	1.96E-04	89.25	5.54459117	1.816					
60	113097	0.044097662	3.39E-04	154.22	6.653509404	5.702					
70	179594	0.070025455	5.39E-04	244.90	7.762427638	21.348					
90	381704	0.14882961	1.15E-03	520.50	9.980264105	49.812					
110	696910	0.271731429	2.09E-03	950.33	12.19810057	70.509					
130	1150347	0.44853039	3.45E-03	1568.65	14.41593704	82.023					
150	1767146	0.689025974	5.30E-03	2409.74	16.63377351	88.012					
180	3053628	1.190636883	9.16E-03	4164.04	19.96052821	91.032					
210	4849048	1.890687273	1.45E-02	6612.34	23.28728291	92.468					
240	7238229	2.82225039	2.17E-02	9870.31	26.61403761	94.091					
270	10305995	4.018399481	3.09E-02	14053.63	29.94079232	94.689					
300	14137167	5.512207792	4.24E-02	19277.95	33.26754702	96.288					
350	22449298	8.753181818	6.73E-02	30612.68	38.81213819	97.011					
400	33510322	13.06597403	1.01E-01	45695.89	44.35672936	98.34					
450	47712938	18.6037013	1.43E-01	65063.10	49.90132053	99.071					
500	65449847	25.51948052	1.96E-01	89249.79	55.4459117	99.071					
600	113097336	44.09766234	3.39E-01	154223.64	66.53509404	100					
		Solid Particle Diameter	**Interpolated Value**								
		2.5	0.2036	%							
		10	50.0	%							

Appendix J: Modeling PTE Numeric Explanation

ASARCO LLC – Hayden Operations
Response to EPA questions about derivation of emissions and safety factors Hayden Lead Nonattainment Area SIP Revision
October 25, 2023

During a call between ASARCO, ADEQ and EPA Region IX representatives to discuss the Hayden Lead Nonattainment Area SIP revision, EPA representatives asked if ASARCO could provide a more detailed, equation-based, response for the derivation of the modeled emissions value. ASARCO responded that the initial numbers were derived from AP-42 and other emissions factors and that a safety factor was applied over the calculated value based on a weight of evidence approach considering process continuous emissions monitoring (CEMS) data, partially completed fugitive study data post-Converter Retrofit Project, and engineering judgment based upon control configuration and observation of the process prior the smelter work stoppage. EPA requested that this discussion be placed in writing and subsequently asked that the sources of emissions factors be added. This paper responds to that request.

10.0 Flash Furnace Area

Flash Furnace Building fugitives = Matte Tapping fugitives + Slag Skimming fugitives + Concentrate Dryer fugitives, all calculated as Total Suspended Particulate (TSP). This sum is multiplied by the Lead Speciation (decimal percent) for the Flash Furnace area and a safety factor applied.

Sources of emissions data as follows:

- 693,500 concentrate tons/year based on limit, Air Permit 60647, Condition XVI.B.1.
- 0.3 lb/ton concentrate pre-fugitive control system emission rate, EPA AP-42, Chapter 12.3, Table 12.3-11, Smelting Furnace, with consideration of footnote a as the Hayden smelter uses a flash furnace, the emissions of which are lower than the 0.4 lb/ton concentrate presented.
- 96.5% capture based on engineering estimates from Gas Cleaning Technologies, LLC (GCT) and further reductions achieved by the Uptake Improvement Project.
- 0.75 of slag skimming emissions assigned to initial slag tapping and skimming in flash furnace building due to higher energy when first tapped from the flash furnace and then skimmed; balance 0.25 of slag skimming emissions assigned to pouring slag at the slag pile based on observation and engineering judgment.
- 10 lb/ton concentrate drying, AP-42, Chapter 12.3, Table 12.3-3, Concentrate Dryer.
- 99% efficiency for concentrate dryer based on hard piping of dryers to product recovery baghouse.
- 96% efficiency for concentrate dryer fugitives based on engineering estimates from GCT, with no additional efficiency assigned for Uptake Improvement Project.

11.0 Matte Tapping Fugitives, TSP

693,500 tons concentrate * 0.3 lb TSP/ton concentrate * (1 – 0.965) capture * 1 ton/2000 lbs = 3.641 tpy

12.0 Slag Skimming Fugitives, TSP

693,500 tons concentrate * 0.75 part in building[17] * 0.3 lb TSP/ton concentrate * (1 – 0.965) capture * 1 ton/2000 lbs = 2.731 tpy

13.0 Concentrate Dryer Fugitives, TSP

693,500 tons concentrate * 10 lb/ton * (1 – 0.99) product recovery * (1 – 0.96) capture * 1 ton/2000 lbs = 1.387 tpy

14.0 Flash Furnace Area Fugitives, TSP

3.641 tpy + 2.731 tpy + 1.387 tpy = 7.759 tons TSP/year or 1.771 lb TSP/hour

15.0 Flash Furnace Area Fugitives, Lead

1.771 lb TSP/hour * 0.027 decimal percent = 0.0478 lb Pb/hour

16.0 Safety Factor Considerations

The Hayden smelter may accept concentrate from other sources in addition to ASARCO's Ray and Mission Mines. This "toll" concentrate may have higher lead concentrations. During the partially completed fugitive study fugitive emissions amounted to an average of 0.061 to 0.076 lb Pb/hr adjusting for production (prior to Uptake Improvement Project). An initial safety factor of 2x was applied to reflect feedstock and wind effects, giving 0.0956 lb Pb/hr. In the prior ADEQ modeling demonstration a rate of 0.234 lb Pb/hour was used. This consideration led to the decision to reduce the prior ADEQ modeled value by the 3.4% estimated reduction from the Uptake Improvement Project, giving a value of 0.226 lb/hr, to better reflect the potential magnitude of emissions from the combined flash furnace, matte tapping and slag skimming operations, if adversely affected by wind conditions reducing design efficiencies at one or more points. The proposed value, which translates as 0.0285 g/sec, is a conservative, protective, yet realistic, value for a maximum lb/hr emission rate.

17.0 Converter Aisle Fugitives

Converter Aisle Fugitives = (tons concentrate * 36 lb/ton * blowing fraction * primary hood capture * secondary hood capture * tertiary hood capture * 1 ton/2000 lbs) + (tons concentrate * 36 lb/ton * secondary operations fraction * secondary hood capture * tertiary hood capture * 1 ton/2000 lbs). This value is then adjusted for the lead speciation and a safety factor applied.

Sources of emissions data as follows:

- 693,500 tons concentrate/year from limit, Air Permit 60647, Condition XVI.B.1.
- 36 lb/ton concentrate emissions, EPA AP-42, Chapter 12.3, Table 12.3-3, Converters.
- 99% from blowing, GCT engineering estimate; balance of 1% assigned to secondary operations.
- 97% primary hood capture efficiency, GCT engineering estimate.
- 97% secondary hood capture efficiency, blowing, GCT engineering estimate.
- 95% secondary hood capture efficiency, non-blowing, GCT engineering estimate.

[17] The other 0.25 is accounted for in slag pouring at the slag pile.

- 95% tertiary hood capture efficiency, GCT engineering estimate.

18.0 Converter Aisle Fugitives, TSP

693,500 tons concentrate * 36 lb/ton * 0.99 blowing fraction * (1 – 0.97) primary * (1 – 0.97) secondary * (1 – 0.95) tertiary * 1 ton/2000 lbs + 693,500 tons concentrate * 36 lb/ton * 0.01 secondary operation fraction * (1 – 0.95) secondary * (1 – 0.95) tertiary * 1 ton/2000 lbs = 0.868 tons TSP

19.0 Converter Aisle Fugitives, Lead

0.868 tons TSP * 0.0745 lead fraction = 0.0647 tons Pb or 0.0148 lb Pb/hr

20.0 Safety Factor Considerations

As noted above, the Hayden smelter may accept "toll" concentrate with higher lead concentrations. Initially, a 2x safety factor was assigned to account for this variable, giving a value of 0.0298 lb/hr. During the partially completed fugitive study fugitive emissions amounted to an average of 0.024 to 0.029 lb Pb/hr adjusting for production (prior to Fuming Ladle Control Project). In the prior ADEQ modeling demonstration a rate of 0.084 lb Pb/hour was used. Given uncertainty about concentrate inputs and wind interference and the greater certainty about the reduction likely to be achieved by the Fuming Ladle Control Project, the prior ADEQ modeled value was reduced by the 15.4% estimated project reduction, giving a value of 0.0712 lb/hr. The proposed value, which translates to 0.00895 g/sec, is a conservative, yet realistic, value for a maximum lb/hr emission rate.

21.0 <u>Anode Fugitives</u>

Anode fugitives = anode tons/day * 365 days/yr * 0.45 lb/ton anode * (1-0.85) primary hood capture * (1- 0.7) secondary hood capture * 1 ton/2000 pounds. This sum adjusted for lead and then safety factor applied.

Sources of emissions data:

- 693,500 concentrate tons/year based on limit, Air Permit 60647, Condition XVI.B.1, converted to anode tons based on 693,500/365 or 1900 tons/day multiplied by concentrate at 30<35% Cu gives 570-660 anode tons/day, so used upper end for conservatism.
- 0.45 lb/ton, EPA AP-42, Chapter 12.3, Table 12.3-11, Anode Refining Furnace, adjusted downward slightly from 0.5 lb/ton based on GCT engineering observations and judgment.
- 85% anode primary hood capture, GCT engineering estimate.
- 70% anode secondary hood capture, GCT engineering estimate. The

70% secondary hood capture efficiency is believed to be conservative. **Anode**

Fugitives, TSP

Anode fugitives = 660 anode tons/day * 365 days/yr * 0.45 lb/ton anode * (1 – 0.85) primary hood * (1 – 0.7) secondary hood * 1 ton/2000 pounds = 2.439 tons TSP

22.0 Anode Fugitives, Lead

2.439 tons/year * 0.0308 lead fraction = 0.075 tons Pb or 0.0172 lb Pb/hr

23.0 Safety Factor Considerations

As noted above, the Hayden smelter may accept "toll" concentrate with higher lead concentrations. Initially, a 1.5x safety factor was assigned to account for lead and atmospheric variability, giving a value of 0.0257 lb/hr.

This safety factor is lower than the initial safety factor used for the two prior projects because Gas Cleaning Technologies, LLC, has greater confidence that the Anode Secondary Hood Project would achieve at least 70% control and should be less affected by lead variation in the concentrate because it is further along in the process. During the partially completed fugitive study fugitive emissions amounted to an average of 0.041 to 0.050 lb Pb/hr adjusting for production (prior to the Anode Secondary Hood Project).

The prior ADEQ modeling demonstration was considered but rejected because it did not consider the Anode Primary Baghouse and hence overestimated emissions substantially. Based on consideration of the 0.0257 lb/hr from emission factor and air pollution control, the 0.041 to 0.050 lb/hr after adjusting for production, seen during the fugitive study (post-primary baghouse installation but pre-secondary baghouse installation), and the anode aisle's greater openness and susceptibility to wind compared to the converter aisle, the initial estimate was revised upward from 0.0257 to 0.0286 lb/hr, or approximately another 10%, as an added safety factor. The proposed value, which translates as 0.0036 g/sec, is a conservative, yet realistic, value for a maximum lb/hr emission rate.

ASARCO hopes that this explanation assists EPA and ADEQ in evaluating the proposed Hayden Lead Nonattainment Area SIP revision and its associated modeling. The values presented are intended to be conservative, demonstrating that the Hayden Nonattainment Area will attain the Lead NAAQS even if lead emissions are higher than anticipated. The proposed SIP review also demonstrates that the Hayden Nonattainment Area should achieve attainment expeditiously once the Uptake Improvement, Fuming Ladle Control and Anode Secondary Hood Projects are installed and optimized.

Please contact James Stewart, ASARCO's Director of Environmental, Governmental and Community Affairs, or Eric Hiser, ASARCO's air counsel, if you have any questions or concerns.

Appendix K: Atypical Events Supporting Information

November 9, 2023

Mr. Kamran Khan
Air Quality Division
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: Revised Supporting information for ASARCO Atypical Event on October 12, 2020

Dear Mr. Khan:

On September 7, 2023, ASARCO, the Arizona Department of Environmental Quality (ADEQ) and the U.S. Environmental Protection Agency (EPA) held a call to discuss several questions that EPA had pertaining to the Lead (Pb) State Implementation Plan (SIP) for the Hayden Nonattainment Area (NAA).

EPA supports exclusion of the October 12, 2020 Pb concentration at the Hillcrest monitor from the calculation of the proposed Pb background concentration (as described in Section 7.0 of the Modeling Technical Support Document[1]), provided that ADEQ provides sufficient documentation to demonstrate that this elevated concentration was due to an atypical event that is not expected to reoccur. To that end, EPA requested that ASARCO provide the information they typically ask for in an atypical event report in addition to what is already documented in the TSD. Later that day Mr. William Tsui of EPA emailed you a checklist for evidence supporting atypical events, which you subsequently forwarded to me.

On September 14, 2023, Blue Sky Modeling, LLC (BSM) on behalf of ASARCO submitted to you a letter providing supporting information for the atypical event on October 12, 2020.

On October 23, 2023, you forwarded to me EPA's comments on the September 14 submittal. This revised letter addresses EPA's comments.

Point No. 1: An introductory summary that describes the project and identifies the regulatory purpose of the air quality analysis.

EPA designated the Hayden area of Gila and Pinal Counties as a NAA for the 2008 Pb NAAQS effective as of October 3, 2014. On January 31, 2022 the EPA determined the Hayden NAA failed to attain by the applicable attainment date of October 3, 2019. As a result of this determination, ADEQ is preparing a new SIP revision, which includes an updated model attainment demonstration. Included in that model attainment demonstration is a Pb background concentration.

Point No. 2: The background concentration, calculated before removing any potential atypical events, and discussion describing why the default unmodified design value is unrepresentative.

[1] Appendix B: Modeling Technical Support Document (TSD): Hayden Pb State Implementation Plan Revision. ADEQ Air Quality Division, April 4, 2023. Draft

As described in Section 7.0 of the TSD, the Pb background concentration was derived from ambient air monitoring data that were generated from November 2019 through September 2022 (after ASARCO was temporarily shut down in October 2019). The maximum rolling 3-month Pb concentration during this period, with no atypical events removed, is 0.025 µg/m3.

This value is significantly skewed high because of a specific material handing activity that occurred during the shutdown. On October 12, 2020 there was a very high daily Pb concentration, roughly 15 times higher than most other daily Pb concentrations. On that day ASARCO loaded copper filter cake, a known lead containing material, from roughly 6:00 AM through 3:00 PM, to the southeast of the Hillcrest monitor. The loading of copper filter cake was an unusual occurrence, only taking place on this day since the strike. When it did occur on this day ASARCO was moving piles off site, and as this pile had been there since the strike the inside of it was dry, which led to an unusual amount of fugitive dust (the outside had been crusted over because of watering). The wind was blowing for much of that day from the southeast. Figure 1 below presents the wind rose for the 6:00 AM to 3:00 PM timeframe during which the copper filter cake loading took place; as can be seen, there were winds from the southeast that would have transported Pb from the copper filter cake loading to the Hillcrest monitor.

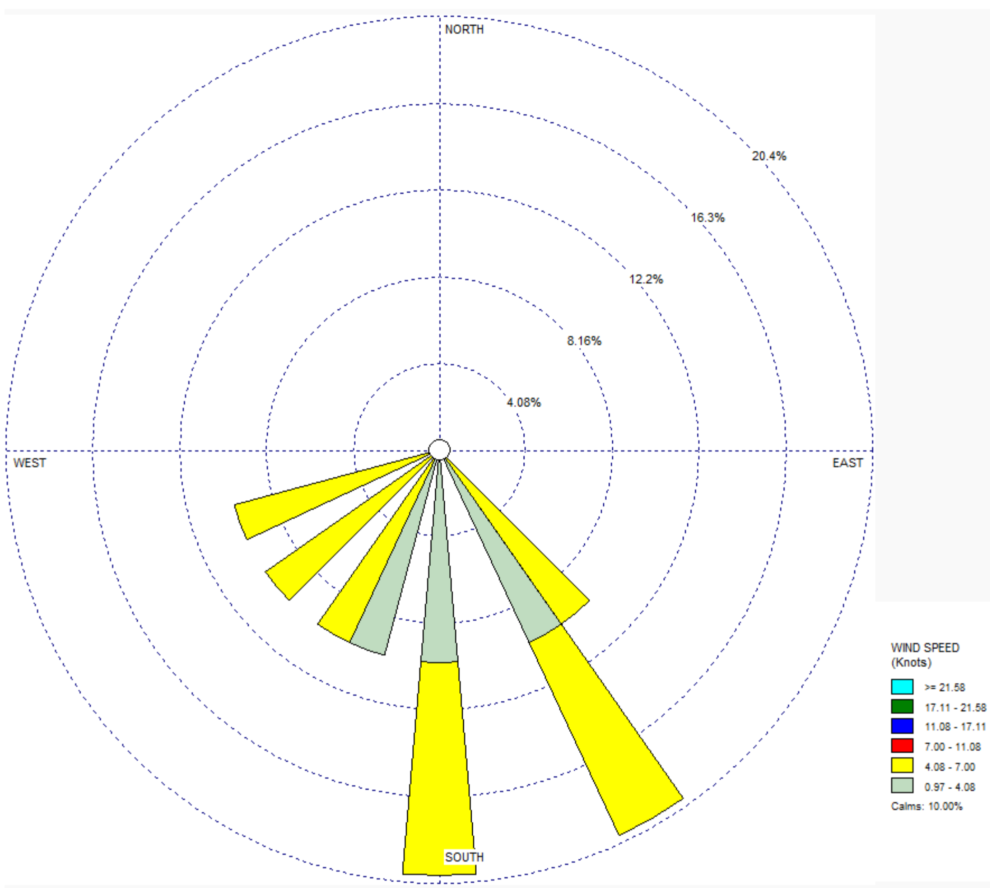


Figure 1
Hayden Jail Wind Rose
October 12, 2020
6:00 AM through 3:00 PM

Point No. 3: Identification of the dates, hours, monitors, and air pollutant concentrations to be removed from the background concentration or base-period design value.

Date: October 12, 2020
Hours: the 24-hr Pb concentration
Monitor: Hillcrest
Concentration to be removed: 0.076 μg/m^3

This specific concentration can be seen in Figure 2 below (which was originally provided in a March 2, 2023 letter from BSM to ADEQ[2]).

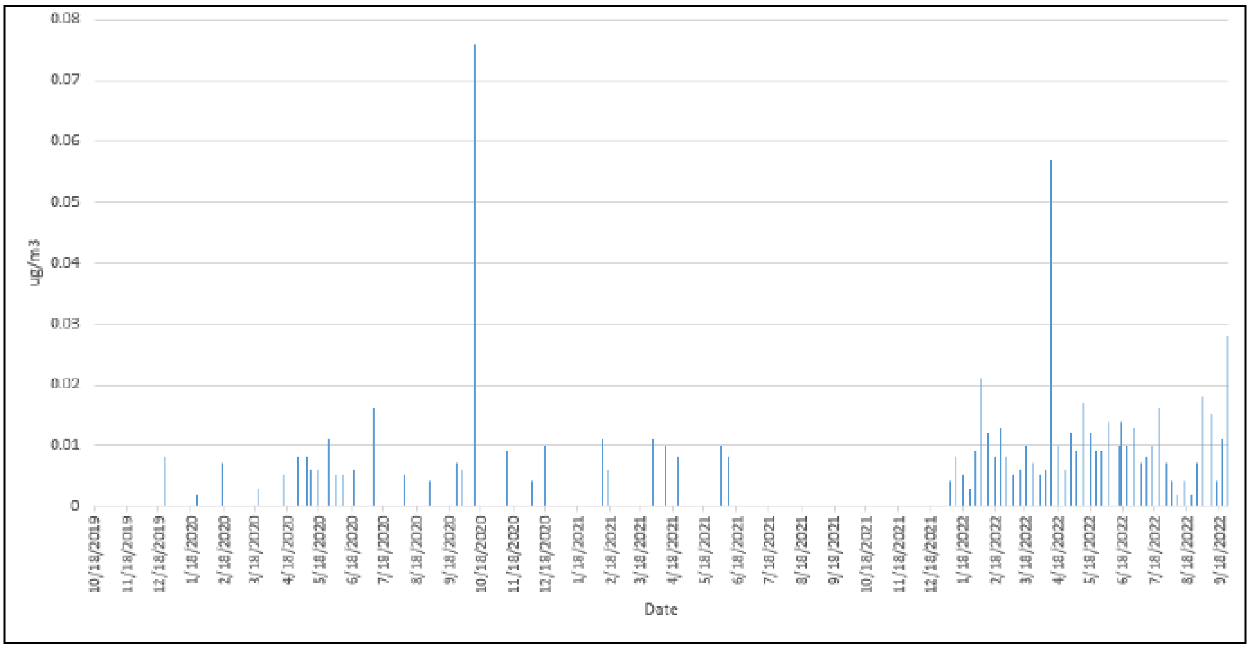


Figure 2
Daily Pb values used in the derivation of
Rolling 3-Month Averages used for
Hayden Pb SIP Background Concentration,
Before Removal of Atypical Event

Point No. 4: For each monitor and date proposed for removal, sufficient evidence the monitor was affected by an atypical event or event unlikely to occur again.

On October 12, 2020 ASARCO loaded copper filter cake, a known lead containing material, from roughly 6:00 AM through 3:00 PM, to the southeast of the Hillcrest monitor. The loading of copper filter cake was an unusual occurrence, only taking place at this time since the strike. When it did occur on this day ASARCO was moving piles off site, and as this pile had been there since the strike the inside of it was dry, which led to an unusual amount of fugitive dust (the outside had been crusted over because of watering).

[2] "ASARCO Response to EPA Pb SIP Modeling Comments" letter, William B. Jones (BSM) to Kamran Khan (ADEQ), March 2, 2023.

The activity that led to the pile and its moving no longer takes place; the material is now bagged in an enclosed structure.

Attached to this letter is an Outgoing Commodities report for October 12-13, 2020, which documents the removal of copper filter cake at this time.

Point No. 5: The modified background design concentration, calculated after the modification of the monitor record.

When the Hillcrest Pb concentration observed during the October 12, 2020 atypical event is removed from the calculation of the background concentration, the modified background concentration is 0.013 $\mu g/m^3$.

Thank you very much for your assistance. If you have any questions or need anything else, please contact me at bjones@blueskymodeling.com or at 410.499.9918.

Best regards,
William B. Jones
President
Attachment

Weight entered manually

SCALE	TICKET	BOL	TRUCK #	CARRIER	FROM	COMMODITY	QUALITY	GROSS	TARE	NET	WEIGH IN DATE	WEIGH OUT DATE	SERVICE TIME (hh:mm)	OFFICER	DESTINATION	DRIVER	COMMENTS
Main Gate Hayden	BO2020-12080	A2751	951	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,280	27,100	52,180	10/12/2020 01:49	10/12/2020 02:23	00:34	HAYOPUSMAINGATE	Marana	MARK BALLARD	
Main Gate Hayden	BO2020-12081	A2752	250	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,400	29,040	50,360	10/12/2020 04:09	10/12/2020 04:56	00:47	HAYOPUSMAINGATE	Phoenix	BRUCE EGGERS	
Main Gate Hayden	BO2020-12082	A2753	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,140	25,940	53,200	10/12/2020 05:50	10/12/2020 06:37	00:47	HAYOPUSMAINGATE	Marana	DOMINIC SMITH	
Main Gate Hayden	BO2020-12084	BM191	224	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,800	30,000	47,800	10/12/2020 06:26	10/12/2020 06:54	00:28	HAYOPUSMAINGATE	GUAYMAS	MARCO FUENTES	CONTAINER # AZX-1160004 PLATE # AZ-82018-C
Main Gate Hayden	BO2020-12085	CFC20	211	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,600	27,860	50,740	10/12/2020 06:29	10/12/2020 08:47	02:18	HAYOPUSMAINGATE	GUAYMAS	JOHN DAY	PLATE # AZ-37505E TRAILER # 8255
Main Gate Hayden	BO2020-12086	CFC21	938	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,160	28,980	49,180	10/12/2020 07:00	10/12/2020 09:21	02:21	HAYOPUSMAINGATE	GUAYMAS	VINCE DURANT	PLATE # AZ-447735C TRAILER #8238
Main Gate Hayden	BO2020-12095	A2754	318	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,580	24,380	53,200	10/12/2020 08:55	10/12/2020 09:41	00:46	HAYOPUSMAINGATE	Marana	WILLIAM	
Main Gate Hayden	BO2020-12087	BM192	221	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,600	30,140	49,460	10/12/2020 07:41	10/12/2020 09:47	02:06	HAYOPUSMAINGATE	GUAYMAS	LUCIO MARTINEZ	CONTAINER # 1160008 PLATE # AZ-82458C
Main Gate Hayden	BO2020-12089	CFC22	948	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,640	28,520	48,120	10/12/2020 07:51	10/12/2020 10:25	02:34	HAYOPUSMAINGATE	GUAYMAS	JACOB BAKER	PLATE # AZ-72652H TRAILER # 8175
Main Gate Hayden	BO2020-12092	CFC23	250	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,480	26,520	50,960	10/12/2020 08:20	10/12/2020 10:48	02:28	HAYOPUSMAINGATE	GUAYMAS	AL HERMOSILLO	PLATE # AZ-72567 A TRAILER # 8178
Main Gate Hayden	BO2020-12102	A2755	1029	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,420	24,820	53,600	10/12/2020 10:16	10/12/2020 10:59	00:43	HAYOPUSMAINGATE	Marana	LEE	
Main Gate Hayden	BO2020-12093	CFC24	232	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,400	26,880	49,520	10/12/2020 08:25	10/12/2020 11:14	02:49	HAYOPUSMAINGATE	GUAYMAS	TYLER ECHOLLS	PLATE # AZ-44716C TRAILER # 8236
Main Gate Hayden	BO2020-12091	BM193	218	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	78,780	30,080	48,700	10/12/2020 07:58	10/12/2020 11:36	03:38	HAYOPUSMAINGATE	GUAYMAS	TOBIAS TRUJILLO	CONTAINER # 1160015 PLATE # AZ-82462C
Main Gate Hayden	BO2020-12106	A2756	315	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	76,900	23,780	53,120	10/12/2020 11:04	10/12/2020 11:41	00:37	HAYOPUSMAINGATE	Marana	FIDEL	
Main Gate Hayden	BO2020-12107	A2757	421	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,740	29,420	49,320	10/12/2020 11:23	10/12/2020 12:04	00:41	HAYOPUSMAINGATE	Casa Grande	JEREMY	
Main Gate Hayden	BO2020-12097	BM194	947	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,320	31,140	46,180	10/12/2020 09:28	10/12/2020 12:08	02:40	HAYOPUSMAINGATE	GUAYMAS	PAT MITCHELL	CONTAINER # AZX- 1160007 PLATE # AZ-22088-C
Main Gate Hayden	BO2020-12108	A2758	1032	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	25,140	52,560	10/12/2020 11:27	10/12/2020 12:30	01:03	HAYOPUSMAINGATE	Marana	JOHN	
Main Gate Hayden	BO2020-12109	A2759	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,280	25,020	53,260	10/12/2020 11:31	10/12/2020 12:33	01:02	HAYOPUSMAINGATE	Marana	DOMINIC	
Main Gate Hayden	BO2020-12098	CFC25	252	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	75,560	26,480	49,080	10/12/2020 09:17	10/12/2020 12:38	03:21	HAYOPUSMAINGATE	GUAYMAS	RON MATTHYS	PLATE # AZ-72691H TRAILER # 8240
Main Gate Hayden	BO2020-12110	A2760	293	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,680	24,820	53,860	10/12/2020 11:55	10/12/2020 12:46	00:51	HAYOPUSMAINGATE	Marana	GABE	
Main Gate Hayden	BO2020-12099	CFC26	248	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,720	30,200	47,520	10/12/2020 09:53	10/12/2020 13:19	03:26	HAYOPUSMAINGATE	GUAYMAS	MARIO CASTILLO	PLATE # AZ-T 34611 TRAILER # 8206
Main Gate Hayden	BO2020-12101	CFC27	991	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,380	29,580	46,800	10/12/2020 10:15	10/12/2020 13:43	03:28	HAYOPUSMAINGATE	GUAYMAS	LAZARO SANCHEZ	PLATE # AZ-01510F TRAILER # 8205
Main Gate Hayden	BO2020-12116	BM195	247	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	70,900	29,460	41,440	10/12/2020 14:33	10/12/2020 15:05	00:32	HAYOPUSMAINGATE	GUAYMAS	JOHN BARNES	CONTAINER # AZX-1160018 PLATE # AZ-78311C
Main Gate Hayden	BO2020-12117	A2761	318	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,400	23,600	53,800	10/12/2020 14:41	10/12/2020 15:25	00:44	HAYOPUSMAINGATE	Marana	WILLIAM	
Main Gate Hayden	BO2020-12123	A2762	250	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,620	29,840	49,780	10/12/2020 18:16	10/12/2020 19:15	00:59	HAYOPUSMAINGATE	Tonopah	SCOTT MEADOR	
Main Gate Hayden	BO2020-12124	A2763	951	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,260	26,440	52,820	10/13/2020 01:46	10/13/2020 02:22	00:36	HAYOPUSMAINGATE	Marana	MARC BALLARD	
Main Gate Hayden	BO2020-12125	A2764	948	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,100	27,660	50,440	10/13/2020 01:52	10/13/2020 02:35	00:43	HAYOPUSMAINGATE	Marana	DAVID RANDALLE	
Main Gate Hayden	BO2020-12126	A2765	251	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	79,440	29,000	50,440	10/13/2020 04:44	10/13/2020 05:33	00:49	HAYOPUSMAINGATE	Gilbert	BRUCE EGGERS	
Main Gate Hayden	BO2020-12128	A2766	296	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,780	25,820	53,960	10/13/2020 05:48	10/13/2020 06:42	00:54	HAYOPUSMAINGATE	Marana	DOMINIC	296
Main Gate Hayden	BO2020-12132	A2767	77	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,320	28,580	49,740	10/13/2020 06:46	10/13/2020 07:38	00:52	HAYOPUSMAINGATE	Saint Johns, AZ.	BRAD	
Main Gate Hayden	BO2020-12131	BM196	224	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	77,240	29,440	47,800	10/13/2020 06:36	10/13/2020 08:04	01:28	HAYOPUSMAINGATE	GUAYMAS	MARCO FUENTES	container # azx- 1160012 plate # mx-91-uf-4v
Main Gate Hayden	BO2020-12130	CFC28	211	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,000	30,080	47,920	10/13/2020 06:25	10/13/2020 08:18	01:53	HAYOPUSMAINGATE	GUAYMAS	JOHN DAY	plate # az-t34809 trailer # 8204
Main Gate Hayden	BO2020-12134	CFC29	250	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,160	25,940	50,220	10/13/2020 07:02	10/13/2020 08:22	01:20	HAYOPUSMAINGATE	GUAYMAS	AL HERMOSILLO	plate # az-y97152 trailer # 8228
Main Gate Hayden	BO2020-12140	A2768	948	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,720	27,340	51,380	10/13/2020 07:50	10/13/2020 08:28	00:38	HAYOPUSMAINGATE	Marana	DAVID	
Main Gate Hayden	BO2020-12133	BM197	218	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	78,660	30,220	48,440	10/13/2020 06:55	10/13/2020 08:37	01:42	HAYOPUSMAINGATE	GUAYMAS	TOBIS TRUJILLO	container # azx-1160002 plate # mx-29b5m
Main Gate Hayden	BO2020-12139	CFC30	946	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,620	30,520	47,100	10/13/2020 07:42	10/13/2020 08:45	01:03	HAYOPUSMAINGATE	GUAYMAS	JACOB BAKER	plate # az-27845d trailer # 8225
Main Gate Hayden	BO2020-12136	BM198	221	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	74,900	30,160	44,740	10/13/2020 07:10	10/13/2020 08:56	01:46	HAYOPUSMAINGATE	GUAYMAS	LUCIO MARTINEZ	container # azx-1160003 plate # az-15280d
Main Gate Hayden	BO2020-12137	BM199	929	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,040	32,160	46,880	10/13/2020 07:17	10/13/2020 09:14	01:57	HAYOPUSMAINGATE	GUAYMAS	JUAN VALVERDE	container # azx-1160024 plate # az-78243c
Main Gate Hayden	BO2020-12143	CFC31	232	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	79,120	29,240	49,880	10/13/2020 08:41	10/13/2020 09:52	01:11	HAYOPUSMAINGATE	GUAYMAS	TYLER ECHOLLS	plate # az-y97212 trailer # 8228
Main Gate Hayden	BO2020-12148	A2769	970	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	25,480	52,220	10/13/2020 09:25	10/13/2020 10:01	00:36	HAYOPUSMAINGATE	Marana	AUDIE	
Main Gate Hayden	BO2020-12144	CFC32	248	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,960	26,820	50,140	10/13/2020 08:50	10/13/2020 10:14	01:24	HAYOPUSMAINGATE	GUAYMAS	MARIO CASTILLO	plate # az-72693a trailer # 8173
Main Gate Hayden	BO2020-12150	A2770	1022	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,520	24,020	54,500	10/13/2020 09:34	10/13/2020 10:18	00:44	HAYOPUSMAINGATE	Marana	BEN	
Main Gate Hayden	BO2020-12147	CFC33	210	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	78,580	29,200	49,380	10/13/2020 09:21	10/13/2020 11:05	01:44	HAYOPUSMAINGATE	GUAYMAS	MIKE OSIER	plate# az-y97153 trailer # 8227
Main Gate Hayden	BO2020-12149	CFC34	936	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,360	31,540	45,820	10/13/2020 09:28	10/13/2020 11:16	01:48	HAYOPUSMAINGATE	GUAYMAS	VINCE DURANT	plate # az-x81903 trailer # 8208
Main Gate Hayden	BO2020-12157	A2771	315	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	79,500	23,660	55,840	10/13/2020 10:53	10/13/2020 11:30	00:37	HAYOPUSMAINGATE	Marana	ANDRES	
Main Gate Hayden	BO2020-12151	BM200	947	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	79,580	31,760	47,820	10/13/2020 09:36	10/13/2020 11:43	02:07	HAYOPUSMAINGATE	GUAYMAS	PATRICK MITCHELL	container # azx-1160001 plate # mx-65-ty-8g
Main Gate Hayden	BO2020-12161	A2772	293	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	76,880	24,600	52,280	10/13/2020 11:27	10/13/2020 12:01	00:34	HAYOPUSMAINGATE	Marana	GABE	
Main Gate Hayden	BO2020-12152	BM201	247	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	75,940	29,260	46,680	10/13/2020 09:44	10/13/2020 12:07	02:23	HAYOPUSMAINGATE	GUAYMAS	JOHN BARNES	container # azx-1160006 plate # mx-92u64v
Main Gate Hayden	BO2020-12162	A2773	298	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,880	24,580	54,300	10/13/2020 11:34	10/13/2020 12:17	00:43	HAYOPUSMAINGATE	Marana	DOMINIC	
Main Gate Hayden	BO2020-12156	BM202	215	ASA-CTI	HAYDEN SMELTER	BIN MIXES	HAYDEN SMELTER	73,560	29,420	44,140	10/13/2020 10:43	10/13/2020 12:28	01:45	HAYOPUSMAINGATE	GUAYMAS	SAL MONREAL	container # azx-1160011 plate # az-82475 c
Main Gate Hayden	BO2020-12165	A2774	318	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	78,000	23,760	54,240	10/13/2020 11:57	10/13/2020 12:37	00:40	HAYOPUSMAINGATE	Marana	FIDEL	
Main Gate Hayden	BO2020-12155	CFC35	991	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	77,300	27,380	49,920	10/13/2020 10:39	10/13/2020 12:54	02:15	HAYOPUSMAINGATE	GUAYMAS	LAZARO SANCHEZ	plate # az-25372b trailer # 8187

Weight entered manually

SCALE	TICKET	BOL	TRUCK #	CARRIER	FROM	COMMODITY	QUALITY	GROSS	TARE	NET	WEIGH IN DATE	WEIGH OUT DATE	SERVICE TIME (hh:mm)	OFFICER	DESTINATION	DRIVER	COMMENTS
Main Gate Hayden	BO2020-12159	CFC36	219	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	75,540	26,580	48,960	10/13/2020 11:00	10/13/2020 13:18	02:18	HAYOPUSMAINGATE	GUAYMAS	MIKE FORCE	plate # az-72694a trailer #8174
Main Gate Hayden	BO2020-12167	A2775	1032	ASA-CTI	HAYDEN SULPHURIC ACID PLANT	SULPHURIC ACID	TEC-98%	77,700	24,540	53,160	10/13/2020 12:23	10/13/2020 13:22	00:59	HAYOPUSMAINGATE	Marana	JOHN	
Main Gate Hayden	BO2020-12166	CFC37	252	ASA-CTI	HAYDEN SMELTER	COPPER FILTER CAKE	HAYDEN SMELTER	76,240	25,960	50,280	10/13/2020 12:11	10/13/2020 13:27	01:16	HAYOPUSMAINGATE	GUAYMAS	RON MATTHYS	PLATE # AZ-01638F TRAILER # 8254
Main Gate Hayden	BO2020-12174	A2776	245	ASA-BJ CECIL TRUCKING	MMI HAYDEN SULFURIC ACID PLANT	SULPHURIC ACID	MMI-98%	78,180	26,940	51,240	10/13/2020 16:10	10/13/2020 16:56	00:46	HAYOPUSMAINGATE	Joseph City	DAN	
											AVERAGE TIME		01:27				

COMMODITY	CLIENT	RECORDS	NET
MMI HAYDEN SULFURIC ACID PLANT - SULPHURIC ACID			
	Casa Grande	1	49,320
	Gilbert	1	50,440
	Joseph City	1	51,240
	Phoenix	1	50,360
	Saint Johns, AZ.	1	49,740
	Tonopah	1	49,780
		6	300,880
HAYDEN SULPHURIC ACID PLANT - SULPHURIC ACID			
	Marana	20	1,063,500
		20	1,063,500
HAYDEN SMELTER - BIN MIXES			
	GUAYMAS	12	558,080
		12	558,080
HAYDEN SMELTER - COPPER FILTER CAKE			
	GUAYMAS	18	881,540
		18	881,540
		56	**2,804,000**

Appendix L: Proxy Enforceable Attainment Demonstration

ASARCO LLC – Hayden Operations
Demonstration that Post-Project Enforceable Lead Emissions Reductions Will Attain NAAQS
October 25, 2023

EPA and ADEQ have requested that ASARCO LLC – Hayden Operations (ASARCO) provide an additional demonstration showing that if the proposed Uptake Improvement Project, Fuming Ladle Control Project and Anode Secondary Hood Project are implemented as presented in the proposed Hayden Lead SIP that total roofline emissions would be expected to consistently achieve levels consistent with the modeled attainment demonstration and that there is sufficient certainty that the emissions reductions are adequately enforceable. This submittal responds to that request.

As outlined in ASARCO's petition for a SIP revision and responses to ADEQ's and EPA's comments on the petition, the estimated emissions reductions from the three projects are as follows:

Uptake Improvement Project:	3.4% reduction over baseline
Fuming Ladle Control Project:	15.4% reduction over baseline
Anode Secondary Hoods Project:	70% reduction over baseline

Baseline emissions are a combination of underlying process operations at the flash furnace, converters and anode furnaces and the effectiveness of the existing control systems.

To gain additional insight into the baseline emissions, ASARCO committed to and undertook a fugitive emissions study starting in May 2019 until interrupted by the work stoppage at the smelter in October 2019. This study provides the best, but still very limited, data on likely fugitive emissions from the Hayden smelter after completion of the Converter Retrofit Project and prior to the implementation of the proposed projects. During the "intensive phase" of the fugitive study, MiniVol sampler data was taken of fugitive emissions along the smelter roofline on a once every three day basis. SLR International, which conducted the fugitive study on behalf of ASARCO, noted that some of the study monitors/collection points were reclassified during the study to better reflect underlying process operations and that there is some "blow through" of emissions from one process area to another in some atmospheric conditions. In the short term, these factors complicate attribution of roofline emissions to one process or another but over the duration of the study the impact of these effects is likely reduced. SLR then reported a roofline value of 0.13 lb/hr from the roofline fugitives as a whole and a best estimate, subject to the uncertainties listed above, of 0.041 lb/hr for fugitives from the flash furnace area, 0.024 lb/hr for fugitives from the converter aisle, and 0.061 lb/hr for fugitives from the anode aisle. *See* SLR, "Fugitive Emissions Study Intensive Monitoring Data Report – June/July 2019" at 3 (Oct. 2019) (taken from Metal Species, Average Emission Rate (lb/hr) for Pb). The relevant parts from the SLR Report are found in Appendix A.

Based upon the conclusions and limitations of the interrupted fugitive study and the expected emissions reductions developed by its consultants, the following approach was developed to estimate the expected impact of the 2023 Hayden Lead SIP projects (Uptake Improvement Project, Fuming Ladle Control Project and Anode Secondary Hoods Project) on rooftop fugitive emissions from the Hayden smelter. The proposed approach compensates for the lower production rate observed during the intensive period of the study.

General Approach

$$Expected\ Emissions, \frac{lb}{hr} = \sum_{i=1}^{3} \left(Uniti * \frac{Design}{Actual}\ tpd\ conc. * (1 - Proj\ CEi)\right)$$

Where:

Expected Emissions = expected total lead emissions from roofline fugitives post-SIP implementation, in lb/hr
$_i$ = process unit and associated control project, where i=1 is flash furnace roofline and Uptake Improvement Project, i = 2 is converter aisle roofline and Fuming Ladle Control Project, and i = 3 is anode roofline and Anode Secondary Hood Project; emissions are given in lb/hr and control projects in decimal percent of control efficiencies reported above
Unit$_i$ = average lb/hr data for fugitive emissions from Unit$_i$ from SLR report for intensive study period. The SLR report lists 0.041 lb/hr for the flash furnace area; 0.024 lb/hr for the converter aisle; and 0.061 lb/hr for the anode area. Data taken from SLR, "Fugitive Emissions Study Intensive Monitoring Data Report – June/July 2019" at 3 (Oct. 2019) (taken from Metal Species, Average Emission Rate (lb/hr) for Pb)
Design/Actual = long-term potential to emit design / actual average achieved in fugitive study. The Hayden smelter annual limit is 693,500 tons concentrate which is equivalent to 1900 tons/day. The actual process rate on the days MiniVol sampler data were obtained averaged 1560 tons/day. The Design/Actual ratio adjusts the forecast emissions to approximate those likely to be seen at full production.
Project CE$_i$ = decreases anticipated for each project, set forth above, in decimal percent equivalent.

Applying this approach to each area, ASARCO calculates the following anticipated impact from the proposed projects.

Flash Furnace Roofline
Flash Furnace Fugitives lb/hr * Design/Actual tpd concentrate * (1 – Project CE) 0.041 lb/hr * 1900 tpd/1560 tpd * (1-0.034) = 0.048 lb/hr

Converter Aisle Roofline
Converter Aisle Fugitives lb/hr * Design/Actual tpd concentrate * (1 – Project CE)

0.024 lb/hr * 1900 tpd/1560 tpd * (1-0.154) = 0.025 lb/hr

Anode Aisle Roofline
Anode Fugitives lb/hr * Design/Actual tpd concentrate * (1 – Project CE) 0.061 lb/hr * 1900 tpd/1560 tpd * (1-0.70) = 0.022 lb/hr

Comparing these values to the modeled values demonstrates that at full operation the Hayden smelter would be expected to achieve the modeled attainment rates with a margin of safety:

Area	Modeled Rate lb/hr	Expected Rate lb/hr	Exp < Model
Flash Furnace	0.2263	0.048	Yes
Converter Aisle	0.0712	0.025	Yes
Anode Aisle	0.0286	0.022	Yes
Sum of Process Fugitives	0.3261	0.095	Yes

If we consider the SLR report finding that attribution to the individual areas is limited by the various factors discussed above, so that overall comparison is more appropriate given the limited data available, we get the following result:

Modeled Emissions	Expected Emissions	Safety Margin
0.326 lb/hr	0.095 lb/hr	71%

In summary, when the expected emissions post-SIP implementation are compared to the emissions included in the SIP's modeled attainment demonstration, the Hayden smelter's expected emissions are below them with a reasonable safety margin.

The preceding demonstration also demonstrates that the emissions reductions are enforceable through work practices. During the fugitive study, the smelter was operating subject to the work instructions set forth in R18-2-B1301 and air permit significant revision 60647. ASARCO operated with these work practices in place and undertook measurements, which were added to the operations and maintenance plan submitted to ADEQ and EPA. The data from the intensive period of the fugitive study are thus representative of the smelter's performance under the prescribed work practices. Those work practices, together with those proposed in air permit significant revision 97168, are enforceable as a practical matter because they identify the unit, the required action, the allowable range or ranges, averaging periods, and set forth monitoring, reporting and recordkeeping allowing ongoing enforcement. A.A.C. R18-2-B1301 and significant permit revisions 60647 and 97168 thus provide enforceable emissions reductions.

Accordingly, this demonstration, when coupled with application of the enforceable work practice standards set forth in the existing rules and proposed significant permit revision, provides both (1) an ample demonstration that the Hayden smelter is expected to attain post-project implementation; and (2) a reasonable basis for ensuring compliance with the proposed SIP revision and its specified control measures and assumptions.

APPENDIX "A"

Excerpts from
Fugitive Emissions Study Intensive Monitoring Data Report – June/July 2019

SLR
global environmental solutions

ASARCO
GRUPO MEXICO

Fugitive Emissions Study Intensive Monitoring Data Report - June/July 2019

October 2019

Version: 1 Rev: 1

Fugitive Emissions Study Intensive Monitoring Data Report - June/July 2019

Prepared for:
ASARCO LLC
100 Hayden Ave.
Hayden, AZ 85135

This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.

Aaron Wilson
Project Manager

P. P. Miller II

Peter P. Miller II, CCM
Senior Scientist

EXECUTIVE SUMMARY

Consent Decree (CD) No. CV-15-02206-PHX-DLR entered into by ASARCO LLC (Asarco) and the United States Environmental Protection Agency (EPA) dictates Asarco conduct two (2) one-year fugitive emissions studies of the Hayden Operations Copper Smelter in Hayden, Arizona. The initial one-year study was required to commence within 6 months of completion of the Converter Retrofit Project. A second one-year study is required 5 years later from the date of commencement of the first study. The purpose of these studies is to quantify fugitive air emissions from the smelting process not captured by the facility's emissions control systems.

The Converter Retrofit Project was completed on November 30, 2018 and the first of two post-retrofit fugitive emissions studies of the smelter facility was started on May 30, 2019. The fugitive emissions study design was required to follow an EPA-approved protocol that mirrored a previous 1994-1995 study. The protocol called for a 60-day intensive monitoring period followed by 10 months of routine continuous monitoring. This report summarizes the data collected during the Intensive Monitoring period. The data presented should be considered only a preliminary indication of potential smelter fugitive emissions. This reflects the iterative nature of this brief phase of the study. In addition, the two months of data collected during the Intensive Study period is not necessarily representative of a full year of smelter operation.

The study is designed to quantify potential fugitive air emissions of sulfur dioxide (SO_2), particulate matter (PM), and hazardous air pollutant (HAP) particulate metals emitted from the concentrate dryers, flash furnace, converter aisle, and anode furnaces. A network of instrumentation and sampling equipment was installed throughout the smelter at areas which vent directly to the atmosphere. Calculation of potential emissions through these openings required installation of an array of SO_2 intake probes matched with sensors to continuously measure SO_2 concentrations, axial air flow, and exit temperature. PM samplers measuring respirable ($PM_{2.5}$), inhalable (PM_{10}), and total (PM_{TSP}) particulate matter were collocated with designated SO_2 probes. Each smelter process had its own sampling array that measured process-averaged concentrations. Valid data capture was well in excess of project quality assurance goals.

The converter aisle array had the highest average concentration of SO_2 measured during the period at 4.8 ppm. Median concentrations were a half to a third of the average, indicating high impact events of short duration (≤ 1 hour) dominated the SO_2 impact profiles across all processes. PM_{TSP} concentrations were essentially the same across all processes (±10% of the smelter average of 2,479 µg/m^3) with the flash furnace showing the highest average PM_{10} concentration and anode furnaces showing the highest average $PM_{2.5}$ concentration. The table that follows provides a summary of measured concentrations.

Pollutant	Units	Average Concentrations			
		Anode	Converter Aisle	Flash Furnace	Smelter
SO_2	ppm	3.5	4.8	3.8	4.0

Pollutant	Units	Average Concentrations			
		Anode	Converter Aisle	Flash Furnace	Smelter
PM_{TSP}	µg/m^3	2685	2145	2606	2479
PM_{10}	µg/m^3	1398 (1357)	1454 (1282)	1751 (1672)	1554
$PM_{2.5}$	µg/m^3	1017 (933)	1008 (947)	544 (553)	856

HAP metal concentrations were derived from laboratory analysis of PM_{TSP} samples for 11 metals. Results show the anode array had the highest total PM metals concentration with As, Pb, and Se dominating the HAPs metals profile. Lead levels were relatively consistent across all processes with a smelter average concentration of 73.9 µg/m^3. The table below provides an abbreviated summary of metals concentrations.

Particulate Metal Species	Average Concentration (µg/m^3)			
	Anode	Converter Aisle	Flash Furnace	Smelter
As	90.7	41.5	41.8	58.0
Pb	78.0	80.3	63.3	73.9
Mn	0.7	0.3	0.3	0.4
Se	35.5	4.8	1.1	13.8
Sb	1.7	2.1	2.5	2.1
Cd	1.2	4.5	4.7	3.5
Cr	0.4	0.6	0.2	0.4
Ni	0.1	0.03	0.001	0.04
Co	0.0001	0.01	0.004	0.005
Be[1]	<MDL	0.002	0.002	0.002
Hg	0.4	0.6	0.7	0.6
Total Metals HAPs	208.7	134.7	114.6	152.7

Potential fugitive emission profiles for each process array were determined from average concentration data, exit velocities, and exit temperatures plus the cross-sectional area of the exit vents. Review of the computed emission rates show potential converter fugitive emissions were generally well controlled during Intensive Monitoring. Converter average emission rate for PM_{TSP} and PM_{10} were about 25% of those calculated for the flash furnace, while $PM_{2.5}$ emissions were roughly half. In general results were similar for both the flash furnace and anode sampling arrays. They show nearly identical potential emission rates of SO_2 and $PM_{2.5}$ fraction. The table below summarizes these emission profiles.

Pollutant	Average Emission Rate (lb/hr)			
	Anode	Converter Aisle	Flash Furnace	Smelter
SO_2	6.7 [1]	3.8 [2]	8.0	18.5
PM_{TSP}	1.4	0.65	2.5	4.6
PM_{10}	0.7	0.45	1.7	2.9
$PM_{2.5}$	0.5	0.27	0.5	1.3

The anode array and flash furnace array have the same potential total HAP metals emission rates with similar As and Pb profiles. A summary of potential HAP metals emissions is presented below.

Metal Species	Average Emission Rate (lb/hr)			
	Anode	Converter Aisle	Flash Furnace	Smelter
As	4.7×10^{-2}	1.6×10^{-2}	4.0×10^{-2}	1.0×10^{-1}
Pb	4.1×10^{-2}	2.4×10^{-2}	6.1×10^{-2}	1.3×10^{-1}
Mn	3.7×10^{-4}	8.1×10^{-5}	3.1×10^{-4}	7.6×10^{-4}
Se	1.9×10^{-2}	9.8×10^{-4}	1.1×10^{-3}	2.1×10^{-2}
Sb	9.0×10^{-4}	7.5×10^{-4}	2.4×10^{-3}	4.1×10^{-3}
Cd	6.3×10^{-4}	1.6×10^{-3}	4.5×10^{-3}	6.7×10^{-3}
Cr	2.5×10^{-4}	1.0×10^{-4}	1.9×10^{-4}	5.4×10^{-4}
Ni	2.9×10^{-5}	6.9×10^{-6}	7.1×10^{-7}	3.6×10^{-5}
Co	5.7×10^{-8}	1.9×10^{-6}	4.3×10^{-6}	6.2×10^{-6}

Metal Species	Average Emission Rate (lb/hr)			
	Anode	Converter Aisle	Flash Furnace	Smelter
Be	< MDL	2.9×10^{-7}	1.5×10^{-6}	1.8×10^{-6}
Hg	1.9×10^{-4}	2.2×10^{-4}	6.6×10^{-4}	1.1×10^{-3}
Total Metal HAPs	1.1×10^{-1}	4.4×10^{-2}	1.1×10^{-1}	2.6×10^{-1}

Estimated fugitive emissions from Intensive Monitoring measurements show substantial improvement from those calculated for the smelter during the 1994-1995 study. The table below provides a summary comparison of derived emission rates to the previous study. Review of the comparison indicates a substantial reduction in potential smelter fugitive emissions for all pollutants of interest for all smelter processes.

Pollutant	Average Process Emission Rates (lb/hr)					
	Anode		Converter Aisle		Flash Furnace	
	1994-1995	2019	1994-1995	2019	1994-1995	2019
SO_2	13.0	6.7	525	3.8	288	8.0
PM_{TSP}	14.6	1.4	5.8	0.65	10.2	2.5
As	0.55	0.047	0.14	0.016	0.15	0.040
Cd	0.005	0.00063	0.006	0.0016	0.008	0.0045
Pb	0.38	0.041	0.39	0.024	0.26	0.061
Sb	0.01	0.0009	0.03	0.00075	0.01	0.0024
Se	0.49	0.019	0.05	0.00098	0.04	0.0011

1. INTRODUCTION

Consent Decree (CD) No. CV-15-02206-PHX-DLR entered into by ASARCO LLC (Asarco) and the United States Environmental Protection Agency (EPA) dictates Asarco conduct two (2) one-year fugitive emissions studies of the Hayden Operations Copper Smelter in Hayden, Arizona. The initial one-year study was required to commence within 6 months of completion of the Converter Retrofit Project. A second one-year study is required 5 years later from the date of commencement of the first study. The purpose of these studies is to quantify fugitive air emissions from the smelting process not captured by the facility's emissions control systems. The objectives of these studies are to:

- Develop post-retrofit fugitive emission factors.
- Establish post-retrofit baseline fugitive emission levels for future comparison.
- Assist facility operations in control and management of fugitive emissions.
- Determine potential surrogate parametric correlations between pollutants.

The Converter Retrofit Project was completed on November 30, 2018 and the first of two post-retrofit fugitive emissions studies of the smelter facility was started on May 30, 2019. The fugitive emissions study design was required to follow an EPA-approved protocol (SLR, 2017) that mirrored a previous 1994-1995 study (NAWC, 1995). The protocol for the first-year study called for an initial 60-day intensive monitoring period followed by 10 months of routine continuous monitoring. Compared to routine continuous monitoring, intensive monitoring included higher frequency of sampling for particulate matter (PM) and additional monitoring as needed using portable sensors and supplementary samplers. SLR provided Asarco with interim results during intensive monitoring which was conducted from May 30 through July 29, 2019. This report summarizes the data collected during that period. The data presented should be considered only a preliminary indication of potential smelter fugitive emissions. This reflects the iterative nature of this brief phase of the study. In addition, the two months of data collected during the Intensive Study period is not necessarily representative of a full year of smelter operation.

Table 12 Potential HAPs Metals Emission Rates

Metal Species	Average Emission Rate (lb/hr)			
	Anode	Converter Aisle	Flash Furnace	Smelter
As	4.7×10^{-2}	1.6×10^{-2}	4.0×10^{-2}	1.0×10^{-1}
Pb	4.1×10^{-2}	2.4×10^{-2}	6.1×10^{-2}	1.3×10^{-1}
Mn	3.7×10^{-4}	8.1×10^{-5}	3.1×10^{-4}	7.6×10^{-4}
Se	1.9×10^{-2}	9.8×10^{-4}	1.1×10^{-3}	2.1×10^{-2}
Sb	9.0×10^{-4}	7.5×10^{-4}	2.4×10^{-3}	4.1×10^{-3}
Cd	6.3×10^{-4}	1.6×10^{-3}	4.5×10^{-3}	6.7×10^{-3}
Cr	2.5×10^{-4}	1.0×10^{-4}	1.9×10^{-4}	5.4×10^{-4}
Ni	2.9×10^{-5}	6.9×10^{-6}	7.1×10^{-7}	3.6×10^{-5}
Co	5.7×10^{-8}	1.9×10^{-6}	4.3×10^{-6}	6.2×10^{-6}
Be [1]	< MDL	2.9×10^{-7}	1.5×10^{-6}	1.8×10^{-6}
Hg	1.9×10^{-4}	2.2×10^{-4}	6.6×10^{-4}	1.1×10^{-3}
Total Metal HAPs	1.1×10^{-1}	4.4×10^{-2}	1.1×10^{-1}	2.6×10^{-1}

Note: In the table above average emission rates are the average of all valid 24-hour emission rates. Converter Aisle average is the sum of sampling location C4 and C2. The Converter Aisle emission rate is the sum of emission rates calculated for C2 and C3/C4. The Smelter average is the sum of all process area average emission rates.

[1] Be concentrations for some samples were less than the method detection limit (MDL). In these cases the concentration used to calculate the emission rate was set to zero.

Appendix M: Wind Fence Effectiveness – Case Study, Vale

Wind Fence Effectiveness – Case Study, Vale.

Situation

Vale S.A. is the world's largest producer of iron ore pellets. Their main plant is at Vitoria, a coastal city in Brazil. The Vitoria plant covers approximately 5 square kilometers and is 5 km upwind across an open bay from a major housing area.

There are several yards with stockpiles of pellets, coal and other materials up to 14m high and over 1km long.

Dust Control Investigation

To control the dust from the plant, in 2008 Vale initiated a comprehensive wind fence program.

The preliminary stage was to engage the Midwest Research Institute to analyse their yards using CFD (Computational Fluid Dynamics) based on aerodynamic porosity and design information provided by

WeatherSolve. From that report, the MRI predicted a dust control level (in this case control of TSP which is the finest dust suspended in the air) of 80%.

They also engaged a consultant to monitor the dust for 45 days at heights of 4,8,12, 16 and 20m above the ground around the perimeter of one of the yards that was close to the sea. The sampling was done on an hour by hour basis with wet days removed from the sample set.

With the dust base level established, a wind fence was then built.

The wind fence was built using Brazilian structural engineers in tandem with WeatherSolve structural and environmental engineers to create a reliable system that matched the aerodynamic modelling of the MRI. The yard chosen for the sampling test is approximately 400m x 300m, with piles around 14m high.

The fence height is about 18m

Photo August 2009. Note one of the monitoring towers towards the back of the photo.

Some ground contouring was done. In other places the fence followed the contour as shown below.

After the fence was installed, the monitoring program was run for another 45 days. (They waited for a time when similar weather and yard activities to the pre-fence monitoring program were occurring.)

The results showed an effectiveness of 77.4% in the control of TSP (Total suspended particulate) leaving the yard.

A video referencing this work can be found on the Vale website through:

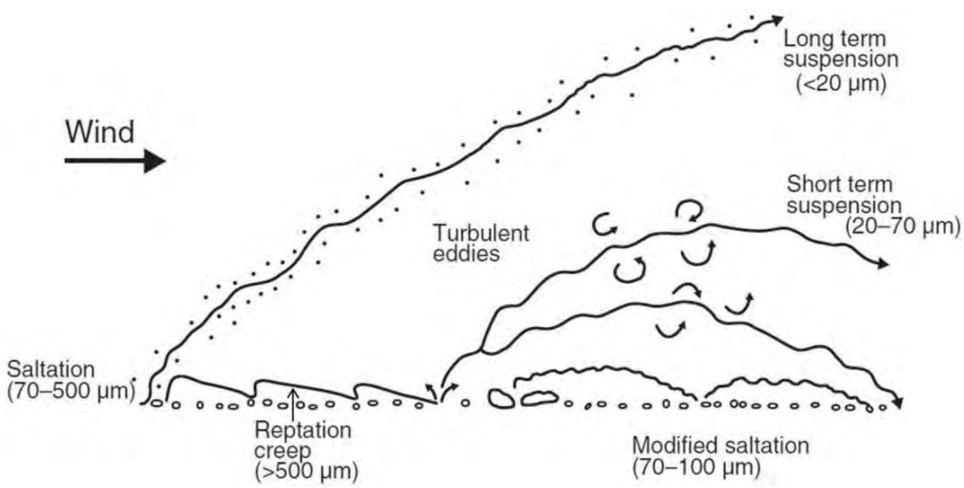
http://www.youtube.com/watch?v=LCE_loyN2Fs

Since 2009, Vale has worked with WeatherSolve in building approximately 14km of wind fence in Vale operations in Vitoria, Oman and Canada, and another 3km of fence in a project jointly owned with BHP. The tallest of those fences are 28m high to reach the target levels of control set by Vale.

Nearly all of those fences have been done in conjunction with CFD analysis from the MRI.

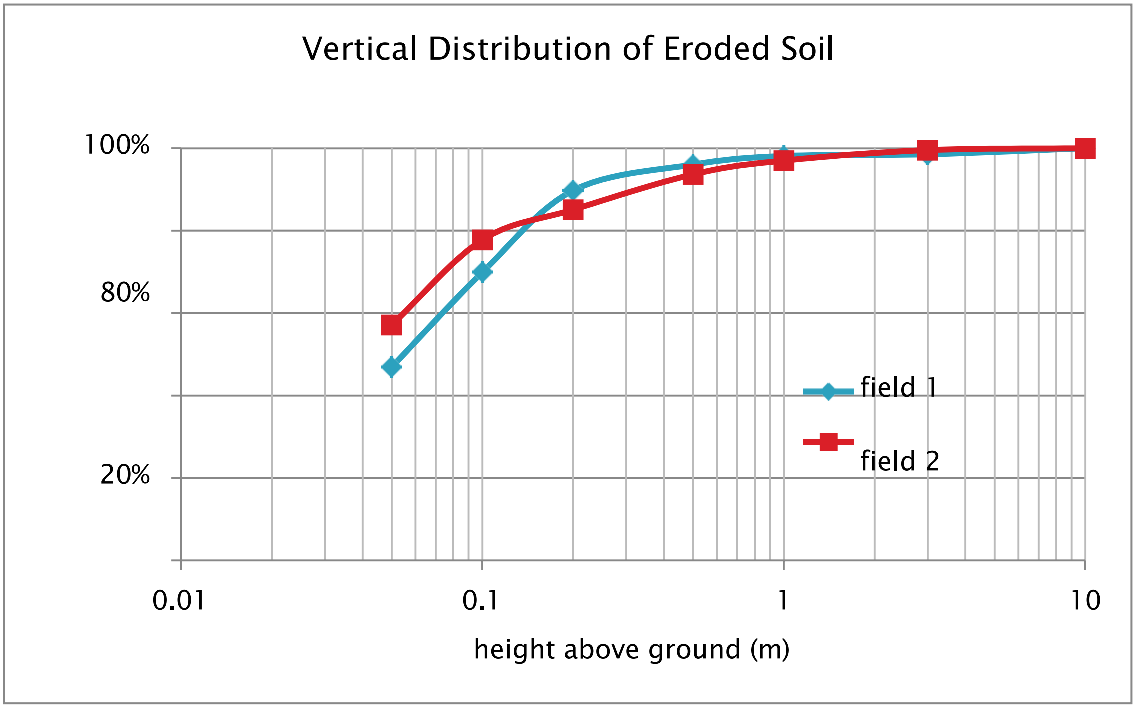
Note on total control levels

Actual control is higher than 77.4% as the fence also controls the considerable volume of larger dust particles that erode off the pile and roll or skip (saltate) onto the roadways before being crushed and dispersed further. Erosion research in Texas has shown that typically the volume of saltating particles is several times greater than the TSP volume.



The diagram above shows the different transport modes of dust particles. TSP measures the long and short term suspension volumes – i.e. particles smaller than about 70 microns. Larger particles very rarely get higher than 0.3m above the surface of the stockpile or ground apart from during their fall from a conveyor or stacker/reclaimer.

The graph below shows measured volumes of dust in two storm events over bare fields. It shows that at least 85% of the dust never gets higher than 0.3m above the ground. These are the larger particles that are not considered in the TSP calculations, but which become TSP if they get crushed on a roadway outside the perimeter of the stockpile. Wind fences with a base wall or steep perimeter embankment control this dust too – and usually to the 100% level.



The total dust control may then be considered as follows:

$$77.4\% \times (1 - 0.85) + 100\% \times 0.85 = 96.6\%$$

where the first part of the equation is the control of the TSP fraction (0.15) and the second part is the control of the saltating fraction (0.85) for an overall control of 96%.

Appendix C: Copies of SIP Regulations - Draft Significant Permit Revision No. 97168, *Attachment "I": Hayden Smelter Site - Specific Requirements*

Air Quality Division
May 20, 2024

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DRAFT PERMIT No. 39948 (As Amended By Significant Permit Revision No. 97168)
PLACE ID No. 2435

PERMITTEE:	**ASARCO LLC**
FACILITY:	**Hayden Operations**
PERMIT TYPE	**Class I Air Quality Permit**
DATE ISSUED:	**December 24, 2018 (As Amended on DATE PENDING)**
EXPIRY DATE:	**April 20, 2023**

SUMMARY

This renewal Title V permit is issued to ASARCO LLC, the Permittee, for the continued operation of their copper concentrator and smelter facilities located in Hayden, Gila County, Arizona. This is a renewal of Permit #1000042 and #M070399P1-99.

This permit is issued in accordance with Arizona Revised Statutes (ARS) 49-426. It contains requirements from Title 18, Chapter 2 of the A.A.C., Title 40 of the Code of Federal Regulations and a consent decree filed on December 30, 2015 in *United States v. ASARCO LLC*, No. CV-15-02206-PHX-DLR (D. Ariz.). All definitions, terms, and conditions used in this permit conform to those in the Arizona Administrative Code R18-2-101 et. seq. (A.A.C.), Title 40 of the Code of Federal Regulations (CFR) and CV-15-02206-PHX-DLR (D. Ariz.), except as otherwise defined in this permit.

Significant Permit Revision (SPR) No. 97168

This SPR authorizes the incorporation of the Uptake Improvement Project, Fuming Ladle Control Project and the Anode Furnaces Secondary Hood Project. In addition, it authorizes the addition of lead emission limitations at the Hayden Smelter under Attachment "I": Hayden Smelter Site-Specific SIP Requirements as part of the state implementation plan (SIP) for the Hayden Lead Nonattainment Area.

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ATTACHMENT "A": GENERAL PROVISIONS

I. PERMIT EXPIRATION AND RENEWAL

A. This permit is valid for a period of five (5) years from the date of issuance.
[ARS § 49-426.F, A.A.C. R18-2-306.A.1]

B. The Permittee shall submit an application for renewal of this permit at least six (6) months, but not more than eighteen (18) months, prior to the date of permit expiration.
[ARS § 49-426.F, A.A.C. R18-2-304.D.2]

II. COMPLIANCE WITH PERMIT CONDITIONS

A. The Permittee shall comply with all conditions of this permit including all applicable requirements of the Arizona Revised Statutes (A.R.S.) Title 49, Chapter 3, and the air quality rules under Title 18, Chapter 2 of the Arizona Administrative Code. Any permit noncompliance is grounds for enforcement action; for permit termination, revocation and reissuance, revision; or for denial of a permit renewal application. In addition, noncompliance with any federally enforceable requirement constitutes a violation of the Clean Air Act.
[A.A.C. R18-2-306.A.8.a]

B. It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
[A.A.C. R18-2-306.A.8.b]

III. PERMIT REVISION, REOPENING, REVOCATION AND REISSUANCE, OR TERMINATION FOR CAUSE

A. The permit may be revised, reopened, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit revision, revocation and reissuance, termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition.
[A.A.C. R18-2-306.A.8.c]

B. The permit shall be reopened and revised under any of the following circumstances:

1. Additional applicable requirements under the Clean Air Act become applicable to the Class I source. Such a reopening shall only occur if there are three or more years remaining in the permit term. The reopening shall be completed no later than 18 months after promulgation of the applicable requirement. No such reopening is required if the effective date of the requirement is later than the date on which the permit is due to expire, unless the original permit or any of it terms and conditions has been extended pursuant to A.A.C. R18-2-322.B. Any permit revision required pursuant to this subparagraph shall comply with the provisions in A.A.C. R18-2-322 for permit renewal and shall reset the five-year permit term;
[A.A.C. R18-2-321.A.1.a]

2. Additional requirements, including excess emissions requirements, become applicable to an affected source under the acid rain program. Upon approval by the Administrator, excess emissions offset plans shall be deemed to be incorporated into the Class I permit;

[A.A.C. R18-2-321.A.1.b]

3. The Director or the Administrator determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit; and

[A.A.C. R18-2-321.A.1.c]

4. The Director or the Administrator determines that the permit needs to be revised or revoked to assure compliance with the applicable requirements.

[A.A.C. R18-2-321.A.1.d]

C. Proceedings to reopen and issue a permit, including appeal of any final action relating to a permit reopening, shall follow the same procedures as apply to initial permit issuance and shall, except for reopenings under Condition III.B.1, affect only those parts of the permit for which cause to reopen exists. Such reopening shall be made as expeditiously as practicable. Permit reopenings for reasons other than those stated in Condition III.B.1 above shall not result in a resetting of the five-year permit term.

[A.A.C. R18-2-321.A.2]

IV. POSTING OF PERMIT

A. The Permittee shall post this permit or a certificate of permit issuance at the facility in such a manner as to be clearly visible and accessible. All equipment covered by this permit shall be clearly marked with one of the following:

1. Current permit number; or

2. Serial number or other equipment identification number (equipment ID number) that is also listed in the permit to identify that piece of equipment.

[A.A.C. R18-2-315.A]

B. A copy of the complete permit shall be kept on site.

[A.A.C. R18-2-315.B]

V. FEE PAYMENT

The Permittee shall pay fees to the Director pursuant to ARS § 49-426(E) and A.A.C. R18-2-326.

[A.A.C. R18-2-306.A.9 and -326]

VI. ANNUAL EMISSION INVENTORY QUESTIONNAIRE

A. The Permittee shall complete and submit to the Director an annual emissions inventory questionnaire. The questionnaire is due by March 31st or ninety (90) days after the Director makes the inventory form available each year, whichever occurs later, and shall include emission information for the previous calendar year.

[A.A.C. R18-2-327.A]

B. The questionnaire shall be on a form provided by the Director and shall include the information required by A.A.C. R18-2-327.B.

[A.A.C. R18-2-327.B]

VII. COMPLIANCE CERTIFICATION

A. The Permittee shall submit a compliance certification to the Director semiannually, which describes the compliance status of the source with respect to each permit condition. The first certification shall be submitted no later than May 15th, and shall report the compliance status of the source during the period between October 1st of the previous year and March 31st of the current year. The second certification shall be submitted no later than November 15th, and shall report the compliance status of the source during the period between April 1st and September 30th of the current year.

[A.A.C. R18-2-309.2.a]

B. The compliance certifications shall include the following:

1. Identification of each term or condition of the permit that is the basis of the certification;

[A.A.C. R18-2-309.2.c.i]

2. Identification of the methods or other means used by the Permittee for determining the compliance status with each term and condition during the certification period,

[A.A.C. R18-2-309.2c.ii]

3. Status of compliance with the terms and conditions of the permit for the period covered by the certification, including whether compliance during the period was continuous or intermittent. The certification shall be based on the methods or means designated in Condition VII.B.2 above. The certifications shall identify each deviation and take it into account for consideration in the compliance certification;

[A.A.C. R18-2-309.2.c.iii]

4. For emission units subject to 40 CFR Part 64, the certification shall also identify as possible exceptions to compliance any period during which compliance is required and in which an excursion or exceedance defined under 40 CFR Part 64 occurred;

[A.A.C. R18-2-309.2.c.iii]

5. All instances of deviations from permit requirements reported pursuant to Condition XII.B; and

6. Other facts the Director may require to determine the compliance status of the source.

[A.A.C. R18-2-309.2.a, -309.2.c-d, and -309.5.d]

C. A copy of all compliance certifications shall also be submitted to the EPA Administrator.

D. If any outstanding compliance schedule exists, a progress report shall be submitted with the semi-annual compliance certifications required in Condition VII.A above.

VIII. CERTIFICATION OF TRUTH, ACCURACY AND COMPLETENESS

Any document required to be submitted by this permit, including reports, shall contain a certification by a responsible official of truth, accuracy, and completeness. This certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

[A.A.C. R18-2-304.I]

IX. INSPECTION AND ENTRY

A. Upon presentation of proper credentials, the Permittee shall allow the Director or the authorized representative of the Director to:

B. Enter upon the Permittee's premises where a source is located, emissions-related activity is conducted, or where records are required to be kept under the conditions of the permit;

[A.A.C. R18-2-309.4.a]

C. Have access to and copy, at reasonable times, any records that are required to be kept under the conditions of the permit;

[A.A.C. R18-2-309.4.b]

D. Inspect, at reasonable times, any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit;

[A.A.C. R18-2-309.4.c]

E. Sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or other applicable requirements; and

[A.A.C. R18-2-309.4.d]

F. Record any inspection by use of written, electronic, magnetic and photographic media.

[A.A.C. R18-2-309.4.e]

X. PERMIT REVISION PURSUANT TO FEDERAL HAZARDOUS AIR POLLUTANT STANDARD

If this source becomes subject to a standard promulgated by the Administrator pursuant to Section 112(d) of the Act, then the Permittee shall, within twelve months of the date on which the standard is promulgated, submit an application for a permit revision demonstrating how the source will comply with the standard.

[A.A.C. R18-2-304.D.3]

XI. ACCIDENTAL RELEASE PROGRAM

If this source becomes subject to the provisions of 40 CFR Part 68, then the Permittee shall comply with these provisions according to the time line specified in 40 CFR Part 68.

[40 CFR Part 68]

XII. EXCESS EMISSIONS, PERMIT DEVIATIONS, AND EMERGENCY REPORTING

A. Excess Emissions Reporting

[A.A.C. R18-2-310.01.A, B, and C]

1. Excess emissions shall be reported as follows:

   a. The Permittee shall report to the Director any emissions in excess of the limits established by this permit. Such report shall be in two parts as specified below:

      (1) Notification by telephone or facsimile within 24 hours of the time when the Permittee first learned of the occurrence of excess emissions including all available information from

Condition XII.A.1.b below.

(2) Detailed written notification by submission of an excess emissions report within 72 hours of the notification pursuant to Condition XII.A.1.a(1) above.

[A.A.C. R18-2-310.01.A]

b. The report shall contain the following information:

(1) Identity of each stack or other emission point where the excess emissions occurred;

[A.A.C. R18-2-310.01.B.1]

(2) Magnitude of the excess emissions expressed in the units of the applicable emission limitation and the operating data and calculations used in determining the magnitude of the excess emissions;

[A.A.C. R18-2-310.01.B.2]

(3) Date, time and duration, or expected duration, of the excess emissions;

[A.A.C. R18-2-310.01.B.3]

(4) Identity of the equipment from which the excess emissions emanated;

[A.A.C. R18-2-310.01.B.4]

(5) Nature and cause of such emissions;

[A.A.C. R18-2-310.01.B.5]

(6) If the excess emissions were the result of a malfunction, steps taken to remedy the malfunction and the steps taken or planned to prevent the recurrence of such malfunctions;

[A.A.C. R18-2-310.01.B.6]

(7) Steps taken to limit the excess emissions; and

[A.A.C. R18-2-310.01.B.7]

(8) If the excess emissions resulted from start-up or malfunction, the report shall contain a list of the steps taken to comply with the permit procedures.

[A.A.C. R18-2-310.01.B.8]

2. In the case of continuous or recurring excess emissions, the notification requirements shall be satisfied if the source provides the required notification after excess emissions are first detected and includes in such notification an estimate of the time the excess emissions will continue. Excess emissions occurring after the estimated time period, or changes in the nature of the emissions as originally reported, shall require additional notification pursuant to Condition XII.A.1 above.

[A.A.C. R18-2-310.01.C]

B. Permit Deviations Reporting

The Permittee shall promptly report deviations from permit requirements, including those attributable to upset conditions as defined in the permit, the probable cause of such deviations, and any corrective actions or preventive measures taken. Where the applicable requirement contains a definition of prompt or otherwise specifies a timeframe for reporting deviations, that definition or timeframe shall govern. Where the applicable requirement does not address the timeframe for reporting deviations, the Permittee shall submit reports of deviations according to the following schedule:

1. Notice that complies with A.A.C. R18-2-310.01.A is prompt for deviations that constitute excess emissions;

[A.A.C. R18-2-306.A.5.a and b]

2. Notice regarding upset conditions, which are defined as malfunctions or breakdowns of pollution control equipment, continuous emissions monitoring systems (CEMS), or continuous opacity monitoring systems (COMS) that are submitted within two working days of discovery shall be considered prompt; and

3. Except as provided in Conditions XII.B.1 and 2, prompt notification of all other types of deviations shall be every 6-months, concurrent with the semi-annual compliance certifications required in Condition VII, and can be submitted on the annual/semiannual deviation monitoring report form located on the Arizona Department of Environmental Quality Website.

C. Emergency Provision

1. An "emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of the source, including acts of God, that require immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

[A.A.C. R18-2-306.E.1]

2. An emergency constitutes an affirmative defense to an action brought for noncompliance with technology-based emission limitations if Condition XII.C.3 is met.

[A.A.C. R18-2-306.E.2]

3. The affirmative defense of emergency shall be demonstrated through properly signed, contemporaneous operating logs, or other relevant evidence that:

[A.A.C. R18-2-306.E.3]

   a. An emergency occurred and that the Permittee can identify the cause(s) of the emergency;

   [A.A.C. R18-2-306.E.3.a]

   b. The permitted facility was being properly operated at the time of the emergency;

   [A.A.C. R18-2-306.E.3.b]

   c. During the period of the emergency, the Permittee took all reasonable steps to minimize levels of emissions that exceeded the emissions standards or other requirements in the permit; and

   [A.A.C. R18-2-306.E.3.c]

d. The Permittee submitted notice of the emergency to the Director by certified mail, facsimile, or hand delivery within two working days of the time when emission limitations were exceeded due to the emergency. This notice shall contain a description of the emergency, any steps taken to mitigate emissions, and corrective action taken.

[A.A.C. R18-2-306.E.3.d]

4. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an emergency has the burden of proof.

[A.A.C. R18-2-306.E.4]

5. This provision is in addition to any emergency or upset provision contained in any applicable requirement.

[A.A.C. R18-2-306.E.5]

D. Compliance Schedule

For any excess emission or permit deviation that cannot be corrected within 72 hours, the Permittee is required to submit a compliance schedule to the Director within 21 days of such occurrence. The compliance schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance with the permit terms or conditions that have been violated.

[ARS § 49-426.I.3]

E. Affirmative Defenses for Excess Emissions Due to Malfunctions, Startup, and Shutdown

1. Applicability

A.A.C. R18-2-310 establishes affirmative defenses for certain emissions in excess of an emission standard or limitation and applies to all emission standards or limitations except for standards or limitations:

a. Promulgated pursuant to Sections 111 or 112 of the Act;

[A.A.C. R18-2-310.A.1]

b. Promulgated pursuant to Titles IV or VI of the Clean Air Act;

[A.A.C. R18-2-310.A.2]

c. Contained in any Prevention of Significant Deterioration (PSD) or New Source Review (NSR) permit issued by the U.S. EPA;

[A.A.C. R18-2-310.A.3]

d. Contained in A.A.C. R18-2-715.F; or

[A.A.C. R18-2-310.A.4]

e. Included in a permit to meet the requirements of A.A.C. R18-2-406.A.5.

[A.A.C. R18-2-310.A.5]

2. Affirmative Defense for Malfunctions

Emissions in excess of an applicable emission limitation due to malfunction shall constitute a violation. When emissions in excess of an applicable emission limitation are due to a malfunction, the Permittee has an affirmative defense to a civil or administrative enforcement proceeding based on that violation, other than a judicial action seeking injunctive relief, if the Permittee has complied with the reporting requirements of A.A.C. R18-2-310.01 and has demonstrated all of the following:

[A.A.C. R18-2-310.B]

a. The excess emissions resulted from a sudden and unavoidable breakdown of process equipment or air pollution control equipment beyond the reasonable control of the Permittee;

[A.A.C. R18-2-310.B.1]

b. The air pollution control equipment, process equipment, or processes were at all times maintained and operated in a manner consistent with good practice for minimizing emissions;

[A.A.C. R18-2-310.B.2]

c. If repairs were required, the repairs were made in an expeditious fashion when the applicable emission limitations were being exceeded. Off-shift labor and overtime were utilized where practicable to ensure that the repairs were made as expeditiously as possible. If off-shift labor and overtime were not utilized, the Permittee satisfactorily demonstrated that the measures were impracticable;

[A.A.C. R18-2-310.B.3]

d. The amount and duration of the excess emissions (including any bypass operation) were minimized to the maximum extent practicable during periods of such emissions;

[A.A.C. R18-2-310.B.4]

e. All reasonable steps were taken to minimize the impact of the excess emissions on ambient air quality;

[A.A.C. R18-2-310.B.5]

f. The excess emissions were not part of a recurring pattern indicative of inadequate design, operation, or maintenance;

[A.A.C. R18-2-310.B.6]

g. During the period of excess emissions there were no exceedances of the relevant ambient air quality standards established in Title 18, Chapter 2, Article 2 of the Arizona Administrative Code that could be attributed to the emitting source;

[A.A.C. R18-2-310.B.7]

h. The excess emissions did not stem from any activity or event that could have been foreseen and avoided, or planned, and could not have been avoided by better operations and maintenance practices;

[A.A.C. R18-2-310.B.8]

i. All emissions monitoring systems were kept in operation if at all practicable; and

[A.A.C. R18-2-310.B.9]

j. The Permittee's actions in response to the excess emissions were documented by contemporaneous records.

[A.A.C. R18-2-310.B.10]

3. Affirmative Defense for Startup and Shutdown

a. Except as provided in Condition XII.E.3.b, and unless otherwise provided for in the applicable requirement, emissions in excess of an applicable emission limitation due to startup and shutdown shall constitute a violation. When emissions in excess of an applicable emission limitation are due to startup and shutdown, the Permittee has an affirmative defense to a civil or administrative enforcement proceeding based on that violation, other than a judicial action seeking injunctive relief, if the Permittee has complied with the reporting requirements of A.A.C. R18-2-310.01 and has demonstrated all of the following:

[A.A.C. R18-2-310.C.1]

(1) The excess emissions could not have been prevented through careful and prudent planning and design;

[A.A.C. R18-2-310.C.1.a]

(2) If the excess emissions were the result of a bypass of control equipment, the bypass was unavoidable to prevent loss of life, personal injury, or severe damage to air pollution control equipment, production equipment, or other property;

[A.A.C. R18-2-310.C.1.b]

(3) The air pollution control equipment, process equipment, or processes were at all times maintained and operated in a manner consistent with good practice for minimizing emissions;

[A.A.C. R18-2-310.C.1.c]

(4) The amount and duration of the excess emissions (including any bypass operation) were minimized to the maximum extent practicable during periods of such emissions;

[A.A.C. R18-2-310.C.1.d]

(5) All reasonable steps were taken to minimize the impact of the excess emissions on ambient air quality;

[A.A.C. R18-2-310.C.1.e]

(6) During the period of excess emissions there were no exceedances of the relevant ambient air quality standards established in Title 18, Chapter 2, Article 2 of the Arizona Administrative Code that could be attributed to the emitting source;

[A.A.C. R18-2-310.C.1.f]

(7) All emissions monitoring systems were kept in operation if at all practicable; and

[A.A.C. R18-2-310.C.1.g]

(8) Contemporaneous records documented the Permittee's actions in response to the excess emissions.

[A.A.C. R18-2-310.C.1.h]

b. If excess emissions occur due to a malfunction during routine startup and shutdown, then those instances shall be treated as other malfunctions subject to Condition XII.E.2 above.

[A.A.C. R18-2-310.C.2]

4. Affirmative Defense for Malfunctions during Scheduled Maintenance

If excess emissions occur due to a malfunction during scheduled maintenance, then those instances will be treated as other malfunctions subject to Condition XII.E.2.

[A.A.C. R18-2-310.D]

5. Demonstration of Reasonable and Practicable Measures

For an affirmative defense under Condition XII.E.2 or XII.E.3, the Permittee shall demonstrate, through submission of the data and information required by Condition XII.E and A.A.C. R18-2-310.01, that all reasonable and practicable measures within the Permittee's control were implemented to prevent the occurrence of the excess emissions.

[A.A.C. R18-2-310.E]

XIII. RECORDKEEPING REQUIREMENTS

A. The Permittee shall keep records of all required monitoring information including, but not limited to, the following:

[A.A.C. R18-2-306.A.4.a]

1. The date, place as defined in the permit, and time of sampling or measurements;

[A.A.C. R18-2-306.A.4.a.i]

2. The date(s) any analyses were performed;

[A.A.C. R18-2-306.A.4.a.ii]

3. The name of the company or entity that performed the analyses;

[A.A.C. R18-2-306.A.4.a.iii]

4. A description of the analytical techniques or methods used;

[A.A.C. R18-2-306.A.4.a.iv]

5. The results of analyses; and

[A.A.C. R18-2-306.A.4.a.v]

6. The operating conditions as existing at the time of sampling or measurement.

[A.A.C. R18-2-306.A.4.a.vi]

B. The Permittee shall retain records of all required monitoring data and support information for a period of at least five (5) years from the date of the monitoring sample, measurement, report, or application. Support information includes all calibration and maintenance records and all original strip-chart recordings or other data recordings for continuous monitoring instrumentation, and copies of all reports required by the permit.

[A.A.C. R18-2-306.A.4.b]

XIV. REPORTING REQUIREMENTS

A. The Permittee shall submit the following reports:

B. Compliance certifications in accordance with Condition VII.

[A.A.C. R18-2-306.A.5.a]

C. Excess emission; permit deviation, and emergency reports in accordance with Condition XII.

[A.A.C. R18-2-306.A.5.b]

D. Other reports required by any condition of Attachment "B".

XV. DUTY TO PROVIDE INFORMATION

A. The Permittee shall furnish to the Director, within a reasonable time, any information that the Director may request in writing to determine whether cause exists for revising, revoking and reissuing, or terminating the permit, or to determine compliance with the permit. Upon request, the Permittee shall also furnish to the Director copies of records required to be kept by the permit. For information claimed to be confidential, the Permittee shall furnish an additional copy of such records directly to the Administrator along with a claim of confidentiality.

[A.A.C. R18-2-304.G and -306.A.8.e]

B. If the Permittee has failed to submit any relevant facts or has submitted incorrect information in the permit application, the Permittee shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information.

[A.A.C. R18-2-304.H]

XVI. PERMIT AMENDMENT OR REVISION

The Permittee shall apply for a permit amendment or revision for changes to the facility which do not qualify for a facility change without revision under Condition XVII, as follows:

A. Administrative Permit Amendment (A.A.C. R18-2-318);

[A.A.C. R18-2-318]

B. Minor Permit Revision (A.A.C. R18-2-319); and

[A.A.C. R18-2-319]

C. Significant Permit Revision (A.A.C. R18-2-320)

[A.A.C. R18-2-320]

D. The applicability and requirements for such action are defined in the above referenced regulations.

XVII. FACILITY CHANGE WITHOUT A PERMIT REVISION

A. The Permittee may make changes at the permitted source without a permit revision if all of the following apply:

[A.A.C. R18-2-317]

1. The changes are not modifications under any provision of Title I of the Act or under ARS § 49-401.01(24);

[A.A.C. R18-2-317.A.1]

2. The changes do not exceed the emissions allowable under the permit whether expressed therein as a rate of emissions or in terms of total emissions;

[A.A.C. R18-2-317.A.2]

3. The changes do not violate any applicable requirements or trigger any additional applicable requirements;

[A.A.C. R18-2-317.A.3]

4. The changes satisfy all requirements for a minor permit revision under A.A.C. R18-2-319.A;

[A.A.C. R18-2-317.A.4]

5. The changes do not contravene federally enforceable permit terms and conditions that are monitoring (including test methods), record keeping, reporting, or compliance certification requirements; and

[A.A.C. R18-2-317.A.5]

6. The changes do not constitute a minor NSR modification.

[A.A.C. R18-2-317.A.6]

B. The substitution of an item of process or pollution control equipment for an identical or substantially similar item of process or pollution control equipment shall qualify as a change that does not require a permit revision, if it meets all of the requirements of Conditions XVII.A and XVII.C of this Attachment.

[A.A.C. R18-2-317.B]

C. For each change under Conditions XVII.A and XVII.B above, a written notice by certified mail or hand delivery shall be received by the Director and the Administrator a minimum of 7 working days in advance of the change. Notifications of changes associated with emergency conditions, such as malfunctions necessitating the replacement of equipment, may be provided less than 7 working days in advance of the change, but must be provided as far in advance of the change~~,~~ as possible or, if advance notification is not practicable, as soon after the change as possible.

[A.A.C. R18-2-317.D]

D. Each notification shall include:

1. When the proposed change will occur;

[A.A.C. R18-2-317.E.1]

2. A description of the change;

[A.A.C. R18-2-317.E.2]

3. Any change in emissions of regulated air pollutants; and

[A.A.C. R18-2-317.E.3]

4. Any permit term or condition that is no longer applicable as a result of the change.

[A.A.C. R18-2-317.E.7]

E. The permit shield described in A.A.C. R18-2-325 shall not apply to any change made under this Section.

[A.A.C. R18-2-317.F]

F. Except as otherwise provided for in the permit, making a change from one alternative operating scenario to another as provided under A.A.C. R18-2-306.A.11 shall not require any prior notice under this Section.

[A.A.C. R18-2-317.G]

G. Notwithstanding any other part of this Section, the Director may require a permit to be revised for any change that, when considered together with any other changes submitted by the same source under this Section over the term of the permit, do not satisfy Condition XVII.A above.

[A.A.C. R18-2-317.H]

XVIII. TESTING REQUIREMENTS

[A.A.C. R18-2-312]

A. The Permittee shall conduct performance tests as specified in the permit and at such other times as may be required by the Director.

B. Operational Conditions during Performance Testing

Performance tests shall be conducted under such conditions as the Director shall specify to the plant operator based on representative performance of the source. The Permittee shall make available to the Director such records as may be necessary to determine the conditions of the performance tests. Operations during periods of start-up, shutdown, and malfunction (as defined in A.A.C. R18-2-101) shall not constitute representative conditions of performance tests unless otherwise specified in the applicable standard.

C. Performance Tests shall be conducted and data reduced in accordance with the test methods and procedures contained in the Arizona Testing Manual unless modified by the Director pursuant to A.A.C. R18-2-312.B.

D. Test Plan

At least 14 working days prior to performing a test, the Permittee shall submit a test plan to the Director in accordance with A.A.C. R18-2-312.B and the Arizona Testing Manual. This test plan must include the following:

1. Test duration;
2. Test location(s);
3. Test method(s); and
4. Source operation and other parameters that may affect test results.

E. Stack Sampling Facilities

The Permittee shall provide, or cause to be provided, performance testing facilities as follows:

1. Sampling ports adequate for test methods applicable to the facility;
2. Safe sampling platform(s);
3. Safe access to sampling platform(s); and
4. Utilities for sampling and testing equipment.

F. Interpretation of Final Results

Each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard, the arithmetic mean of the results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs is required to be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the Permittee's control, compliance may, upon the Director's approval, be determined using the arithmetic mean of the results of the other two runs. If the Director or the Director's designee is present, tests may only be stopped with the Director's or such designee's approval. If the Director or the Director's designee is not present, tests may only be stopped for good cause. Good cause includes: forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the Permittee's control. Termination of any test without good cause after the first run is commenced shall constitute a failure of the test. Supporting documentation, which demonstrates good cause, must be submitted.

G. Report of Final Test Results

A written report of the results of performance tests conducted pursuant to 40 CFR 63, shall be submitted to the Director within 60 days after the test is performed. A written report of the results of all other performance tests shall be submitted within 30 days after the test is performed, or as otherwise provided in the Arizona Testing Manual. All performance testing reports shall be submitted in accordance with the Arizona Testing Manual and A.A.C. R18-2-312.A.

H. Extension of Performance Test Deadline

[A.A.C. R18-2-312.J]

For performance testing required under Condition XVIII.A above, the Permittee may request an extension to a performance test deadline due to a force majeure event as follows:

[A.A.C. R18-2-312.J]

1. If a force majeure event is about to occur, occurs, or has occurred for which the Permittee intends to assert a claim of force majeure, the Permittee shall notify the Director in writing as soon as practicable following the date the Permittee first knew, or through due diligence should have known that the event may cause or caused a delay in testing beyond the regulatory deadline. The notification must occur before the performance test deadline unless the initial force majeure or a subsequent force majeure event delays the notice, and in such cases, the notification shall be given as soon as practicable.

[A.A.C. R18-2-312.J.1]

2. The Permittee shall provide to the Director a written description of the force majeure event and a rationale for attributing the delay in testing beyond the regulatory deadline to the force majeure; describe the measures taken or to be taken to minimize the delay; and identify a date by which the Permittee proposes to conduct the performance test. The performance test shall be conducted as soon as practicable after the force majeure event occurs.

[A.A.C. R18-2-312.J.2]

3. The decision as to whether or not to grant an extension to the performance test deadline is solely within the discretion of the Director. The Director shall notify

the Permittee in writing of approval or disapproval of the request for an extension as soon as practicable.

[A.A.C. R18-2-312.J.3]

4. Until an extension of the performance test deadline has been approved by the Director under subsections Conditions XVIII.H.1, 2, and 3 above, the Permittee remains subject to the requirements of Condition XVII of Attachment A.

[A.A.C. R18-2-312.J.4]

5. For purposes of Condition XVIII, a "force majeure event" means an event that will be or has been caused by circumstances beyond the control of the Permittee, its contractors, or any entity controlled by the Permittee that prevents it from complying with the regulatory requirement to conduct performance tests within the specified timeframe despite the Permittee's best efforts to fulfill the obligation. Examples of such events are acts of nature, acts of war or terrorism, or equipment failure or safety hazard beyond the control of the Permittee.

[A.A.C. R18-2-312.J.1]

XIX. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

[A.A.C. R18-2-306.A.8.d]

XX. SEVERABILITY CLAUSE

The provisions of this permit are severable. In the event of a challenge to any portion of this permit, or if any portion of this permit is held invalid, the remaining permit conditions remain valid and in force.

[A.A.C. R18-2-306.A.7]

XXI. PERMIT SHIELD

Compliance with the conditions of this permit shall be deemed compliance with all applicable requirements identified in the portions of this permit subtitled "Permit Shield". The permit shield shall not apply to minor revisions pursuant to Condition XVI.B of this Attachment and any facility changes without a permit revision pursuant to Condition XVII of this Attachment.

[A.A.C. R18-2-317.F, - 320, and -325]

XXII. PROTECTION OF STRATOSPHERIC OZONE

If this source becomes subject to the provisions of 40 CFR Part 82, then the Permittee shall comply with these provisions accordingly.

[40 CFR Part 82]

XXIII. APPLICABILITY OF NSPS/NESHAP GENERAL PROVISIONS

For all equipment subject to a New Source Performance Standard or a National Emission Standard for Hazardous Air Pollutants, the Permittee shall comply with all applicable requirements contained in Subpart A of Title 40, Chapter 60 and Chapter 63 of the Code of Federal Regulations.

[40 CFR Part 60 and Part 63]

ATTACHMENT "B": SPECIFIC CONDITIONS

I. FACILITY-WIDE REQUIREMENTS

A. Unless otherwise noted, all references to consent decree (CD) in this permit shall refer to the consent decree filed on December 30, 2015 in *United States v. ASARCO LLC,* No. CV-15-02206-PHX-DLR (D. Ariz.). After termination of the CD, the Director shall exercise any responsibilities and authorities granted to EPA under the CD for the items identified in CD paragraph 101 and included in this permit, except as otherwise provided in this permit.

B. The following effective dates shall apply:

1. Any requirement contained in this permit authorized by A.A.C. R18-2-B1301 or A.A.C. R18-2-B1302 shall not be effective until the earlier of July 1, 2018 or 180 days after completion of all project improvements authorized by Significant Permit Revision No. 60647.

[A.A.C R18-2-715.I, 715.01.V, A.A.C. R18-2-B1301.A.2, B1302.A.2]

2. Any requirement contained in this permit authorized by A.A.C. R18-2-B1301.01 shall not be effective until December 1, 2018.

[A.A.C. R18-2-B1301.01.A.2]

C. At the time the compliance certifications required by Section VII of Attachment "A" are submitted, the Permittee shall submit summary reports of any monitoring required in this permit, and performed in the six months that correspond with the compliance certification periods.

[A.A.C. R18-2-306.A.5.a]

D. Opacity

1. Instantaneous Surveys and Six-Minute Observations

   a. Instantaneous Surveys

   Any instantaneous survey required by this permit shall be determined by an EPA Reference Method 9 Certified Observer.

   [A.A.C. R18-2-306.A.3.c]

   b. Six-Minute Observations

   Any six-minute observation required by this permit shall be determined by EPA Reference Method 9.

   [A.A.C. R18-2-306.A.3.c]

2. Monitoring, Recordkeeping, and Reporting Requirements

   a. At the frequency specified in this permit, the Permittee shall conduct an instantaneous survey of visible emissions from both process stack sources, when in operation, and fugitive dust sources.

   b. If the plume on an instantaneous basis appears less than or equal to the applicable opacity standard, then the Permittee shall keep a record of the name of the observer, the date on which the instantaneous survey was made, and the results of the instantaneous survey.

c. If the plume on an instantaneous basis appears greater than the applicable opacity standard, then the Permittee shall immediately conduct a six-minute observation of the plume.

(1) If the six-minute observation of the plume is less than or equal to the applicable opacity standard, then the Permittee shall record the name of the observer, the date on which the six-minute observation was made, and the results of the six-minute observation.

(2) If the six-minute observation of the plume is greater than the applicable opacity standard, then the Permittee shall do the following:

(a) Adjust or repair the controls or equipment to reduce opacity to less than or equal to the opacity standard;

(b) Record the name of the observer, the date on which the six-minute observation was made, the results of the six-minute observation, and all corrective action taken;

(c) Report the event as an excess emission for opacity in accordance with Condition XII.A of Attachment "A"; and

(d) Conduct another six-minute observation to document the effectiveness of the adjustments or repairs completed.

[A.A.C. R18-2-306.A.3.c]

E. Definition of" Blowing"

"Blowing" shall mean the introduction of air or oxygen-enriched air into the converter furnace molten bath through tuyeres that are submerged below the level of the molten bath. The flow of air through the tuyeres above the level of the molten bath or into an empty converter shall not constitute "Blowing".

[CD CV-15-02206-PHX-DLR 6]

II. HAZARDOUS AIR POLLUTANTS REQUIREMENTS

A. Emissions Limitations

Total hazardous air pollutant (HAP) emissions from the facility shall be less than the following:

[A.A.C. R18-2-306.01, 331.A.3.a]
[Material Permit Conditions are indicated by italics and underline]

1. *10 tons of any single HAP on rolling 12-month basis; and*

2. *25 tons of all HAPs on rolling 12-month basis*.

B. Monitoring and Recordkeeping Requirements

[A.A.C. R18-2-306.A.3.c]

1. The Permittee shall monitor and record:

   a. Total ore processed at the track hopper every calendar month.

   b. Total concentrate processed through the concentrate dryers every calendar month.

   c. Total feed processed through the flash furnace every calendar month

   d. Total natural gas used at the facility every calendar month, and total natural gas used in the flash furnace, converters and anode furnaces, every calendar month, measured at appropriate meters.

   e. Hours of operation for the emission sources for each stack in the concentrator and smelter every calendar month

   f. Material processed in brick crusher during every calendar month.

C. Testing Requirements

[A.A.C. R18-2-312, -306.A.3.c]

1. Composite Metallurgical Assay in the Ore and Flash Furnace Feedstock

   a. The Permittee shall determine concentrations in weight percent of arsenic, lead, manganese and selenium in the ore and flash furnace feedstock at least once every month by means of composite metallurgical assay of dry feed material. If any of these HAPs in ore or flash furnace feed sample is greater than the levels in Table 1, the Permittee shall test a second sample. In such an event, the average of two samples shall be taken for determining monthly average concentrations.

Table 1

HAP	Ore (%)	Feed (%)
As	0.027	0.586
Pb	0.042	1.162
Mn	0.511	0.205
Se	0.041	0.174
Other metal HAPs	0.236	0.615
Total metal HAPs	0.354	1.246

   b. The Permittee shall determine concentrations in weight percent of other metal HAPs (antimony, cadmium, chromium, , nickel, cobalt, beryllium and mercury) in the ore and flash furnace feedstock once a year by means of composite metallurgical assay of dry feed material.

   c. The protocol to conduct the composite metallurgical assay shall be made available for inspection when requested by the Department.

   d. The Permittee shall maintain records of monthly average concentrations in weight percent of HAPs in the ore and flash furnace feed.

2. Performance Test for Stacks in Concentrator

The Permittee shall conduct performance test for PM for scrubbers 1 through 10 once every year in accordance with EPA Reference Method 5.

3. Performance Test for Smelter Area Stacks

a. Within 6 months of the issuance of this permit, the Permittee shall conduct performance tests for Metal HAPs from the following emission points:

(1) Acid plant tail gas - Testing shall be conducted when the flash furnace and converters are operating

(2) Vent gas baghouse – Testing shall include product baghouse ventilation and matte tapping, slag skimming emissions.

(3) Secondary hood baghouse - Testing shall include at least one full charging and Blowing cycle.

(4) Anode furnace baghouse - Testing shall include at least one full refining cycle (charging, blowing, and poling).

(5) Tertiary capture system - Testing shall be conducted when the converters are operating.

b. Brick crusher stack – The Permittee shall conduct a performance test for the brick crusher stack once during the permit term if the brick crusher is operated to process bricks. The Permittee shall ensure that prior to the initial use of the brick crusher in the permit term, sufficient amount of bricks are available to conduct the performance test.

c. The performance tests in Conditions II.C.3.a and II.C.3.b above shall be conducted in accordance with USEPA Reference Method 29.

d. Except as required in Condition II.C.3.e, performance tests for the emission points in Condition II.C.3.a shall be repeated every 6 months. After the first 3 performance tests, tests for the stacks shall be performed annually.

e. If for any two consecutive months following the last Method 29 test of the five smelter process emission points in Condition II.C.3.a, the monthly assays of feed for any single metal HAP, or Total Metal HAPs are greater than the levels in Table 1, within 30 days, and quarterly thereafter, the Permittee shall conduct a Method 29 test on all the five process emission points in Condition II.C.3.a, until the monthly assays for HAPs are below the levels in Table 1 for two consecutive months. Method 29 tests performed to comply with this provision shall be included in the 3 most recent performance tests referenced in Condition II.D.1.c.

f. The Permittee shall record the hours of operation and process throughput during each test.

g. The performance test report shall provide the following information for each emission point unit in Conditions II.C.3.a and II.C.3.b:

(1) Emissions of total particulate, in pounds per hour

(2) Emissions of each HAP, in pounds per hour, and as % particulate emissions

(3) Emissions of total HAP, pounds per hour, and as % particulate emissions

D. Compliance Demonstration

[A.A.C. R18-2-306.A.3.c]

1. By the 15th day of the following month, the Permittee shall calculate the total tons of each individual HAP and the sum of all HAP emitted during a month using the following procedure.

a. HAPs emissions from each wet scrubber = PM in pounds per hour (based on Method 5 test) * number of hours of operation * current month assay concentration of HAPs in the ore/2000.

b. Fugitive HAPs emissions from concentrator facility = Estimated fugitive PM emissions (0.12 pound per ton of ore) * ore processed in the month *current month assay concentration of HAPs in the ore/2000.

c. For each of the emission points in smelter facility identified in Conditions II.C.3.a, the emissions of each HAP shall be calculated by either of the two methods below:

(1) If PM CEMS data is available,

HAPs emissions = Total PM from PM CEMS * average HAP weight % of PM from the 3 most recent performance tests in Condition C.3.f.

(2) If a PM CEMS data is not available,

HAPs emissions = average HAP in pounds per hour from 3 most recent performance tests in Condition II.C.3.g * number of hours of operation during the calendar month and divided by 2000

d. For Brick crusher, the emissions of each HAP = most recent Method 29 test result, in pounds per ton * throughput for brick crusher during the calendar month.

e. Process Fugitive emissions from the smelter shall be calculated as follows:

(1) Until the Fugitive Emissions Study for the smelter is completed, calculate process fugitive HAP emissions by multiplying tons of concentrate tons processed during the month by the following factors:

Pollutant	Process Sources (lb./ton of Concentrate)
Pb	0.0013
As	0.00064
Mn	0.00061
Se	0.00043
Other metal HAPs	0.00024

(2) After the Fugitive Emissions Study for the smelter is completed, calculate process fugitive HAP emissions by multiplying tons of concentrate tons processed during the month by the factors developed in the study.

f. Non-process Fugitive HAP emissions from the smelter shall be calculated by multiplying tons of concentrate processed during the month by the following factors:

Pollutant	Non-process Sources (lb./ton of Concentrate)
Pb	0.0010
As	0.00035
Mn	0.00013
Se	0.000058
Other metal HAPs	0.00028

g. Natural gas metal HAP shall be calculated by multiplying the total natural gas purchased during the month, less natural gas used at the flash furnace, converters, and anode furnaces * AP-42 emission factors.

h. Natural gas non-metallic HAP shall be calculated by multiplying the total natural gas purchased * AP-42 emission factors.

i. Total HAP shall be calculated as the sum of paragraphs a through h.

2. The 12-month rolling sum for each HAP and total HAPs shall be calculated by taking the prior month's value and adding it to the eleven prior calendar month's values. Compliance is demonstrated if the 12-month rolling sum for each HAP is less than 10 tons and if the 12-month rolling sum of all HAPs is less than 25 tons.

3. If the 12-month rolling sum of any HAP exceeds 9 tons or the 12-month rolling sum for all HAP exceeds 23.0 tons, the Permittee shall make the compliance demonstration in Conditions II.D.1 and II.D.2 by the third working day of each week in lieu of monthly.

III. GENERAL FACILITY-WIDE REQUIREMENTS

A. Fugitive Emissions Studies

[CD CV-15-02206-PHX-DLR 22]

1. The Permittee shall conduct Fugitive Emissions Studies in accordance with Paragraph 22 of the CD and as per the following schedule:

   a. The first Fugitive Emissions Study shall commence no later than six (6) months after completion of the Converter Aisle Retrofit Project.

   b. The subsequent Fugitive Emissions Study commencement date shall occur within the same calendar quarter, but five (5) years later from the date of commencement of the first Fugitive Emissions Study.

B. Fugitive Dust Plan

1. Requirements from CD

   The Permittee shall submit to EPA an initial fugitive Dust Plan for approval in accordance with the CD. Once approved, the Permittee shall comply with the requirements of the Dust Plan at all times.

   [CD CV-15-02206-PHX-DLR 25]

   a. The Dust Plan shall, at a minimum, contain the elements and requirements set forth in Appendix B of the CD.

   [CD CV-15-02206-PHX-DLR 25.a]

   b. For any element of the Dust Plan that requires new construction at the Facility, the Permittee shall complete such construction, in accordance with the specifications and schedule set forth in the approved Dust Plan and the CD.

   [CD CV-15-02206-PHX-DLR 25.b]

   c. Until the termination of the CD, the Permittee shall submit any proposed modifications and/or revisions to the approved Dust Plan to EPA for review and approval.

   [CD CV-15-02206-PHX-DLR 25]

   d. Upon approval by the EPA of the initial or any revised Dust Plan, the Permittee shall comply with the terms of the approved Fugitive Dust Plan, including all modifications and revisions approved or directed by EPA prior to termination of the CD.

   [CD CV-15-02206-PHX-DLR 101(i)]

   e. After termination of the CD, the Permittee shall submit any proposed modifications and/or revisions to the approved Fugitive Dust Plan to the Director pursuant to A.A.C. R18-2-317 through R18-2-320, as applicable. Permittee must comply with the proposed modification(s) and/or revision(s) upon approval or when deemed approved by operation of law. A copy of any application shall be provided to EPA.

   [A.A.C. R18-2-306.A.3.c]

   f. Any proposed modifications and/or revisions to the approved Fugitive Dust Plan shall comply with all elements and requirements set forth in Appendix B of the CD, even if the CD has terminated, except that requirements made pursuant to CD, Appendix B, Paragraphs 31.B-D and 33, shall not survive the termination of the CD.

   [A.A.C. R18-2-306.A.3.c]

g. The Permittee shall maintain a copy of the currently approved Fugitive Dust Plan on-site and provide a copy of the currently-approved plan to the Department.

[A.A.C. R18-2-306.A.3.c]

h. Any violation of the Fugitive Dust Plan, including all approved modifications or revisions, shall constitute a violation of this permit, except violations of Appendix B, Paragraphs 31.B-D and 33 shall not constitute a violation of the permit. Any violation of the Fugitive Dust Plan that is also a violation of an identical provision of this permit or A.A.C. R18-2-B1301.01 shall constitute a single violation.

[A.A.C. R18-2-306.A.3.c]

i. The requirements of this Subsection shall survive termination of the CD.

[CD CV-15-02206-PHX-DLR 101(i)]

2. Requirement from Lead Rule A.A.C. R18-2-B1301.01

a. Definitions

[A.A.C. R18-2-B1301.01.B]

(1) "High wind event" means any period of time beginning when the average wind speed, as measured at a meteorological station maintained by the owner or operator that is approved by the Department, is greater than or equal to 15 miles per hour over a 15 minute period, and ending when the average wind speed, as measured at the approved meteorological station maintained by the owner or operator, falls below 15 miles per hour over a 15 minute period.

(2) Lead-bearing fugitive dust" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.

(3) "Non-smelting process sources" means sources of lead bearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads.

b. The Permittee shall develop, implement, and follow a fugitive dust plan that is designed to minimize lead-bearing fugitive dust from non-smelting process sources. At minimum, the fugitive dust plan shall contain all the requirements in A.A.C. R18-2-B1301.01.C.2.

[A.A.C. R18-2-B1301.01.C.2]

c. The fugitive dust plan shall also contain all the Performance and Housekeeping Requirements in A.A.C. R18-2-B1301.01.D. The Permittee shall comply with these requirements at all times regardless of a fugitive dust plan.

[A.A.C. R18-2-B1301.01.D]

d. The Permittee shall keep current the fugitive dust plan. Any plan or plan revision shall be consistent with this A.A.C. R18-2-B1301.01, and shall be submitted to the Department for review. Plans and plan revisions shall be consistent with good air pollution control practice for fugitive dust. Except for the meteorological station to be used for high wind events which shall require prior approval, plans and plan revisions may be implemented upon submittal and shall remain in effect until superseded or until disapproved by the Department. Disapprovals are appealable Department actions.

[A.A.C. R18-2-B1301.01.C.3]

e. Any violation of A.A.C. R18-2-B1301.01 that is also a violation of an identical provision of this permit or the Fugitive Dust Plan required by III.B. of this Attachment shall constitute a single violation.

[A.A.C. R18-2-306.A.3.c]

C. Operating and Maintenance Plan Requirements

1. Requirements from Consent Decree

a. The Permittee shall prepare and submit to EPA a written Operation and Maintenance (O&M) Plan that has been prepared according to the requirements in 40 C.F.R. § 63.1447(b) and the CD.

[CD CV-15-02206-PHX-DLR 27]

b. In addition to the requirements specified in 40 C.F.R. § 63.1447(b), this Plan shall include:

[CD CV-15-02206-PHX-DLR 27]

(1) All operational requirements specified in Paragraphs 7, 8, 9, 10, 11, 12, 23, and 26 of the CD;

(2) The corrective action triggers based on COMS readings as approved by EPA pursuant to Paragraph 16 of the CD; and

(3) All requirements of the approved Dust Plan.

c. The Permittee shall conduct an annual review of the O&M Plan and update as necessary. The Permittee shall also submit an updated O&M Plan within sixty (60) days of each major change to an operational or substantive requirement of the CD that is not already captured within the terms of the existing O&M Plan, including but not limited to additional provisions that apply because of the Converter Retrofit Project, changes made to the parametric monitoring of the hooding, and changes made to the Dust Plan.

[CD CV-15-02206-PHX-DLR 27 & 101.k]

d. Upon approval by EPA, the Permittee shall operate the capture systems according to the written O&M Plan, as updated, at all times that material is being processed in the process vessels controlled or partially controlled by such systems. The Permittee shall also operate all fugitive dust controls according to the written O&M Plan, as updated, at all times that fugitive dust producing materials are being processed and/or stored at and around the Facility.

[CD CV-15-02206-PHX-DLR 27]

e. After termination of the CD, the Permittee shall submit any proposed modifications and/or revisions to the O & M Plan to the Director pursuant to A.A.C. R18-2-317 through R18-2-320, as applicable. Permittee must comply with the proposed modification(s) and/or revision(s) upon approval or when deemed approved by operation of law. A copy of any application shall be provided to EPA.

[A.A.C. R18-2-306.A.3.c]

2. Requirements from National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 63 Subpart QQQ

a. The Permittee shall prepare and operate at all times according to a written operation and maintenance plan for each capture system and control device subject to standards in 40 CFR 63.1444 or 1446. The plan must address the requirements in Conditions III.C.2.a(1) through III.C.2.a(3) below as applicable to the capture system or control device.

[40 CFR 63.1447(b)]

(1) Preventive Maintenance

The Permittee must perform preventative maintenance for each capture system and control device according to written procedures specified in the operation and maintenance plan. The procedures shall include a preventative maintenance schedule that is consistent with the manufacturer's instructions for routine and long-term maintenance.

[40 CFR 63.1447(b)(1)]

(2) Capture System Inspections

The Permittee shall conduct monthly inspections of the equipment components of the capture system that can affect the performance of the system to collect the gases and fumes emitted from the affected source (e.g., hoods, exposed ductwork, dampers, fans) according to written procedures specified in the operation and maintenance plan. The inspection procedure shall include the following requirements as applicable to the capture system or control device.

[40 CFR 63.1447(b)(2)]

(a) Observations of the physical appearance of the equipment to confirm the physical integrity of the equipment (e.g., verify by visual inspection no holes in ductwork or hoods, no flow constrictions caused by dents, or accumulated dust in ductwork).

[40 CFR 63.1447(b)(2)(i)]

(b) Inspection, and if necessary testing, of equipment

components to confirm that the component is operating as intended (e.g., verify by appropriate measures that flow or pressure sensors, damper plates, automated damper switches and motors are operating according to manufacture or engineering design specifications).
[40 CFR 63.1447(b)(2)(ii)]

(c) In the event that a defective or damaged component is detected during an inspection, the Permittee shall initiate corrective action according to written procedures specified in the operation and maintenance plan to correct the defect or deficiency as soon as practicable.
[40 CFR 63.1447(b)(2)(iii)]

(3) Copper Converter Department Capture System Operating Limits

The Permittee shall establish, according to the requirements in Conditions III.C.2.a(3)(a) through III.C.2.a(3)(c) below, operating limits for the capture system that are representative and reliable indicators of the performance of capture system when it is used to collect the process off-gas vented from batch copper converters during Blowing.
[40 CFR 63.1447(b)(3)]

(a) The Permittee shall select operating limit parameters appropriate for the capture system design that are representative and reliable indicators of the performance of the capture system when it is used to collect the process off-gas vented from batch copper converters during Blowing. At a minimum, the Permittee must use appropriate operating limit parameters that indicate the level of the ventilation draft and the damper position settings for the capture system when operating to collect the process off-gas from the batch copper converters during Blowing. Appropriate operating limit parameters for ventilation draft include, but are not limited to, volumetric flow rate through each separately ducted hood, total volumetric flow rate at the inlet to control device to which the capture system is vented, fan motor amperage, or static pressure. Any parameter for damper position setting may be used that indicates the duct damper position relative to the fully open setting.
[40 CFR 63.1447(b)(3)(i)]

(b) For each operating limit parameter selected in Condition III.C.2.a(3)(a) above, the Permittee shall designate the value or setting for the parameter at which the capture system operates during batch copper converter Blowing.
[40 CFR 63.1447(b)(3)(ii)]

(c) The Permittee shall include documentation in the plan to support the selection of the operating limits established for the capture system. This documentation must include a description of the capture system design, a description of the capture system operation during blister copper production, a description of each selected operating limit parameter, a rationale for why the parameter was chosen, a description of the method used to monitor the parameter according to the requirements in 40 CFR 63.1452(a), and the data used to set the value or setting for the parameter for each of the Permittee's batch copper converter configurations.

[40 CFR 63.1447(b)(3)(iii)]

3. O & M Requirements from SO_2 SIP Rule A.A.C. R18-2-B1302

(Note: These requirements are state enforceable only until EPA approval of the SO_2 SIP rule A.A.C. R18-2-B1302 into the Arizona SIP, after which the requirements shall also be federally enforceable)

a. The Permittee shall operate each capture system and/or control device used to ventilate or control process gas or emissions from the flash furnace including matte tapping, slag skimming, and slag return operations; converter primary hoods, converter secondary hoods, tertiary ventilation system, and anode refining operations in accordance with the O & M Plan, developed in accordance with A.A.C. R18-2-1302.D.2. The initial plan shall include the initial volumetric flow monitoring provisions, the initial operational limits, preventative maintenance procedures, and the inspection procedures.

[A.A.C. R18-2-B1302.D.2]

b. Revisions to O & M Plan

[A.A.C. R18-2-B1302.D.2.e]

(1) The Permittee shall submit to the Department for approval a plan revision with changes, if any, to the initial volumetric flow monitoring provisions and initial operational limits in the O & M Plan not later than six months after completing a fugitive emissions study conducted in accordance with A.A.C R18-2, Appendix 14. The Department shall submit the approved changes to the volumetric flow monitoring provisions and operational limits to EPA Region IX as a SIP revision not later than 12 months after completion of a fugitive emissions study.

(2) Other plan revisions may be submitted at any time when necessary. All plans and plan revisions shall be designed to achieve operation of the capture system and/or control device consistent with the attainment demonstration in the Hayden 2010 Sulfur Dioxide National Ambient Air Quality Standards Nonattainment Area SIP.

(3) Except for changes to the volumetric flow monitoring provisions and operational limits in Condition III.C.3.b(1), which shall require prior approval, plans and plan revisions

may be implemented upon submittal and shall remain in effect until superseded or until disapproved by the Department.

(4) Any plan revision submitted shall include the associated manufacturer's recommendations and/or instructions used for capture system and control device operations and maintenance.

c. Compliance with the O & M Requirements

The Permittee shall determine compliance with the O & M requirements by

[A.A.C. R18-2-B1302.F.3]

(1) Maintaining and operating the emissions capture and control equipment in accordance with the capture system and control device operations and maintenance plan and recording operating parameters for capture and control equipment; and

(2) Conducting a fugitive study in accordance with A.A.C. R18-2, Appendix 14 starting not later than 6 months after completion of the Converter Retrofit Project. The fugitive study shall demonstrate that fugitive emissions from the smelter are consistent with estimates used in the attainment demonstration in the Hayden 2010 Sulfur Dioxide National Ambient Air Quality Standards Nonattainment Area SIP.

d. Recordkeeping Requirements

The Permittee shall maintain a record of the operation and maintenance plan.

[A.A.C. R18-2-B1302.G.1]

4. O & M Plan Requirements from Lead Rule A.A.C. R18-2-B1301

(*Note: These requirements are state enforceable only until EPA approval of the Lead SIP rule A.A.C. R18-2-B1301 into the Arizona SIP, after which the requirements shall also be federally enforceable)*

a. The Permittee shall operate each capture system and/or control device used to ventilate or control process gas or emissions from the flash furnace including matte tapping, slag skimming, and slag return operations; converter primary hoods, converter secondary hoods, tertiary ventilation system, and anode refining operations in accordance with the O & M Plan, developed in accordance with A.A.C. R18-2-B1301.D.2. The initial plan shall include the initial volumetric flow monitoring provisions, the initial operational limits, preventative maintenance procedures, and the inspection procedures.

[A.A.C. R18-2-B1301.D.2]

b. Revisions to O & M Plan

[A.A.C. R18-2-B1301D.2.e]

(1) The Permittee shall submit to the Department for approval a plan revision with changes, if any, to the initial volumetric flow monitoring provisions and initial operational limits in the O & M Plan not later than six months after completing a fugitive emissions study conducted in accordance with A.A.C. R18-2, Appendix 14 . The Department shall submit the approved changes to the volumetric flow monitoring provisions and operational limits to EPA Region IX as a SIP revision not later than 12 months after completion of a fugitive emissions study.

(2) Other plan revisions may be submitted at any time when necessary. All plans and plan revisions shall be designed to achieve operation of the capture system and/or control device consistent with the attainment demonstration in the Hayden 2008 Lead National Ambient Air Quality Standards Nonattainment Area SIP.

(3) Except for changes to the volumetric flow monitoring provisions and operational limits, which shall require prior approval, plans and plan revisions may be implemented upon submittal and shall remain in effect until superseded or until disapproved by the Department.

(4) Any plan revision submitted shall include the associated manufacturer's recommendations and/or instructions used for capture system and control device operations and maintenance.

c. Compliance Requirements

The Permittee shall determine compliance with the O & M requirements by

[A.A.C. R18-2-B1301.F.2]

(1) Maintaining and operating the emissions capture and control equipment in accordance with the capture system and control device operations and maintenance plan and recording operating parameters for capture and control equipment as required in the O & M Plan; and

(2) Conducting a fugitive emissions study in accordance with A.A.C R18-2, Appendix 14 starting not later than 6 months after completion of the Converter Retrofit Project authorized by Significant Permit Revision No. 60647, and demonstrating that the fugitive emissions from the smelter are consistent with estimates used in the attainment demonstration in the Hayden 2008 Lead National Ambient Air Quality Standards Nonattainment Area SIP.

d. Recordkeeping Requirements

(1) The Permittee shall maintain a record of the operation and

maintenance plan.

[A.A.C. R18-2-B1301.G.1]

(2) All records of major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment, including those set forth in the operations and maintenance plan.

[A.A.C. R18-2-B1301.G.2]

e. Reporting Requirement

Within 30 days after the end of each calendar-year quarter, the Permittee shall submit a quarterly report to the Department for the preceding quarter that shall include dates, times, and descriptions of deviations when the Permittee operated smelting processes and related control equipment in a manner inconsistent with the operations and maintenance plan.

[A.A.C. R18-2-B1301.H.5]

D. Emissions Reductions

[CD CV-15-02206-PHX-DLR Section IX & 101.l]

1. "CD Emissions Reductions" shall mean any emissions reductions that result from any projects, controls, or any other actions utilized to comply with the CD.

[CD CV-15-02206-PHX-DLR 51]

2. The Permittee shall neither generate nor use any CD Emissions Reductions: as netting reductions; as emissions offsets; or to apply for, obtain, trade, or sell any emission reduction credits. Baseline actual emissions for each unit during any 24-month period selected by Permittee shall be adjusted downward to exclude any portion of the baseline emissions that would have been eliminated as CD Emissions Reductions had Permittee been complying with this Consent Decree during that 24-month period. The Permittee and the EPA understand that the Converter Aisle Retrofit Project requires that the five (5) existing Peirce-Smith converters be replaced with three (3) new Peirce-Smith converters and that adjustment of baseline actual emissions to reflect CD Emissions Reductions resulting from that project would therefore reflect converter aisle emissions post-project based on the replacement of the converters rather than only the retirement of the existing converters.

[CD CV-15-02206-PHX-DLR 52]

3. Nothing in this section prevents the Permittee from seeking to:

[CD CV-15-02206-PHX-DLR 53]

a. Use or generate emission reductions from emissions units that are covered by the CD to the extent that the proposed emission reductions represent the difference between CD Emissions Reductions and more stringent control requirements that Permittee may accept for those emissions units in any permitting process;

b. Use or generate emission reductions from emissions units that are not subject to an emission limitation or control requirement pursuant to the CD; or

c. Use CD Emissions Reductions for compliance with any rules or regulations designed to address regional haze or the non-attainment status of any area (excluding PSD and non-attainment NSR rules, but including, for example, RACT rules) that apply to the facility; provided, however, that the Permittee shall not be allowed to trade or sell any CD Emissions Reductions.

4. Notwithstanding the general prohibition set forth in Condition III.D.2, Permittee may use all pollutant emissions reductions generated by the installation and operation of emissions control devices on the anode furnaces, to which the EPA and Permittee acknowledge that no emissions limit or control requirements apply under 40 C.F.R. Part 63, Subpart QQQ, and which was permitted prior to EPA's November 10, 2011 FOV pursuant to Air Quality Control Permit No. 54251 (minor permit revision to Permit No. 1000042) for the Facility, issued by the ADEQ on August 23, 2011, for purposes of obtaining netting credits or offsets in any PSD, major NSR, and/or minor NSR or other permit or permit proceeding. Utilization of this exception is subject to each of the following conditions:

[CD CV-15-02206-PHX-DLR 54]

a. Under no circumstances shall the Permittee use CD Emissions Reductions prior to the time that actual CD Emissions Reductions have occurred;

b. CD Emissions Reductions may be used only at the facility that generated them;

c. The Permittee shall still be subject to all federal and state regulations applicable to the PSD, Non-attainment NSR, and/or Minor NSR permitting process; and

d. Not later than 30 Days before Permittee seeks to use any CD Emissions Reductions allowed under Condition III.D.4, Permittee shall provide notice of such projects to EPA (including copies of all permit applications and other relevant documentation submitted to the permitting authority).

E. Any requirements included pursuant to the CD in this Attachment or any other Attachment of this permit shall not be deleted or modified without the approval of EPA.

[CD CV-15-02206-PHX-DLR 101.m]

F. Performance and Housekeeping Requirements from Lead Rule A.A.C. R18-2-B1301.01

The Permittee shall comply with these requirements at all times regardless of a fugitive dust plan.

1. The Permittee shall implement a recordkeeping system to capture sprayer operations, including identification of the particular operation, leadbearing fugitive dust source, timing and intensity of watering, and data regarding the quantity of water used at each water sprayer.

[A.A.C. R18-2-B1301.D.1]

2. The Permittee shall ensure that wind fences used to control lead-bearing fugitive dust from the non-smelting process sources specified in Conditions III.F.9 and III.F.10 below meet the following requirements:

[A.A.C. R18-2-B1301.D.2]

a. Wind fence height shall be greater than or equal to the material pile height. The allowed material pile height shall be posted in a readily visible location at each wind fence.

b. Wind fence porosity shall not exceed 50 percent.

3. For sources specified in Conditions III.F.9 and III.F.10 below, as applicable, the Permittee shall:

[A.A.C. R18-2-B1301.D.3]

a. Minimize conveyor drop heights to the greatest extent practicable.

b. Clean any spills from conveyors within 30 minutes of discovery. The material collected must be handled in such a way so as to minimize lead-bearing fugitive dust to the maximum extent practicable.

4. The Permittee shall maintain vehicle cargo compartments used to transport materials capable of producing lead-bearing fugitive dust so that the cargo compartment is free of holes or other openings and is covered by a tarp.

[A.A.C. R18-2-B1301.D.4]

5. High wind event requirements

[A.A.C. R18-2-B1301.D.5]

a. During high wind events, the Permittee shall evaluate the non-smelting process sources specified in Conditions III.F.9 and III.F.10 below for ongoing visible emissions using the appropriate logsheet for each source.

b. If ongoing visible emissions are observed, the Permittee shall promptly wet the source of emissions with the objective of mitigating further emissions.

c. If wetting does not appear to mitigate the ongoing visible emissions to 20 percent opacity or less, the Permittee shall postpone associated handling of the source until the high wind event has ceased.

6. The Permittee shall conduct physical inspections as follows:

[A.A.C. R18-2-B1301.D.6]

a. Daily inspections of all water sprayers to make sure they are functioning and are in accordance with the dust plan;

b. Daily visual inspections of all material piles to make sure they are maintained within areas protected by a wind fence, that they are not higher than allowed for the wind fence, and to verify that moisture content requirements are met;

c. Daily inspections of all material handling areas to identify and clean up track out or spills of materials;

d. Daily inspections of conveyor systems to identify and clean up material spills;

e. Daily inspections of rumble grates sump levels;

f. Daily spot inspections of vehicles carrying lead bearing fugitive dust-producing materials when vehicles are in use to ensure that material is not overloaded, is properly covered, and cargo compartments are intact;

g. Weekly inspections of wind fences for material integrity and structural stability;

h. Daily inspections of all paved roads to identify and clean up track out or spills of materials;

i. Daily inspections of unpaved roads in Condition III.F.8.a to identify areas where chemical dust suppressant coverage has broken down; and

j. Bi-weekly inspections of the acid plant scrubber blowdown drying system enclosure.

7. These requirements apply to all roads at the facility currently paved and roads to be paved in the future. The Permittee shall:

[A.A.C. R18-2-B1301.D.9]

a. Clean roads at least once daily with a sweeper, vacuum, or wet broom in accordance with applicable manufacturer recommendations.

b. Maintain the integrity of the road surface.

c. Clean up trackout and carry-out of material on the following schedule:

(1) As expeditiously as practicable, when trackout and carry-out extends a cumulative distance of 50 linear feet or more; and

(2) At the end of the workday, for all other trackout and carry-out.

d. Comply with a speed limit not to exceed 15 miles per hour for all vehicular traffic. At minimum, speed limit signs shall be posted at all entrances and truck loading and unloading areas and/or at conspicuous areas along the roadway.

8. For the unpaved roads identified in Condition III.F.8.a, including any access points where the unpaved roads adjoin paved roads and any areas of vehicular handling of material, the Permittee shall:

[A.A.C. R18-2-B1301.D.10]

a. Implement a chemical dust suppressant application intensity and schedule, which at minimum shall be:

(1) For the slag hauler road and all other unpaved roads used or to be used by the slag hauler, chemical dust suppressant shall be applied at least once per week during the summer, and once per every two weeks during the winter.

(2) For the main road to the secondary crusher, chemical dust suppressant shall be applied at least once every six weeks,

year-round.

(3) For unpaved roads near reverts and silica flux crushing operations, chemical dust suppressant shall be applied at least once per two weeks during the summer, and once per month in the winter.

b. Increase the frequency of chemical dust suppressant application if necessary to reduce fugitive dust emissions from unpaved roads.

c. Maintain sufficient watering trucks and personnel to operate such trucks to be employed as an interim measure whenever visible emissions or a breakdown in dust suppressant covering are observed at any point along the treated unpaved road system.

d. Immediately, but no later than 30 minutes after initial observation of any visible emissions, apply water or chemical dust suppressant to the portion of the unpaved road where the visible emissions were observed.

e. Reapply chemical dust suppressant within 24 hours of discovery of any area where the surface chemical dust suppressant coverage has broken down.

f. Collect and prevent from becoming airborne any runoff or material from rinsing or sweeping as soon as practicable.

g. Comply with a speed limit not to exceed 15 miles per hour for all vehicular traffic. At minimum, speed limit signs shall be posted at all entrances and truck loading and unloading areas and/or at conspicuous areas along the roadway.

9. The Permittee shall, at all times, comply with the requirements applicable to Concentrate Storage, Handling, and Unloading Operations, bedding operations, furnace/converter silica flux handling and storage operations, converter dust handling operations as identified in the CD CV-15-02206-PHX-DLR B.6, 7, 8, 9 and 11, and included in the approved fugitive dust plan.

[A.A.C. R18-2-B1301.D.11 and 14]

10. The Permittee shall, at all times, comply with the requirements applicable to Uncrushed Reverts Handling and Storage operations and Reverts Crushing and Crushed Reverts Storage as identified in the CD CV-15-02206-PHX-DLR B.3 and 4, included in the approved fugitive dust plan.

[A.A.C. R18-2-B1301.D.12 and 13]

11. cid Plant Scrubber Blowdown Drying System

a. The Permittee shall, at all times, comply with the requirements applicable to Acid Plant Scrubber Blowdown Drying System as identified in the CD CV-15-02206-PHX-DLR B.10, and included in the approved fugitive dust plan.

[A.A.C. R18-2-B1301.D.15]

b. The Permittee shall maintain the negative pressure of the electric dryer using a 2,500 ACFM dryer ventilation fan that must run at all times the electric dryer is operational. Monitoring of the negative pressure shall be demonstrated through the run and stop states of the ventilation fan and electric dryer.

[A.A.C. R18-2-B1301.D.15.b]

IV. GENERAL COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

A. Applicability

These general CAM requirements are applicable to all equipment required to comply with specific CAM requirements identified in the permit.

B. CAM Operation Requirements

1. At all times, the Permittee shall maintain the CAM monitoring equipment, including but not limited to, maintaining necessary parts for routine repairs of the CAM monitoring equipment.

[40 CFR 64.7(b)]

2. Except for, as applicable, monitoring malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), the Permittee shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used for purposes of this part, including data averages and calculations, or fulfilling a minimum data availability requirement, if applicable. The Permittee shall use all the data collected during all other periods in assessing the operation of the control device and associated control system. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.

[40 CFR 64.7(c)]

3. Upon detecting an excursion or exceedance, the Permittee shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance. Such actions may include initial inspection and evaluation, recording that operations returned to normal without operator action (such as through response by a computerized distribution control system), or any necessary follow-up actions to return operation to within the indicator range, designated condition, or below the applicable emissions limitation or standard, as appropriate.

[40 CFR 64.7(d)(1)]

4. Determination of whether the Permittee has used acceptable procedures in response to an excursion will be based on information available, which may include but is not limited to, monitoring results, review of operation and

maintenance procedures and records, and inspection of the control device, associated capture system, and the process.

[40 CFR 64.7(d)(2)]

5. If the Permittee identifies a failure to achieve compliance with an emission limitation or standard for which CAM did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges or designated conditions, then the Permittee shall promptly notify the Director and, if necessary, submit a proposed modification to the permit to address the necessary monitoring changes. Such a modification may include, but is not limited to, reestablishing indicator ranges or designated conditions, modifying the frequency of conducting monitoring and collecting data, or the monitoring of additional parameters.

[40 CFR 64.7(e)]

C. Quality Improvement Plan (QIP) Requirements

1. In the event that the excursions exceed 5% duration of a pollutant-specific emissions unit's operating time for a reporting period, the Permittee shall develop and implement a QIP. The Director may otherwise specify the threshold at a higher or lower number of excursions or rely on other criteria for purposes of indicating whether a pollutant-specific emissions unit is being maintained and operated in a manner consistent with good air pollution control practices.

[40 CFR 64.8(a)]

2. The QIP shall include the following elements:

[40 CFR 64.8(b)]

a. The Permittee shall maintain a written QIP, if required, and have it available for inspection. Within 30 days of development of the QIP, the Permittee shall notify the Department in writing. The notification shall identify the equipment for which the QIP was developed.

b. The plan initially shall include procedures for evaluating the control performance problems and, based on the results of the evaluation procedures, the Permittee shall modify the plan to include procedures for conducting one or more of the following actions, as appropriate:

(1) Improved preventive maintenance practices;

(2) Process operation changes;

(3) Appropriate improvements to control methods;

(4) Other steps appropriate to correct control performance; and

(5) More frequent or improved monitoring (only in conjunction with one or more of steps (1) through (4).

3. If required, pursuant to Condition IV.C.1, then the Permittee shall develop and implement a QIP as expeditiously as practicable and shall notify the Director if the period for completing the improvements contained in the QIP exceeds 180 days

from the date on which the need to implement the QIP was determined.

[40 CFR 64.8(c)]

4. Following implementation of a QIP, the Director may require the Permittee to make reasonable changes to the QIP if the QIP is found to have:

[40 CFR 64.8(d)]

a. Failed to address the cause of the control device performance problems; or

b. Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions.

5. Implementation of a QIP shall not excuse the Permittee from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state or local law, or any other applicable requirements under the Act.

[40 CFR 64.8(e)]

D. Reporting and Recordkeeping Requirements

1. Along with the compliance certifications required by Condition VII of Attachment “A”, the Permittee shall submit to the Director monitoring reports required by this Section.

[40 CFR 64.9(a)(1)]

2. A monitoring report under this Section shall include, at a minimum, the information required under Condition I.B, and the following information, as applicable:

[40 CFR 64.9(a)(2)]

a. Summary information on the number, duration and cause (including unknown cause, if applicable) of excursions or exceedances, and the corrective actions taken.

b. Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other daily calibration checks, if applicable); and

c. A description of the actions taken to implement a QIP during the reporting period as specified in Condition IV.C. Upon completion of a QIP, the Permittee shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions occurring.

3. The Permittee shall maintain records of monitoring data, corrective actions taken, any written quality improvement plan required pursuant to Condition IV.C and any activities undertaken to implement a quality improvement plan, and other supporting information required to be maintained under this Section (such as data used to document the adequacy of monitoring, or records of monitoring, maintenance or corrective actions).

[40 CFR 64.9(b)(1)]

4. Instead of paper records, the Permittee may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements.

[40 CFR 64.9(b)(2)]

E. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 CFR Part 64.

[A.A.C. R18-2-325]

V. FOSSIL FUEL FIRED EQUIPMENT

A. Applicability

The requirements of this Section are applicable to the acid plant preheater, natural gas-fired boilers, water heaters and space heaters identified in the equipment lists in Attachment "I and J" as subject to this Section V.

B. Fuel Limitations

The Permittee shall fire only natural gas in acid plant preheater, boilers, water heaters, and space heaters.

[A.A.C. R18-2-306.A.2]

C. Operational Limitation

1. *The Permittee shall not fire natural gas in the acid plant preheater in excess of 460 million standard cubic feet (MMscf) per year based on a 365-day rolling total.*

[A.A.C. R18-2-306.01 and 331.A.3.a]
[Material Permit Conditions are indicated by italics and underline]

2. The Permittee shall maintain a daily 365 day rolling total of the fuel being combusted in the acid plant preheater in order to demonstrate compliance with the annual fuel limitation requirement in Condition V.C.1.

[A.A.C. R18-2-306.A.4]

D. Particulate Matter and Opacity

1. Emission Limitations and Standards

   a. The Permittee shall not cause, allow or permit the emission of particulate matter, caused by the combustion of fuel in excess of the amount calculated by the following equation:

   [A.A.C. R18-2-724.C.1]

   $E = 1.02\ Q^{0.769}$

   Where:

   E = the maximum allowable particulate emissions rate in pounds-mass per hour.

Q= the heat input in million Btu per hour.

b. For purposes of this Section, the heat input shall be the aggregate heat content of all fuels whose products of combustion pass through a stack or other outlet. The total heat input of all fuel-burning units on a plant or premises shall be used for determining the maximum allowable amount of particulate matter which may be emitted.

[A.A.C. R18-2-724.B]

c. The Permittee shall not cause, allow or permit to be emitted into the atmosphere, smoke which exceeds 15 percent opacity.

[A.A.C. R18-2-724.J]

2. Monitoring, Reporting, and Recordkeeping Requirements

a. The Permittee shall maintain a vendor-provided copy of that part of the Federal Energy Regulatory Commission (FERC) approved Tariff agreement that contains the lower heating value of the natural gas fuel.

[A.A.C. R18-2-306.A.3.c]

b. The Permittee shall conduct a quarterly monitoring of visible emissions from the stacks of all boilers/heaters greater than 10 million BTU per hour in accordance with Condition I.D.

[A.A.C. R18-2-306.A.3.c]

c. The Permittee shall report all 6-minute periods during which the visible emissions exceed 15 percent opacity, as required under Section XII of Attachment “A”.

[A.A.C. R18-2-724.J]

E. Sulfur Dioxide

1. Emission Limitations and Standards

The Permittee shall not emit more than 1.0 pound of sulfur dioxide per million BTU heat input.

[A.A.C. R18-2-724.E]

2. Monitoring, Recordkeeping, and Reporting Requirements

The Permittee shall keep records of fuel supplier certifications to demonstrate compliance with Condition V.E.1 above.

[A.A.C. R18-2-306.A.3.c]

F. Nitrogen Oxides

1. Emission Limitations and Standards

<u>The Permittee shall not emit or cause to emit more than 0.17 pounds per MMBtu of nitrogen oxides from the acid plant preheater</u>.

[A.A.C. R18-2-306.01 and 331.A.3.a]
[Material Permit Conditions are indicated by italics and underline]

2. Performance Test Requirements

a. Within 60 days of achieving the maximum throughput, but not later than 180 days of the startup of the acid plant preheater, unless otherwise required by Condition V.F.2.b the Permittee shall conduct a performance test for nitrogen oxides in accordance with EPA reference Method 7 to demonstrate compliance with nitrogen oxides emission standard in Condition V.F.1. The performance test shall be repeated annually (between 11 and 13 months of the previous performance test).

[A.A.C. R18-2-312]

b. If during any performance test, the nitrogen oxides emissions exceed 90% of the emission limit in Condition V.F.2.a, the Permittee shall conduct a subsequent performance test within six months.

[A.A.C. R18-2-306.A.3.c]

3. Monitoring, Recordkeeping and Reporting Requirements

The Permittee shall record and report to the Director the actual emission increase for NOx resulting from the acid plant preheater. The report shall be done in accordance with R18-2-402.F.3. The report shall be prepared on a calendar year basis for 5 years from the year of installation, and reported by March 1 for each prior calendar year. The first report shall be due March 1, 2019. The Permittee shall calculate and record annual nitrogen oxides emissions based on the daily fuel consumption, and the average emission rate from the three most recent performance tests, if available.

[A.A.C. R18-2-306.A.4, A.5 and R18-2-402.F.3]

G. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C. R18-2-402.F.3, 724.B, 724.C.1, 724.E, and 724.J.

[A.A.C. R18-2-325]

VI. REQUIREMENTS FOR ENGINES

A. Requirements for Existing Engines

1. Applicability

The Conditions of this Section apply to emergency and non-emergency diesel engines listed in the equipment lists in Attachment I" and "J" as subject to Section VI.A.

2. Fuel Limitations

a. The Permittee shall only fire diesel fuel in the internal combustion engines.

[A.A.C. R18-2-306.A.2]

b. The diesel fuel shall not contain 0.90% or more by weight of sulfur.

[A.A.C. R18-2-701.20]

3. Particulate Matter and Opacity

a. Emission Limitations and Standards

(1) The Permittee shall not cause or allow to be discharged into the atmosphere from the generator stacks affected under this Section, particulate matter in excess of the amount calculated by the following equation and rounded off to two decimal points:

[A.A.C. R18-2-719.C.1]

$E = 1.02Q^{0.769}$

Where:

E = The maximum allowable particulate emissions rate in pounds-mass per hour.

Q = The heat input in million Btu per hour.

(2) For the purposes of this condition, the heat input shall be the aggregate heat content of all fuels whose products of combustion pass through a stack or other outlet. The total heat input of all operating fuel-burning units at a plant or premises shall be used for determining the maximum allowable amount of particulate matter which may be emitted.

[A.A.C. R18-2-719.B]

(3) The Permittee shall not cause, allow or permit to be emitted into the atmosphere from any generator sets affected under this Section, smoke for any period greater than 10 consecutive seconds which exceeds 40% opacity, measured in accordance with EPA Reference Method 9. Visible emissions when starting cold equipment shall be exempt from this requirement for the first ten minutes.

[A.A.C. R18-2-719.E]

b. Monitoring and Recordkeeping Requirements

(1) The Permittee shall conduct a quarterly opacity monitoring for the engines, when in operation, in accordance with Condition I.D.

[A.A.C. R18-2-306.A.3.c]

(2) The Permittee shall keep records of a current, valid purchase contract, tariff sheet or transportation contract. The records shall contain information regarding the lower heating value of the fuel. These records shall be made available to ADEQ upon request.

[A.A.C. R18-2-306.A.3.c and -719.I].

c. Permit Shield

Compliance with the terms of this Subsection shall be deemed compliance with A.A.C. R18-2-719.B, 719.C.1 and 719.E.

[A.A.C. R18-2-325]

4. Sulfur Dioxide

a. Emission Limitations and Standards

The Permittee shall not cause, allow, or permit emissions of more than 1.0 pound of sulfur dioxide per million Btu heat input from each engine under this Section.

[A.A.C. R18-2-719.F]

b. Monitoring, Recordkeeping and Reporting Requirements

(1) The Permittee shall keep records of fuel supplier certifications or other documentation listing the sulfur content to demonstrate compliance with the sulfur content limit in Condition VI.A.2.b. These records shall be made available to ADEQ upon request.

[A.A.C. R18-2-306.A.3.c and -719.I]

(2) The Permittee shall report to the Director any daily period during which the sulfur content of the fuel being fired in the machine exceeds 0.8%.

[A.A.C. R18-2-719.J]

c. Permit Shield

Compliance with the terms of this Subsection shall be deemed compliance with A.A.C. R18-2-719.F, 719.I and 719.J.

[A.A.C. R18-2-325]

5. National Emission Standards for Hazardous Air Pollutant (NESHAP) Requirements

a. General Requirements

(1) The Permittee shall operate and maintain at all times the engines, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require you to make any further efforts to reduce emissions if levels required by this standard have been achieved. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

[40 CFR 63.6605(b)]

(2) The Permittee shall minimize the engine time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the emission standards applicable to all times other than startup in shall apply.

[40 CFR 63.6625(h)]

(3) The Permittee shall operate and maintain the engines and after-treatment control device (if any) according to the manufacturer's emission-related written instructions or develop a maintenance plan which shall provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.

[40 CFR 63.6625(e)]

b. Operation Requirements for Emergency Engines

(1) The Permittee shall comply with the following operation and maintenance requirements:

[40 CFR 63.6603, 63.6625(i) and 40 CFR 63, Subpart ZZZZ, Table 2d]

(a) The Permittee shall change the oil and filter every 500 hours operation or annually, whichever comes first. If the Permittee prefers to extend the oil change requirement, an oil analysis program shall be completed. The oil analysis must be performed at the same frequency specified for changing the oil. The Permittee shall at a minimum analyze the following three parameters: Total Base Number, viscosity and water content. The condemning limits for these parameters are as follows:

(i) Total Base Number is less than 30 percent of the Total Base Number of the oil when new;

(ii) Viscosity: changed more than 20 percent from the viscosity of oil when new; and

(iii) Water Content: greater than 0.5 percent by volume.

If all of the above limits are not exceeded, the Permittee is not required to change the oil. If any of the above limits are exceeded, the Permittee shall change the oil within 2 business days of receiving the results of the analysis or before commencing operation, whichever is later. The Permittee shall maintain records of the parameters that are analyzed as part of the program, the results of the analysis, and the oil changes for the engine. The analysis program shall be part of the maintenance plan for the operation of the engine.

(b) The Permittee shall inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary.

(c) The Permittee shall inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.

(2) If an emergency engine is operating during an emergency and it is not possible to shut down the engine in order to perform the work practice requirements on the schedule required in Conditions VI.A.5.b(1)(a) through VI.A.5.b(1)(c), or if performing the work practice on the required schedule would otherwise pose an unacceptable risk under federal, state, or local law, the work practice can be delayed until the emergency is over or the unacceptable risk under federal, state, or local law has abated. The work practice shall be performed as soon as practicable after the emergency has ended or the unacceptable risk under federal, state, or local law has abated.

[40 CFR 63 Subpart ZZZZ, Table 2d]

(3) The Permittee shall operate the emergency engines according to the requirements in Conditions VI.A.5.b(3)(a) through VI.A.5.b(3)(c).

[40 CFR 60.6640 (f)]

(a) There is no time limit on the use of emergency engine in emergency situations.

[40 CFR 60.6640 (f)(1)]

(b) The Permittee may operate an engine for maintenance checks and readiness testing for a maximum of 100 hours per year provided that the tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. The Permittee may petition the Director for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the Permittee maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year.

[40 CFR 63.6640(f)(2)]

(c) The Permittee may operate an emergency engine for up to 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year for maintenance and testing.

[40 CFR 63.6640(f)(4)]

(4) *The Permittee shall install non-resettable hour meter for each emergency engine*.

[40 CFR 63.6625(f), R18-2-331.A.3.c]
[Material Permit Conditions are indicated by underline and italics]

c. Operation Requirements for Non-Emergency Compression Ignition Engines

The Permittee shall comply with the following operation and maintenance requirements:

[40 CFR 63.6603, and 40 CFR 63, Subpart ZZZZ, Table 2c]

(1) The Permittee shall change the oil and filter every 1,000 hours operation or annually, whichever comes first. If the Permittee prefers to extend the oil change requirement, an oil analysis program described in Condition VI.A.5.b(1)(a). The oil analysis shall be performed at the same frequency specified for changing the oil.

(2) Every 1,000 hours of operation or annually, whichever comes first, the Permittee shall inspect and replace air cleaner as necessary.

(3) Every 500 hours of operation or annually, whichever comes first, the Permittee shall inspect all hoses and belts and replace as necessary.

d. Continuous Compliance Requirements

The Permittee shall demonstrate continuous compliance by operating and maintaining the engine according to the manufacturer's emission-related operation and maintenance instructions; or by developing and following its own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions

[40 CFR 63.6640(a), Table 6 to 40 CFR 63 Subpart ZZZZ]

e. Recordkeeping Requirements

(1) The Permittee shall keep records of the maintenance conducted on the stationary RICE in order to demonstrate that , the Permittee operated and maintained the stationary RICE and after-treatment control device (if any) according to the Permittee's own maintenance plan.

[40 CFR 63.6655(e)]

(2) The Permittee shall keep records of the parameters that are analyzed and the results of the oil analysis, if any, and the oil changes for the engine.

[40 CFR 63.6625(i)]

(3) For emergency engines, the Permittee shall keep records of the hours of operation of the RICE that is recorded through the non-resettable hour meter. Records shall include the hours spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation.

[40 CFR 63.6655(f)]

(4) The records shall be in a form suitable and readily available for expeditious review according to 40 CFR 63.10(b)(1).

[40 CFR 63.6660(a)]

(5) The Permittee shall keep each record for 5 years following the date of each occurrence, measurement, maintenance,

corrective action, report, or record.

[40 CFR 63.6660(b)]

(6) The record shall be readily accessible in hard copy or electronic form for at least 5 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record.

[40 CFR 63.6660(c)]

f. Permit Shield

Compliance with the Conditions of this Subsection shall be deemed compliance with 40.CFR 63.6602, 63.6605(b), 63.6625(e), 63.6625(f), 63.6625(i), 63.6625(h), 63.6640(a), 63.6650(d), 63.6650(h), 63.6640(f), 63.6655(a)(5), 63.6655(e), 63.6655(f), 63.6660(a) through (c).

[A.A.C. R18-2-325]

B. New Source Performance Standards (NSPS) Requirements for Emergency Compression Ignition Internal Combustion Engines (CI ICE)

1. Applicability

This Section applies to the emergency Stationary Compression Ignition Internal Combustion Engines identified in the equipment list as subject to this Subsection.

2. Operating Requirements

a. The Permittee shall operate and maintain the CI ICE and the control device according to the manufacturer's emission-related written instructions over the entire life of the engine. A copy of the instructions or procedures shall be kept onsite and made available to ADEQ upon request.

[40 CFR 60.4211(a)(1)]

b. The Permittee shall only change those engine settings that are permitted by the manufacturer.

[40 CFR 60.4211(a)(2)]

c. The Permittee shall meet the applicable requirements of 40 CFR Part 89, 94, and/or 1068, as they apply.

[40 CFR 60.4211(a)(3)]

d. *If an emergency stationary CI internal combustion engine does not meet the standards applicable to non-emergency engines, the Permittee shall install a non-resettable hour meter prior to startup of the engine..*

[40 CFR 60.4209(a), A.A.C. R18-2-331.A.3.a]
[Material Permit Conditions are indicated by underline and italics]

e. The Permittee shall operate the emergency engines according to the requirements in Conditions VI.B.2.e(1) through VI.B.2.e(3).

(1) In emergency situations, there is no time limit on the use of the emergency ICE.

[40 CFR 60.4211(f)(1)]

(2) The Permittee may operate an engine for maintenance checks and readiness testing for a maximum of 100 hours per year provided that the tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. The Permittee may petition the Director for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the Permittee maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year.

[40 CFR 60.4211(f)(2)]

(3) The Permittee may operate an emergency engine for up to 50 hours per calendar year in non-emergency situations. The 50 hours of operation in non-emergency situations are counted as part of the 100 hours per calendar year for maintenance and testing.

[40 CFR 60.4211(f)(3)]

3. Fuel Requirements

The Permittee operating a stationary CI ICE shall use diesel fuel that meets the requirements of non-road diesel fuel listed in 40 CFR 80.510(b) and listed below:

(1) Sulfur content: 15 ppm maximum; and

(2) A minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

[40 CFR 60.4207(b)]

4. Emission Limitations and Standards

The Permittee shall comply with the emission standards for new non-road CI engines the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants beginning in model year 2007.

[40 CFR 60.4202(a)(2), 4205(b)]

5. Compliance Requirements

a. The Permittee shall comply by purchasing an engine certified to the emission standards in Condition VI.B.4, for the same model year and maximum engine power. The engine must be installed and configured according to the manufacturer's specifications, except as permitted in Condition VI.B.5.b below.

[40 CFR 60.4211(c) and 60.4205(b)]

b. If the Permittee does not install, configure, operate, and maintain the ICE and control device according to the manufacturer's emission-related written instructions, or change the emission-related setting in a way that is not permitted by the manufacturer, the Permittee shall demonstrate compliance by keeping a maintenance plan and records of conducted maintenance to demonstrate compliance and shall, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, the Permittee shall conduct an initial performance test to demonstrate compliance with the applicable emission standards within 1 year of startup, or within 1 year after changing any non-permitted emission-related setting.

[40 CFR 60.4211(g)]

6. Recordkeeping Requirements

a. The Permittee shall record the time of operation of the engine and the reason the engine was in operation during that time.

[40 CFR 60.4214(b)]

b. The Permittee shall maintain a copy of the engine certification or other documentation demonstrating that the engine complies with the applicable standards in this permit, and shall make the documentation available to ADEQ upon request.

[40 CFR 60.4211(c)]

c. The Permittee shall keep records of fuel supplier specifications or other documentation such as results of laboratory tests. The documentation shall contain the name of the supplier or laboratory, sulfur content, and cetane index or aromatic content in the fuel. These records shall be made available to ADEQ upon request.

[A.A.C. R18-2-306.A.3.c]

7. Permit Shield

Compliance with the conditions of this Subsection shall be deemed compliance with 40 CFR 60.4202(a)(2), 60.4205(a), 60.4205(b), 60.4205(d), 60.4205(f), 60.4207(b), 4211(a), 60.4211(b), 60.4211(c), 60.4211(d), 60.4211(e), 60.4211(f), 60.4211(g) and 60.4214(b).

[A.A.C. R18-2-325]

C. NSPS Requirements for Emergency Stationary Spark Ignition Internal Combustion Engines (SI ICE)

1. Applicability

This Section applies to the emergency SI ICEs identified in the equipment list as subject to this Subsection.

2. Operating Requirements

The Permittee shall operate the emergency engines according to the requirements in Conditions VI.C.2.a through VI.C.2.c .

a. In emergency situations, there is no time limit on the use of the emergency ICE.

[40 CFR 60.4243(d)(1)]

b. The Permittee may operate an engine for maintenance checks and readiness testing for a maximum of 100 hours per year provided that the tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. The Permittee may petition the Director for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the Permittee maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year.

[40 CFR 60.4243(d)(2)]

c. The Permittee may operate the emergency stationary ICE up to 50 hours per year in non-emergency situations. These hours shall be counted towards the 100 hours per year provided for maintenance and testing.

[40 CFR 60.4243(d)(3)]

3. Emission Limitations and Standards

The emergency SI ICEs shall comply with the following emission standards:

[40 CFR 60.4233(e)]

a. NO_X: 2.0 g/HP-hr or 160 ppmvd @15% O_2

b. CO: 4.0 g/HP-hr or 540 ppmvd @15% O_2

c. VOC: 1.0 g/HP-hr or 86 ppmvd @15% O_2

4. Monitoring Requirements

If any emergency stationary SI ICE does not meet the standards applicable to non-emergency engine, the Permittee shall install a non-resettable hour meter.

[40 CFR 60.4237(a), R18-2-331.A.3.a]
[Material Permit Conditions are indicated by underline and italics]

5. Compliance Requirements

a. The Permittee operating a stationary SI ICE shall demonstrate compliance by purchasing engines certified to the emission standards in Condition VI.C.3. The engine shall be installed and configured according to the manufacturer's specifications. The Permittee shall

[40 CFR 60.4243(a)(1) and (b)]

(1) Operate and maintain the certified stationary SI ICE and control device according to the manufacturer's emission-related written instructions;

(2) Keep records of conducted maintenance; and

(3) Meet the requirements specified in 40 CFR Part 1068, Subparts A through D.

b. If Permittee does not operate and maintain the certified stationary SI internal combustion engine and control device according to the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine, and the Permittee must demonstrate compliance by

[40 CFR 60.4243(a)(2)]

(1) The Permittee shall keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions.

(2) In addition, the Permittee shall conduct an initial performance test within 1 year of engine startup and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance in accordance with 40 CFR 60.4244.

6. Recordkeeping and Reporting Requirements

a. The Permittee operating a stationary SI ICE must meet the following recordkeeping requirements:

[40 CFR 60.4245(a)]

(1) Records of all notifications submitted to comply with 40 CFR §60.4245 and all documentation supporting any notification;

(2) Maintenance conducted on the engine;

(3) If the stationary SI ICE is a certified engine, documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR Parts 90, 1048, 1054, and 1060, as applicable; and

(4) If the stationary SI ICE is not a certified engine or is a certified engine operating in a non-certified manner and subject to the requirements in Condition VI.C.5.b, documentation that the engine meets the emission standards.

b. For the SI emergency ICE that do not meet the standards applicable to non-emergency engines, the Permittee shall keep records of the hours of operation of the engine that is recorded through the non-resettable hour meter. The Permittee shall document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation.

[40 CFR 60.4245(b)]

c. For the engines that have not been certified by an engine manufacturer to meet the emission standards. The Permittee shall submit an initial notification as required in 40 CFR 60.7(a)(1). The notification shall include the following information:

[40 CFR 60.4245(c)]

(1) Name and address of the Permittee;

(2) The address of the affected source;

(3) Engine information including make, model, engine family, serial number, model year, maximum engine power, and engine displacement;

(4) Emission control equipment; and

(5) Fuel used

d. If any SI ICE is subject to performance testing requirement, the Permittee shall submit a copy of each performance test as conducted in accordance with 40 CR CFR 60.4244 within 60 days after the test has been completed in accordance with 40 CFR 60.4245(d) .

[40 CFR 60.4245(d)]

7. Permit Shield

Compliance with the conditions of this Subsection shall be deemed compliance with 40 CFR 60.4233(e), 60.4237(a), 60.4243(a)(1), (a)(2), (b), (d), 60.4245(a), (b), (c) and (d).

[A.A.C. R18-2-325]

VII. GASOLINE STORAGE TANK

A. Applicability

This Section applies to the gasoline storage tanks identified in the Equipment Lists in Attachments "I" and "J" as applicable to this Section.

B. Operating Limitations

1. Gasoline storage tank shall be equipped with a submerged filling device or acceptable equivalent, for control of hydrocarbon emissions.

[A.A.C. R18-2-710.B]

2. All pumps and compressors that handle gasoline shall be equipped with mechanical seals or other equipment of equal efficiency to prevent release of organic contaminants into the atmosphere.

[A.A.C. R18-2-710.D]

C. Monitoring and Recordkeeping Requirements

[A.A.C. R18-2-710.E]

The Permittee shall maintain a storage tank log showing the following:

1. The Permittee shall maintain a file of each type of petroleum liquid stored, the typical Reid vapor pressure of the petroleum liquid stored and the dates of storage. Dates on which the storage vessel is empty shall be shown.

2. The Permittee shall determine and record the average monthly storage temperature and true vapor pressure of the petroleum liquid stored at such temperature if either:

a. The petroleum liquid has a true vapor pressure, as stored, greater than 26 mm Hg (0.5 psia) but less than 78 mm Hg (1.5 psia) and is stored in a storage vessel other than one equipped with a floating roof, a vapor recovery system or their equivalents; or

b. The petroleum liquid has a true vapor pressure, as stored, greater than 470 mm Hg (9.1 psia) and is stored in a storage vessel other than one equipped with a vapor recovery system or its equivalent.

3. The average monthly storage temperature shall be an arithmetic average calculated for each calendar month, or portion thereof, if storage is for less than a month, from bulk liquid storage temperatures determined at least once every seven days.

4. The true vapor pressure shall be determined by the procedures in American Petroleum Institute Bulletin 2517, amended as of February 1980 (and no future editions), which is incorporated herein by reference and on file with the Office of the Secretary of State. This procedure is dependent upon determination of the storage temperature and the Reid vapor pressure, which requires sampling of the petroleum liquids in the storage vessels. Unless the Director requires in specific cases that the stored petroleum liquid be sampled, the true vapor pressure may be determined by using the average monthly storage temperature and the typical Reid vapor pressure. For those liquids for which certified specifications limiting the Reid vapor pressure exist, the Reid vapor pressure may be used. For other liquids, supporting analytical data must be made available upon request to the Director when typical Reid vapor pressure is used.

D. Permit Shield

Compliance with the terms of this Section shall be deemed compliance with the A.A.C. R18-2-710.D, 710.D and 710.E.

[A.A.C. R18-2-325]

VIII. GASOLINE DISPENSING FACILITY

A. Applicability

1. This Section applies to each gasoline dispensing facility (GDF) located at the facility. The affected source includes each gasoline cargo tank during the delivery of product to a GDF and also includes each gasoline storage tank identified in the Equipment Lists as applicable to this Section.

[40 CFR 63.11111(a)]

2. This Section applies to gasoline storage tank and associated equipment components in vapor or liquid gasoline service. Pressure/vacuum vents on gasoline storage tanks and the equipment necessary to unload product from cargo tanks into the storage tanks at GDF are covered emission sources. The equipment used for the refueling of motor vehicles is not covered by this Section.

[40 CFR 63.11112(a)]

3. The equipment associated with this Section is subject to the NESHAP General Provisions, as described in Table 3 to 40 CFR 63 Subpart CCCCCC.

[40 CFR 63.11130]

4. If at any time during the permit term, the monthly throughput at any GDF exceeds 10,000 gallons per month calculated pursuant to Condition VIII.C, the facility will,

thenceforth, be subject to additional requirements under 40 CFR 63.11117 for 10000 gallons threshold. These additional requirements will then continue to remain applicable, even if the throughput drops below this threshold.

[40 CFR 63.11111(h)(ii)]

B. Emission Standards

The Permittee shall not allow gasoline to be handled in a manner that would result in vapor releases to the atmosphere for extended periods of time. Measures to be taken include, but are not limited to, the following:

[40 CFR 63.11116(a)]

1. Minimize gasoline spills;

2. Clean up spills as expeditiously as practicable;

3. Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use;

4. Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.

C. Recordkeeping Requirements

The Permittee shall maintain records of monthly throughput of gasoline. Monthly throughput shall be calculated by summing the volume of gasoline loaded into, or dispensed from, the gasoline storage tanks at the GDF during the current day, plus the total volume of gasoline loaded into, or dispensed from, the gasoline storage tanks at the GDF during the previous 364 days, and then dividing that sum by 12. These records shall be available to the Director within 24 hours of the request.

[A.A.C. R18-2-306.A.3.c, 40 CFR 63.11116(b), 40 CFR 63.11132]

D. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 CFR 63.11111(a), 40 CFR 63.11111(h)(ii), 40 CFR 63.11112(a), 40 CFR 63.11116(a), 40 CFR 63.11116(b), 40 CFR 63.11130 and 40 CFR 63.11132.

[A.A.C. R18-2-325]

IX. OTHER STORAGE TANKS

A. Applicability

This Section is applicable to the sulfuric acid tanks identified in the Equipment list as applicable to this Section.

B. General Requirements

1. The Permittee shall not emit gaseous or odorous materials from equipment, operations or premises under the Permittee's control in such quantities or concentrations as to cause air pollution.

[A.A.C. R18-2-730.D]

2. Materials including solvents or other volatile compounds, and other chemicals

utilized in the processes under this Section shall be processed, stored, used, and transported in such a manner and by means that they will not evaporate, leak, escape or be otherwise discharged into the ambient air so as to cause or contribute to air pollution. Where means are available to reduce effectively the contribution to air pollution from evaporation, leakage or discharge, the installation and use of such control methods, devices, or equipment shall be mandatory.

[A.A.C. R18-2-730.F]

3. Where a stack, vent or other outlet is at such a level that fumes, gas mist, odor, smoke, vapor or any combination thereof constituting air pollution is discharged to adjoining property, the Director may require the installation of abatement equipment or the alteration of such stack, vent, or other outlet by the Permittee to a degree that will adequately dilute, reduce or eliminate the discharge of air pollution to adjoining property.

[A.A.C. R18-2-730.G]

C. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C. R18-2-730.D, F and G.

[A.A.C. R18-2-325]

X. FUGITIVE DUST REQUIREMENTS

A. Applicability

This Section applies to any source of fugitive dust in the facility.

B. Particulate Matter and Opacity

Open Areas, Roadways & Streets, Storage Piles, and Material Handling

1. Emission Limitations/Standards

a. Opacity from dust emissions shall not exceed 20% from any part of the facility at any time, as determined using EPA Reference Method 9.

[CD CV-15-02206-PHX-DLR B.29.A]

b. The Permittee shall employ the following reasonable precautions to prevent excessive amounts of particulate matter from any non-point source of fugitive dust from becoming airborne:

(1) Keep dust and other types of air contaminants to a minimum in an open area where construction operations, repair operations, demolition activities, clearing operations, leveling operations, or any earth moving or excavating activities are taking place, by good modern practices such as using an approved dust suppressant or adhesive soil stabilizer, paving, covering, landscaping, continuous wetting, detouring, barring access, or other acceptable means;

[A.A.C. R18-2-604.A]

(2) Keep dust to a minimum from driveways, parking areas, and vacant lots where motor vehicular activity occurs by using an

approved dust suppressant, or adhesive soil stabilizer, or by paving, or by barring access to the property, or by other acceptable means;

[A.A.C. R18-2-604.B]

(3) Keep dust and other particulates to a minimum by employing dust suppressants, temporary paving, detouring, wetting down or by other reasonable means when a roadway is repaired, constructed, or reconstructed;

[A.A.C. R18-2-605.A]

(4) Take reasonable precautions, such as wetting, applying dust suppressants, or covering the load when transporting material likely to give rise to airborne dust;

[A.A.C. R18-2-605.B]

(5) Take reasonable precautions, such as the use of spray bars, wetting agents, dust suppressants, covering the load, and hoods when crushing, handling, or conveying material likely to give rise to airborne dust;

[A.A.C. R18-2-606]

(6) Take reasonable precautions such as chemical stabilization, wetting, or covering when organic or inorganic dust producing material is being stacked, piled, or otherwise stored;

[A.A.C. R18-2-607.A]

(7) Operate stacking and reclaiming machinery utilized at storage piles at all times with a minimum fall of material, or with the use of spray bars and wetting agents;

[A.A.C. R18-2-607.B]

(8) Operate mineral tailings piles by taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne. Reasonable precautions shall mean wetting, chemical stabilization, revegetation or such other measures as are approved by the Director.

[A.A.C R18-2-608]

(9) The Permittee shall take reasonable precautions, such as the use of dust suppressants, before the cleaning of a site, roadway, or alley. Earth or other material shall be removed from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water or by other means.

[A.A.C. R18-2-804.B]

(10) Any other method as proposed by the Permittee and approved by the Director.

[A.A.C. R18-2-306.A.3.c]

2. Air Pollution Control Requirements

a. The Permittee shall operate and maintain each fugitive dust source covered by the Fugitive Dust Plan required pursuant to Condition III.B, including all associated air pollution control equipment and monitoring equipment, in a manner consistent with good air pollution control practices for minimizing emissions to the greatest extent practicable at all times.

[CD CV-15-02206-PHX-DLR B 22]

3. Opacity Monitoring Requirements

a. In the event ongoing visible emissions are observed at a source covered by the Fugitive Dust Plan required pursuant to Condition III.B, a Method 9 certified observer shall promptly evaluate the emissions and conduct a Method 9 reading, if possible.

[CD CV-15-02206-PHX-DLR B 29.B]

b. A Method 9 certified observer shall conduct a weekly visible emissions survey of all sources covered by the Fugitive Dust Plan in accordance with Condition I.D, and perform a Method 9 reading for any plumes that on an instantaneous basis appear to exceed 15% opacity.

[CD CV-15-02206-PHX-DLR B 29.C]

c. Except as provided otherwise in the Fugitive Dust Plan required pursuant Condition III.B, at any time that visible emissions appear to exceed 15% opacity from dust sources covered by the Fugitive Dust Plan, the Permittee shall take prompt corrective action to identify the source of the emissions and abate such emissions, with the corrective action starting within thirty (30) minutes after discovery.

[CD CV-15-02206-PHX-DLR B 24.A]

4. At any time that the Permittee becomes aware that provisions of the Fugitive Dust Plan required pursuant to Condition III.B are not being met, the Permittee shall take prompt action to return to compliance, which may include modifications to monitoring, recordkeeping, and/or reporting requirements in the Fugitive Dust Plan.

[CD CV-15-02206-PHX B 24.B]

5. The Permittee shall conduct physical inspections in accordance with, and at the frequencies specified in the Fugitive Dust Plan required pursuant to Condition III.B.

[CD CV-15-02206-PHX-DLR B 28]

6. Recordkeeping Requirements

a. The Permittee shall maintain records of the dates on which any of the activities listed in Conditions X.B.1.b(1) through X.B.1.b(10) were performed and the control measures that were adopted.

[A.A.C. R18-2-306.A.3.c]

b. All records for purposes of the Fugitive Dust Plan shall be maintained in a recordkeeping log or recordkeeping system. The records shall include all the information required in Paragraph 35.B, Appendix B of the CD and as specified in the Fugitive Dust Plan.

CD CV-15-02206-PHX-DLR B 35.B]

c. For each inspection conducted in accordance with Condition X.B.5, the Permittee shall maintain in the log the completed inspection sheet or checklist.

[CD CV-15-02206-PHX-DLR B 35.C]

d. The Permittee shall maintain in the log which employees took the Dust Plan training or Method 9 certification course, the date of the training and/or certification, and the nature of the material included in the Dust Plan training.

[CD CV-15-02206-PHX-DLR B 35.D]

7. Reporting Requirements

On the 30th day after each calendar quarter, the Permittee shall submit a report to EPA covering the prior quarter that includes the information and data required in Paragraph 36A in Appendix B of the CD. The Permittee may submit these quarterly reports electronically.

[CD CV-15-02206-PHX-DLR B 36.A]

8. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with CD CV-15-02206-PHX-DLR B22, B24.A, B24.B, B28, B29.A, B29.B, B29.C, B35.B, B35.C, B35.D and B36.A, A.A.C. R18-2-604.A, 604.B, 605, 606, 607, 608, 614 and 804.B

[A.A.C. R18-2-325]

XI. OTHER PERIODIC ACTIVITIES

A. Abrasive Blasting

1. Particulate Matter and Opacity

a. Emission Limitations/Standards

The Permittee shall not cause or allow sandblasting or other abrasive blasting without minimizing dust emissions to the atmosphere through the use of good modern practices. Good modern practices include:

(1) Wet blasting;

(2) Effective enclosures with necessary dust collecting equipment; or

(3) Any other method approved by the Director.

[A.A.C. R18-2-726]

b. Opacity

The Permittee shall not cause, allow or permit visible emissions from sandblasting or other abrasive blasting operations in excess of 20% opacity.

[A.A.C. R18-2-702.B]

2. Monitoring and Recordkeeping Requirement

   Each time an abrasive blasting project is conducted, the Permittee shall make a record of the following:

   a. The date the project was conducted;

   b. The duration of the project; and

   c. Type of control measures employed.

   [A.A.C. R18-2-306.A.3.c]

3. Permit Shield

   Compliance with this Section shall be deemed compliance with A.A.C. R18-2-726 and A.A.C. R18-2-702.B.

   [A.A.C.R18-2-325]

B. Use of Paints

1. Volatile Organic Compounds

   a. Emission Limitations/Standards

   While performing spray painting operations, the Permittee shall comply with the following requirements:

   (1) The Permittee shall not conduct or cause to be conducted any spray painting operation without minimizing organic solvent emissions. Such operations, other than architectural coating and spot painting, shall be conducted in an enclosed area equipped with controls containing no less than 96 percent of the overspray.

   [A.A.C.R18-2-727.A]

   (2) The Permittee or their designated contractor shall not either:

   (a) Employ, apply, evaporate, or dry any architectural coating containing photochemically reactive solvents for industrial or commercial purposes; or

   (b) Thin or dilute any architectural coating with a photochemically reactive solvent.

   [A.A.C.R18-2-727.B]

   (3) For the purposes of Condition XI.B.1.a(2)(a), a photochemically reactive solvent shall be any solvent with an aggregate of more than 20 percent of its total volume composed of the chemical compounds classified in Conditions XI.B.1.a(3)(a) through XI.B.1.a(3)(c) below, or which exceeds any of the following percentage composition limitations, referred to the total volume of solvent:

   (a) A combination of the following types of compounds having an olefinic or cyclo-olefinic type of unsaturation- hydrocarbons, alcohols, aldehydes, esters, ethers, or ketones: 5 percent.

(b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene: 8 percent.

(c) A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichloroethylene or toluene: 20 percent.

[A.A.C.R18-2-727.C]

(4) Whenever any organic solvent or any constituent of an organic solvent may be classified from its chemical structure into more than one of the groups of organic compounds described in Conditions XI.B.1.a(3)(a) through XI.B.1.a(3)(c) above, it shall be considered to be a member of the group having the least allowable percent of the total volume of solvents.

[A.A.C.R18-2-727.D]

b. Monitoring and Recordkeeping Requirements

(1) Each time a spray painting project is conducted, the Permittee shall make a record of the following:

(a) The date the project was conducted;

(b) The duration of the project;

(c) Type of control measures employed;

(d) Safety Data Sheets (SDS) for all paints and solvents used in the project; and

(e) The amount of paint consumed during the project.

(2) Architectural coating and spot painting projects shall be exempt from the recordkeeping requirements of Condition XI.B.1.b(1).

[A.A.C. R18-2-306.A.3.c]

c. Permit Shield

Compliance with this Section shall be deemed compliance with A.A.C.R18-2-727.

[A.A.C.R18-2-325]

2. Opacity

a. Emission Limitation/Standard

The Permittee shall not cause, allow or permit visible emissions from painting operations in excess of 20% opacity.

[A.A.C. R18-2-702.B]

b. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C.R18-2-702.B.

[A.A.C. R18-2-325]

C. Demolition/Renovation - Hazardous Air Pollutants

1. Emission Limitation/Standard

The Permittee shall comply with all of the requirements of 40 CFR 61 Subpart M (National Emissions Standards for Hazardous Air Pollutants - Asbestos).

[A.A.C. R18-2-1101.A.8]

2. Monitoring and Recordkeeping Requirement

The Permittee shall keep all required records in a file. The required records shall include the "NESHAP Notification for Renovation and Demolition Activities" form and all supporting documents.

[A.A.C. R18-2-306.A.3.c]

3. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C. R18-2-1101.A.8.

[A.A.C. R18-2-325]

D. Nonvehicle Air Conditioner Maintenance and/or Services

1. The Permittee shall comply with the applicable requirements of 40 CFR 82 - Subpart F (Protection of Stratospheric Ozone - Recycling and Emissions Reduction).

[40 CFR 82, Subpart F]

2. As a means of demonstrating compliance with Condition XI.D.1 above, the Permittee shall keep a record of all relevant paperwork to the applicable requirements of 40 CFR 82 - Subpart F on file.

[A.A.C. R18-2-306.A.3.c]

3. Permit Shield

Compliance with the conditions of this Part shall be deemed compliance with 40 CFR 52, Subpart F.

[A.A.C. R18-2-325]

E. Solvent Degreasing

1. The Permittee shall process, store, use, and transport materials including solvents or volatile compounds in such a manner and by such means that they will not evaporate, leak, escape, or be otherwise discharged into the atmosphere so as to cause or contribute to air pollution. Where means are available to reduce

effectively the contribution to air pollution from evaporation, leakage, or discharge, the installation and usage of such control methods, devices, or equipment shall be mandatory.

[A.A.C. R18-2-730.F]

2. Permit Shield

Compliance with the conditions of this Part shall be deemed compliance with A.A.C. R18-2-730.F.

[A.A.C. R18-2-325]

XII. COOLING TOWERS

A. General Operational Requirements

1. The Permittee shall not emit gaseous or odorous materials from equipment, operations, or premises in such quantities or concentrations so as to cause air pollution.

[A.A.C. R18-2-730.D]

2. Where a stack, vent, or other outlet is at such a level that fumes, gas mist, odor, smoke, vapor or any combination thereof constituting air pollution is discharged to adjoining property, the Director may require the installation of abatement equipment or the alteration of such stack, vent, or other outlet by the Permittee thereof to a degree that will adequately dilute, reduce, or eliminate the discharge of air pollution to adjoining property.

[A.A.C.R18-2-730.G]

B. Particulate Matter and Opacity

1. Emission Limitations/Standards

a. The Permittee shall not cause or permit the emissions of particulate matter discharged into the atmosphere in any one hour from cooling towers in total quantities in excess of the amounts calculated by one of the following equations:

(1) For process sources having a process weight rate of 60,000 pounds per hour (30 tons per hour) or less, the maximum allowable emissions shall be determined by the following equation:

[A.A.C. R18-2-730.A.1.a]

$$E = 4.10P^{0.67}$$

Where:

E = the maximum allowable particulate emissions rate in pounds-mass per hour.

P = the process weight rate in tons-mass per hour.

(2) For process weight rate greater than 60,000 pounds per hour (30 tons per hour), the maximum allowable emissions shall be

determined by the following equation:

[A.A.C. R18-2-730.A.1.b]

$$E = 55.0P^{0.11} - 40$$

Where "E" and "P" are defined as indicated in Condition XII.B.1.a(1) above.

b. The Permittee shall not cause or allow to be discharged into the atmosphere any plume or effluent from the cooling towers which exhibits opacity greater than 20%, measured in accordance with EPA Reference Method 9. Where the presence of uncombined water is the only reason for the exceedance of this opacity standard, such exceedance shall not constitute a violation.

[A.A.C. R18-2-702.B.3 and -702.C]

2. Air Pollution Control Requirements

At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate the cooling towers in a manner consistent with good air pollution control practice for minimizing particulate matter emissions.

[A.A.C. R18-2-306.A.2]

3. Monitoring, Record keeping and Reporting Requirements

A certified Method 9 observer shall conduct a quarterly (once in 3 months) visual survey of visible emissions from cooling towers as per the procedure in Condition I.D.

[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with requirements of this Section shall be deemed compliance with A.A.C.R18-2-702.B.3, C, -730.A.1, 730.D, and 730.G.

[A.A.C. R18-2-325]

XIII. AMBIENT MONITORING REQUIREMENTS

A. General Requirements

1. All ambient air quality monitoring required under this Section shall be conducted in accordance with the following:

a. Only those methods which have been either designated by EPA as reference or equivalent methods or approved by the Director shall be used to monitor ambient air.

[A.A.C. R18-2-215.A]

b. Quality assurance, monitor siting, and sample probe installation procedures shall be in accordance with procedures described in the Appendices to 40 CFR 58.

[A.A.C. R18-2-215.B]

c. The Director may approve other procedures upon a finding that the proposed procedures are substantially equivalent or superior to procedures in the Appendices to 40 CFR 58.

[A.A.C. R18-2-215.C]

d. Unless otherwise specified, interpretation of all ambient air quality standards contained in this Section shall be in accordance with 40 CFR 50.

[A.A.C. R18-2-216]

e. All ambient air quality monitoring shall be conducted in accordance with the regulations and guidance listed below as applicable:

[A.A.C. R18-2-715.02.E]

(1) National Primary and Secondary Ambient Air Quality Standards, 40 CFR Part 50 and Appendices; and

(2) Ambient Air Quality Surveillance, 40 CFR Part 58 and Appendices.

f. The procedures and requirements associated with the ambient monitoring network shall be documented via a Quality Assurance Project Plan (QAPP) in accordance with 40 CFR 58 Appendix A. The Permittee shall work with ADEQ in formulating this documentation.

[A.A.C. R18-2-306.A.3.c]

2. General Reporting and Recordkeeping Requirements

a. The Permittee shall retain record of all monitoring data in accordance with Section XIII of Attachment "A". The data shall be available to ADEQ upon request.

[A.A.C. R18-2-306.A.3.c]

b. Quarterly reports, and the associated quality assurance information shall be submitted to the Facilities Emissions and Control Section of the Air Quality Division of ADEQ. The fourth quarterly report for the year should include an annual summary, as applicable for each pollutant.

[A.A.C. R18-2-306.A.3.c]

c. Updated site and monitor metadata information shall be included in the annual reports as applicable.

[A.A.C. R18-2-306.A.3.c]

B. Meteorological Monitoring

1. Monitoring Requirements

[A.A.C. R18-2-306.A.3.c]

a. The Permittee shall continue to maintain and operate meteorological monitoring stations at the monitoring sites listed in the table below to record wind speed, vector wind direction, and standard deviations of wind direction and temperature.

Identifier	Unit	Latitude/Longitude
MT0	Montgomery Ranch	33.029/-110.810
HJ0	Hayden Junction	33.011/-110.811
GH0	Globe Highway	33.002/-110.765

b. The Permittee shall maintain equipment at the Camera Hill ambient monitoring location and the meteorological monitoring stations at the following locations that shall, on a continuous basis, measure and record wind speed and wind direction, including calculation of the average wind speed (in miles per hour) at each location over fifteen (15) minutes, rolled each minute.

[CD CV-15-02206-PHX-DLR B.32.A, R18-2-B1301.01.F.2.a and b]

(1) ST-14 (the smelter parking lot),

(2) ST-16 (Terrace Street)

(3) ST-23 (Hillcrest area),

(4) ST-26 (post office), and

(5) ST-18 (next to the concentrate handling area).

c. The Permittee shall conduct wind speed and direction measurements using methods in accordance with EPA's Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Measurements, Version 2.0.

[A.A.C R18-2-B1301.01.F.2.c]

2. Quality Assurance

No later than December 1, 2018, and annually thereafter, the Permittee shall conduct audits of the meteorological monitoring stations in Condition XIII.B.1.b consistent with applicable sections and appendices of the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Measurements, Version 2.0.

[A.A.C. R18-2-B1301.01.F.2.c]

3. Recordkeeping Requirements

a. The Permittee shall maintain all records of major maintenance activities and inspections conducted on monitors required by Condition XIII.B.1.b.

[A.A.C. R18-2-B1301.01.H.1.e]

b. All records of quality assurance and quality control activities for the monitors required by subsection (F) of A.A.C. R18-2-B1301.01.

[A.A.C. R18-2-B1301.01.H.1.f]

c. The Permittee shall maintain all records of wind data from the meteorological station required in Condition XIII.B.1.b.

[A.A.C. R18-2-B1301.01.H.1.h]

d. All records of any periods during which a monitoring device required by subsection (F) of A.A.C. R18-2-B1301.01 is inoperative or not operating correctly.

[A.A.C. R18-2-B1301.01.H.1.i]

C. Sulfur Dioxide Monitoring

1. Monitoring Requirements

a. The Permittee shall calibrate, maintain and operate ambient sulfur dioxide monitoring stations at the monitoring sites listed in the table below.

[A.A.C. R18-2-306.A.3.c]

Identifier	Unit	Latitude/Longitude
MT0	Montgomery Ranch	33.029/-110.810
JL	Jail - The Permittee	33.006/-110.786
HJ0	Hayden Junction	33.011/-110.811
GA	Garfield Avenue	33.003/-110.785
GH0	Globe Highway	33.002/-110.765

b. The Permittee shall collect the maximum 5-minute block average concentration of the twelve 5-minute blocks in each hour or the twelve consecutive 5-minute block averages in each hour, and the consecutive hourly averages. Data that are influenced by routine maintenance, audits and periods of instrument calibration or other services should be identified using the appropriate flags. (40 CFR Part 58.16(a)).

[40 C.F.R. 58.16(g)]

c. The SO_2 data measurements shall be made continuously. In the event of system malfunction, the unit shall be repaired or replaced within 5 business days or as soon as practicable. The Permittee shall notify ADEQ of any such malfunction and expected duration within 2 business days. Monitoring shall resume as soon as practicable after the correction of the malfunction problem. The Permittee shall notify ADEQ if any malfunctions are not corrected within 5 business days.

d. Quality Assurance

(1) All samplers shall be operated, calibrated, and maintained in accordance with the procedures set forth in the respective manufacturer's instruction manuals and in accordance with applicable sections and appendices of 40 CFR Parts 50 and 58 and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, U.S. Environmental Protection Agency. The Permittee shall use EPA approved SO_2 samplers.

(2) The Permittee shall conduct performance evaluation of the monitoring equipment in accordance with the requirements pertaining to sampler accuracy as specified in 40 CFR Part 58 Appendix A, section 3.1.2. The performance audits shall be

conducted by a qualified independent auditor under contract to the Permittee at least once per year.

(3) The Permittee shall conduct technical systems audits of its ambient air monitoring program consistent with the applicable sections of the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, U.S. Environmental Protection Agency. The technical systems audits shall be conducted by a qualified independent auditor under contract to the Permittee at least once in every three (3) years beginning from the issuance of this permit.

(4) The Permittee shall participate in technical systems audits or performance audits conducted by the Department. The Department shall provide a minimum of 30-day notice of a technical systems audit and a minimum of 48-hour notice of a performance audit.

2. Reporting Requirements

[A.A.C. R18-2-306.A.3.c]

The quarterly and annual reports as required by Condition XIII.A.2.b shall contain the following information specified by site and monitor. All concentration data shall be presented in accordance with the data reporting conventions in 40 CFR 50 Appendix T.

a. Valid hours of data expressed as the percentage obtained by dividing the actual valid data hours by the number of hours in the reporting period;

b. Daily maximum 5-min block average

c. Daily Maximum one-hour and second highest three-hour block average concentration of SO_2;

d. Number of exceedances of the three-hour, and one-hour standards;

e. The 99^{th} percentile of the daily maximum one-hour average SO_2 concentration for each quarter;

f. The Annual Report must include the annual 99^{th} percentile of the daily maximum 1-hour averages, and the most recent 3 year average of the annual 99^{th} percentiles; and

g. Precision (bi-weekly one-point QC check) and accuracy (multi-point audit) data.

D. Ambient Air Monitoring for Particulate Matter, Lead, Arsenic and Cadmium

1. The Permittee shall maintain and operate the ambient air monitors for TSP, PM_{10}, $PM_{2.5}$, lead, arsenic and cadmium as per the following table:

[CD CV-15-02206-PHX-DLR App B 31.A and E, and A.A.C. R18-2-B1301.01.F.1.a]

Station	Location/Monitor Type(s)	Pollutant

No.		
ST-14	Smelter Parking Lot TSP PM_{10} $PM_{2.5}$	Lead*
		PM_{10}
		$PM_{2.5}$
		Cadmium**
		Arsenic**
ST-16	Terrace Street PM_{10}	PM_{10}
		Cadmium**
		Arsenic**
ST-18	Near Concentrate Handling Area TSP PM_{10}	Lead*
		PM_{10}
		Cadmium**
		Arsenic**
ST-23 and ST-26	Hillcrest area and Post Office TSP PM_{10} $PM_{2.5}$	Lead*
		PM_{10}
		$PM_{2.5}$
		Cadmium**
		Arsenic**

* Lead from TSP monitor
** Cadmium and Arsenic from PM_{10} monitor

2. The Permittee shall follow the quality assurance project plan ("QAPP") applicable to these monitors under the AOC and otherwise operate them consistent with 40 C.F.R. Part 58 Appendix A.
[CD CV-15-02206-PHX-DLR B 31.A, A.A.C. R18-2-B1301.01.F.1.c and d]

3. The Permittee shall continuously monitor and record the ambient concentration levels of PM_{10}, $PM_{2.5}$, lead, arsenic and cadmium at the above locations. For the purposes of this provision, "continuous" means that 24-hour filters are placed and collected, at a minimum (but it may be more frequent consistent with the requirements of 40 C.F.R. §58.12), every 6 days for the TSP and PM_{10} monitors and every 3 days for the $PM_{2.5}$ monitors.
[CD CV-15-02206-PHX-DLR B 31.A, A.A.C. R18-2-B1301.01.F.1.b]

4. The Permittee shall provide each filter removed from a monitoring station to a certified laboratory for analysis consistent with the timeframes set forth in the QAPP, but no later than 18 days after the filter's removal. The Permittee shall also ensure that the laboratory performs its analysis and submits the results the Permittee as quickly as feasible, but not to exceed 21 days from the lab's receipt of the filter.
[CD CV-15-02206-PHX-DLR B 31.A, A.A.C. R18-2-B1301.01.F.1.e]

5. The Permittee shall calculate, update, and maintain as a record the following data within 14 calendar days of receipt of any results pertaining to the monitor filters received from a certified lab:
[A.A.C. R18-2-B1301.01.F.1.f]

   a. The total pollutants on the filters collected and analyzed; and

   b. Calculations of 30-day rolling average ambient air levels of lead for the ST-23, ST-26, and ST- 18 monitors, and 60-day rolling average ambient air levels of lead for the ST-14 monitor, expressed as µg/m3.

6. The Permittee shall retain lead samples collected pursuant to this Section for at least three years. The samples shall be stored in individually sealed containers and labeled with the applicable monitor and date. Upon request, the samples shall be provided to the Department within five business days.

[A.A.C. R18-2-B1301.01.F.1.g]

7. Recordkeeping Requirements

a. All records of major maintenance activities and inspections conducted on monitors in Condition XIII.D.1.

[A.A.C. R18-2-B1301.01.H.1.e]

b. All records of quality assurance and quality control activities for the monitors in Condition XIII.D.1.

[A.A.C. R18-2-B1301.01.H.1.f]

c. All air quality monitoring samples, rolling averages of ambient lead concentrations and necessary calculations, and data required by Condition XIII.D.1.

[A.A.C. R18-2-B1301.01.H.1.g]

d. All records of any periods during which a monitoring device is inoperative or not operating correctly.

[A.A.C. R18-2-B1301.01.H.1.i]

e. Raw monitoring data and calculated ambient levels from the ambient monitoring stations maintained pursuant to Condition XIII.D.1.

[CD CV-15-02206-PHX-DLR B 35.B.xvii]

8. Reporting

a. Within 30 days after the end of each calendar-year quarter, the Permittee shall submit a report to the Department covering the prior quarter that includes the raw monitoring data and calculated ambient lead concentrations from the ambient air monitoring stations in Condition XIII.D.1. The Permittee may submit these quarterly reports electronically to the Department.

[A.A.C. R18-2-B1301.01.I.6]

b. On a quarterly basis, the Permittee shall submit a report to EPA covering the prior quarter that includes raw monitoring data and calculated ambient levels (24-hour concentrations and rolling averages) from the ambient monitoring stations maintained pursuant to Condition XIII.D.1, to the extent that the Permittee has begun ambient monitoring pursuant to the Dust Plan. The Permittee may submit these quarterly reports electronically to the email address identified by EPA.

[CD CV-15-02206-PHX-DLR App B 36.A]

ATTACHMENT "C": SPECIFIC CONDITIONS- CONCENTRATOR

**AIR QUALITY CONTROL PERMIT NO. 39948
FOR
ASARCO LLC-HAYDEN OPERATIONS**

I. TRACK HOPPER UNLOADING OPERATIONS

A. Applicability.

This Section applies to the emission units identified in Attachment "I" as subject to Section I.

B. Particulate Matter and Opacity

1. Emission Limitations and Standards

a. The Permittee shall not cause to be emitted particulate matter from Ducon wet scrubber 7 in excess of 0.05 grams per dry standard cubic meter (g/dscm).

[CD CV-15-02206-PHX-DLR 26.b.i]

b. The Permittee shall not cause to be discharged into the atmosphere from an affected facility that exhibits an opacity greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-702.B]

2. Air Pollution Controls Requirement

The Permittee shall, to the extent practical, operate and maintain *wet scrubber 7 in accordance with good air pollution control practices for minimizing particulate matter emissions.*

[A.A.C. R18-2-306.A.3.c and 331.A.3.e]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Reporting and Recordkeeping Requirements

a. The Permittee shall record the daily process rate and hours of operation of all material handling facilities.

[A.A.C. R18-2-721.F]

b. *The Permittee shall install, calibrate*, operate and maintain *continuous monitoring devices to measure the change in gas pressure (accurate to +/- 1 water pressure) across each scrubber and a continuous monitoring device to measure the liquid flow rate (accurate to +/- 5% of design) for the scrubber*.

[CD CV-15-02206-PHX-DLR 26.b.ii, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. The wet scrubber shall be operated such that the hourly (block) average pressure drop of the gas stream across the scrubber and the hourly (block) average scrubber liquid flow rate is within the range established for each parameter during the most recent performance test. These values shall be recorded and stored in an electronic data storage system that has an associated alarm system that will be triggered when values are outside of the range established for each parameter. The alarm system shall include visual indicators displayed in a control room that is staffed on a twenty-four (24) hour basis.

[CD CV-15-02206-PHX-DLR 26.b.iii]

d. The wet scrubber shall be visually inspected at least once per shift to detect any visual signs of operational problems.

[CD CV-15-02206-PHX-DLR 26.b.iv]

e. When either the pressure drop or scrubber liquid flow rates are outside the established range for that parameter, the Permittee shall maintain record of such instances in the maintenance log or other record. Within one (1) hour of the first discovery that a scrubber's flow rate and/or pressure drop reading is outside the established range for that parameter, the Permittee shall initiate investigation. If necessary, the Permittee shall take corrective action as soon as practicable to adjust or repair the wet scrubber to minimize any increased PM emissions. The records shall include the dates, times of occurrence and repair, scrubber liquid flow rates or pressure drop at the time of issue, their cause, and an explanation of the corrective actions taken, if any. The Permittee shall also record any dates, times, and durations when a wet scrubber was not in service or was believed to be malfunctioning.

[CD CV-15-02206-PHX-DLR 26.b.v]

f. The Permittee shall conduct a bi-weekly (once in every two weeks) monitoring of visible emissions from the stack as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R 18-2-306.A.3.c]

4. Performance Test Requirements

a. The Permittee shall conduct annual performance tests on each wet scrubber for particulate matter in accordance with EPA Reference Method 5. For Method 5, Method 1 shall be used to select the sampling site and the number of traverse sampling points. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf), except that smaller sampling times or volumes, when necessitated by process variables or other factors, may be approved by the Director. The probe and filter holder heating systems in the sampling train shall be set to provide a gas temperature no greater than 160°C. (320°F.).

[CD CV-15-02206-PHX-DLR 26.b.i, A.A.C. R18-2-721.H.1 and 2 & 312.B]

b. The Permittee shall use the monitoring devices required in Condition I.B.3.b to determine the pressure loss of the gas stream through the scrubber and scrubbing liquid flow rate during each particulate matter test run and the average of the three determinations shall be computed to establish the range for pressure drop and scrubber liquid flow rate on the scrubber.

[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C. R18-2-721.F, 721.H.1 and CD CV-15-02206-PHX-DLR 26.b.

[A.A.C. R18-2-325]

II. SECONDARY CRUSHER AND FINE ORE STORAGE AREAS

A. Affected Facilities subject to Standards of Performance for Existing Nonferrous Metals Industry Sources.

1. Applicability

This Subsection applies to the emission units constructed on or before August 24, 1982, and identified in Attachment "I" as subject to Subsection II.A.

2. Emission Limitations and Standards

a. The Permittee shall not cause to be discharged into the atmosphere from wet scrubbers 3, 6, 9 and 10 emissions that contain particulate matter in excess of 0.05 grams per dry standard cubic meter (g/dscm).

[CD CV-15-02206-PHX-DLR 26.b.i]

b. The Permittee shall not cause to be discharged into the atmosphere from an affected facility opacity exhibiting greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-702.B]

3. Air Pollution Controls Requirements

The Permittee shall, to the extent practicable, operate and maintain *the Ducon wet scrubbers 3, 6, 9 and 10 in accordance with good air pollution control practices for minimizing particulate matter emissions*.

[A.A.C. R18-2-306.A.3.c and 331.A.3.e]
[Material permit conditions are indicated by underline and italics]

4. Monitoring, Reporting and Recordkeeping Requirements

a. The Permittee shall record the daily process rate and hours of operation of all material handling facilities.

[A.A.C. R18-2-721.F]

b. *The Permittee shall install, calibrate*, operate and maintain *continuous monitoring devices to measure the change in gas pressure (accurate to +/- 1 water pressure) across each scrubber and a continuous monitoring device to measure the liquid flow rate (accurate to +/- 5% of design) for the scrubber.*

[CD CV-15-02206-PHX-DLR 26.b.ii, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. The wet scrubber shall be operated such that the hourly (block) average pressure drop of the gas stream across the scrubber and the hourly (block) average scrubber liquid flow rate is within the range established for each parameter during the most recent performance test. These values shall be recorded and stored in an electronic data storage system that has an associated alarm system that will be triggered when values are outside of the range established for each parameter. The alarm system shall include visual indicators displayed in a control room that is staffed on a twenty-four (24) hour basis.

[CD CV-15-02206-PHX-DLR 26.b.iii]

d. Each wet scrubber shall be visually inspected at least once per shift to detect any visual signs of operational problems.

[CD CV-15-02206-PHX-DLR 26.b.iv]

e. When either the pressure drop or scrubber liquid flow rates are outside the established range for that parameter, the Permittee shall maintain record of such instances in the maintenance log or other record. Within one (1) hour of the first discovery that a scrubber's flow rate and/or pressure drop reading is outside the established range for that parameter, the Permittee shall initiate investigation. If necessary, the Permittee shall take corrective action as soon as practicable to adjust or repair the wet scrubber to minimize any increased PM emissions. The records shall include the dates, times of occurrence and repair, scrubber liquid flow rates or pressure drop at the time of issue, their cause, and an explanation of the corrective actions taken, if any. The Permittee shall also record any dates, times, and durations when a wet scrubber was not in service or was believed to be malfunctioning.

[CD CV-15-02206-PHX-DLR Section IV Item 26.b.v]

f. The Permittee shall conduct a bi-weekly (once in every two weeks) monitoring of visible emissions from the stacks as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R 18-2-306.A.3.c]

5. Performance Test Requirements

a. The Permittee shall conduct annual performance tests on each wet scrubber for particulate matter in accordance with EPA Reference Method 5. For Method 5, Method 1 shall be used to select the sampling site and the number of traverse sampling points. The sampling time for each run shall be at least 60 minutes and the minimum sampling volume shall be 0.85 dscm (30 dscf), except that smaller sampling times or volumes, when necessitated by process variables or other factors, may be approved by the Director. The probe and filter holder heating systems in the sampling train shall be set to provide a gas temperature no greater than 160°C. (320°F.).

[CD CV-15-02206-PHX-DLR 26.b.i, A.A.C. R18-2-721.H.1 and 2 & 312.B]

b. The Permittee shall use the monitoring devices required in Conditions II.A.4.b to determine the pressure loss of the gas stream through the scrubber and scrubbing liquid flow rate during each particulate matter test run and the average of the three determinations shall be computed to determine the operating parameter for each scrubber.

[A.A.C. R18-2-306.A.3.c and –306.A.4]

6. Permit Shield

Compliance with the conditions of this Subsection shall be deemed compliance with A.A.C. R18-2-721.F, 721.H.1 and CD CV-15-02206-PHX-DLR 26.b.

[A.A.C. R18-2-325]

B. Affected facilities Subject to New Source Performance Standards for Metallic Mineral Processing Plants.

1. Applicability

This Subsection applies to the emission units constructed after August 24, 1982, and identified in Attachment "I" as subject to Subsection II.B.

2. Emission Limitations and Standards

a. The Permittee shall not cause to be discharged into the atmosphere from wet scrubbers 1, 2, 4, 5 and 8 emissions that contain particulate matter in excess of 0.05 grams per dry standard cubic meter (g/dscm).

[40 CFR §60.382(a)(1), CD CV-15-02206-PHX-DLR 26.b.i]

b. *The Permittee shall not cause to be discharged into the atmosphere from an affected facility any process fugitive emissions that exhibit greater than 10 percent opacity*.

[40 CFR §60.382(b) and A.A.C. R18-2-331.A.3.f]
[Material permit conditions are indicated by underline and italics]

3. Air Pollution Control Requirements

The Permittee shall, to the extent practicable, maintain and *operate wet scrubbers 1, 2, 4, 5 and 8 in accordance with good air pollution control practices for minimizing particulate matter emissions*.

[40 CFR §60.11(d) and A.A.C. R18-2-331.a.3.e]
[Material permit conditions are indicated by underline and italics]

4. Monitoring, Reporting and Recordkeeping Requirements

a. *The Permittee shall install, calibrate*, operate and maintain *continuous monitoring devices to measure the change in gas pressure (accurate to +/- 1 water pressure) across each scrubber and a continuous monitoring device to measure the liquid flow rate (accurate to +/- 5% of design) for the scrubber*.

[40 CFR §60.384(a), (b), CD CV-15-02206-PHX-DLR 26.b.ii and A.A.C. R18-2-331-A.3.c]
[Material permit conditions are indicated by underline and italics]

b. The wet scrubber shall be operated such that the hourly (block) average pressure drop of the gas stream across the scrubber and the hourly (block) average scrubber liquid flow rate is within the range established for each parameter during the most recent performance test. These values shall be recorded and stored in an electronic data storage system that has an associated alarm system that will be triggered when values are outside of the range established for each parameter. The alarm system shall include visual indicators displayed in a control room that is staffed on a twenty-four (24) hour basis.

[CD CV-15-02206-PHX-DLR 26.b.iii]

c. Each wet scrubber shall be visually inspected at least once per shift to detect any visual signs of operational problems.

[CD CV-15-02206-PHX-DLR 26.b.iv]

d. When either the pressure drop or scrubber liquid flow rates are outside the established range for that parameter, the Permittee shall maintain record of such instances in the maintenance log or other record. Within one (1) hour of the first discovery that a scrubber's flow rate and/or pressure drop reading is outside the established range for that parameter, the Permittee shall initiate investigation. If necessary, the Permittee shall take corrective action as soon as practicable to adjust or repair the wet scrubber to minimize any increased PM emissions. The records shall include the dates, times of occurrence and repair, scrubber liquid flow rates or pressure drop at the time of issue, their cause, and an explanation of the corrective actions taken, if any. The Permittee shall also record any dates, times, and durations when a wet scrubber was not in service or was believed to be malfunctioning.

[CD CV-15-02206-PHX-DLR 26.b.v]

e. The Permittee shall submit semiannual reports to the Director of occurrences when the measurements of the scrubber pressure loss (or gain) or liquid flow rate differ by more than ±30 percent from the average obtained during the most recent performance test.

f. The Permittee shall conduct a bi-weekly (once in every two weeks) monitoring of visible emissions from the stacks as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R 18-2-306.A.3.c]

5. Performance Tests

a. The Permittee shall conduct annual performance test for particulate matter on scrubbers 1, 2, 4, 5 and 8. EPA Reference Method 5 or 17 shall be used to conduct this test. The sampling probe and filter holder of Method 5 may be operated without heaters if the gas stream being sampled is at ambient temperature. For gas streams above ambient temperature, the Method 5 sampling train shall be operated with a probe and filter temperature slightly above the effluent temperature (up to a maximum filter temperature of 121°C (250°F)) in order to prevent water condensation on the filter.

[40 CFR §60.386(b)(1), CD CV-15-02206-PHX-DLR 26.b.i, A.A.C. R18-2-312]

b. The Permittee shall use the monitoring devices required in Conditions II.B.4.a to determine the pressure loss of the gas stream through the scrubber and scrubbing liquid flow rate during each particulate matter test run and the average of the three determinations shall be computed to determine the operating parameters for each scrubber..

[40 CFR §60.386(c) and A.A.C. R18-2-312]

6. Permit Shield

Compliance with the conditions of this Subsection shall be deemed compliance with 40 CFR §60.382(a)(1), 60.382(a)(2), 60.382(b), 60.384(a), 60.384(b), 60.386(b)(1), 60.386(b)(2), and 60.386(c) and CD CV-15-02206-PHX-DLR 26.b.

[A.A.C. R18-2-325]

C. Slag Processing Project Recordkeeping, Monitoring, and Reporting

1. For purposes of this Condition, “Slag Processing Project” means the changes authorized by Minor Permit Revision No. 90645. Provisions in Attachments “D” & “E” Section V, Slag Screening & Transport are independent of the “Slag Processing Project" operating scenario.

2. Before beginning actual construction of the Slag Processing Project, the Permittee shall document and maintain a record of the following information:

   a. A description of the Project;

   b. Identification of the emissions unit(s) with emissions of a regulated NSR pollutant that could be affected by the Project;

   c. A description of the applicability test used to determine that the Project is not a major modification for any regulated NSR pollutant, including the baseline actual emissions, the projected actual emissions, the amount of emissions excluded under R18-2-401(23)(b)(iv) of the definition of projected actual emissions, and an explanation for why such amount was excluded; and

   d. Any netting calculations, if applicable.

[A.A.C. R18-2-402.F.1]

3. The Permittee shall monitor the emissions of any regulated NSR pollutant that could increase as a result of the Project and that is emitted by any emissions unit identified in Condition II.C.2.b above; and calculate and maintain a record of the annual emissions, in tons per year on a calendar year basis, for a period of five years following resumption of regular operations after the Project changes, or for a period of 10 years following resumption of regular operations after the Project changes if the Project increases the design capacity or potential to emit of that regulated NSR pollutant at such emissions unit. For purposes of this Condition II.C.3, fugitive emissions (to the extent quantifiable) shall be monitored.

[A.A.C. R18-2-402.F.3]

4. The Permittee shall submit a report to the Director if for a calendar year the annual emissions, in tons per year, from the Project identified in Condition II.C.2 above exceed the sum of the baseline actual emissions, as documented and maintained under Condition II.C.2.c above, by a significant amount for that regulated NSR pollutant, and if the emissions differ from the preconstruction projection as documented and maintained under Condition II.C.2.c above. The Permittee shall submit the report to the Director within 60 days after the end of the calendar year. The report shall contain the following:

a. The name, address, and telephone number of the Permittee;

b. The annual emissions as calculated pursuant to Condition II.C.3 above; and

c. Any other information that the Permittee wishes to include in the report, such as an explanation as to why the emissions differ from the preconstruction projection.

[A.A.C. R18-2-402.F.4]

5. The Permittee shall make the information required to be documented and maintained under Condition II.C.2 and 3 above available for review upon request for inspection by the Department or the general public.

[A.A.C. R18-2-402.F.7]

III. COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

A. Applicability

Following emission sources have uncontrolled particulate matter emissions greater than 100 tons per year. These emission sources are controlled by Ducon wet scrubbers and are thus subject to CAM requirements.

[A.A.C. R18-2-306.A.3.b]

1. Track Hopper (Controlled by Scrubber #7)

2. #1 conveyor to screens to 3 standard cone crushers to #6 belt conveyor (Controlled by Scrubber #4)

3. #3 belt conveyor to belt conveyor #4 (Controlled by Scrubber #5)

B. Primary Indicators

The primary indicators of scrubber performance shall be as follows:

[40 CFR 64.3]

1. Scrubber liquid flow rate; and

2. Change in pressure of the gas stream through the scrubber.

C. Monitoring Approach

The Permittee shall record on a daily basis the measurements of both the change in the pressure of the gas stream across the scrubbers and the scrubbing liquid flow rate.

[40 CFR 64.3]

D. Excursion Determination

An excursion is defined as:

[40 CFR 64.6]

1. Any liquid flow rate that is outside of the ±30% range of the unit-specific values established during the most recent performance test that demonstrated compliance with the particulate matter emission limit for the each scrubber.

2. Any change in pressure of the gas stream through a scrubber that is outside of the ±30% range of the unit-specific values obtained in the most recent performance test that demonstrated compliance with the particulate matter emission limit for the each scrubber.

3. If an excursion is detected, then the Permittee shall initiate an investigation of the appropriate scrubber(s) within 24 hours of the first discovery of the excursion incident and take corrective action as soon as practicable to adjust or repair the scrubber(s) to minimize possible exceedances of the particulate standard.

E. In addition to above, the Permittee shall comply with all the applicable General Compliance Assurance Monitoring Requirements under Section IV of Attachment "B".

F. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 CFR Part 64.

[A.A.C. R18-2-325]

IV. LIME STORAGE AND HANDLING

A. Applicability

This Subsection applies to the emission units and identified in Attachment "I" as subject to Section IV.

B. Emission Limitations and Standards

1. Particulate Matter

The Permittee shall not cause, allow, or permit the discharge of particulate matter into the atmosphere from any process source in total quantities in excess of the amounts calculated by the following equations:

[A.A.CR18-2-730.A.1]

a. For process sources having a process rate of 30 tons per hour or less, the maximum allowable emission shall be determined by the following equation:

$E = 4.10P^{0.67}$

Where:

E= the maximum allowable particulate emissions rate in pounds-mass per hour

P = the process weight rate in tons-mass per hour.

b. For process sources having a process weight rate greater than 30 tons per hour, the maximum allowable emissions shall be determined by the following equation:

$E = 55.0P^{0.11}-40$

Where E and P are defined as indicated in Condition IV.B.1.a above.

2. Opacity

The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-702.B]

C. Air Pollution Control

<u>*The Permittee shall, to the extent practicable, operate*</u> and maintain <u>*the Lime Receiving and Transfer Dust Collector in accordance with good air pollution control practices for minimizing particulate matter emissions*</u>.

[A.A.C. R18-2-306.A.3.c, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

D. Monitoring, Reporting, and Recordkeeping Requirements

The Permittee shall conduct bi-weekly monitoring of visible emissions from the lime receiving and transfer baghouse, when in operation, as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

E. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with the following applicable requirements as of the issuance date of this permit: A.A.C. R18-2-702.B and 730.

[A.A.C. R18-2-325]

ATTACHMENT "D": SMELTER (WITH 40 CFR 63 SUBPART EEEEEE)

I. APPLICABILITY

A. This Attachment shall be applicable until the effective date the Permittee accepts to incorporate NESHAP Subpart QQQ requirements. The Permittee shall communicate this effective date to the EPA and the Director in writing. After this effective date the Permittee shall comply with the requirements in the Attachment "E".

B. The Permittee shall complete CRP no later than December 1, 2018.

[CD CV-15-02206-PHX-DLR 8.a]

C. The Converter Retrofit Project shall consist of the following improvements:

[CD CV-15-02206-PHX-DLR 6.j]

1. The installation of improved primary and secondary hooding systems,

2. The installation of new tertiary hooding systems

3. The replacement of the five (5) existing Peirce-Smith converters with three (3) new Peirce-Smith converters of increased size (approximately 15 feet by 35 feet); and

4. The increase in the size of ladles used for matte transfer to a minimum of two hundred eighty (280) cubic feet.

II. GENERAL FACILITYWIDE REQUIREMENTS FROM 40 CFR 63 SUBPART EEEEEE

A. 40 CFR 63 Subpart EEEEEE General Requirements

The Permittee shall comply with the requirements of the General Provisions (40 CFR part 63, subpart A) as specified in Table 1 to 40 CFR 63 Subpart EEEEEE.

[40 CFR 63.11150(a)]

B. O & M Requirements

[40 CFR 63.11148(f)]

1. At all times, including periods of startup, shutdown, and malfunction, the Permittee shall to the extent practicable, maintain and operate any affected source, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

2. All pollution control equipment shall be installed, maintained, and operated properly. Instructions from the vendor or established maintenance practices that maximize pollution control must be followed. All necessary equipment control and operating devices, such as pressure gauges, amp meters, volt meters, flow rate indicators, temperature gauges, continuous emissions monitor, etc., shall be installed, and operated properly, and easily accessible to compliance inspectors. A copy of all manufacturers' operating instructions for pollution control equipment

and pollution emitting equipment shall be maintained at the facility. These instructions shall be available to all employees who operate the equipment and must be made available to the Director upon request. Maintenance records must be made available to the Director upon request.

3. The Permittee shall document and keep records of the activities performed to assure proper operation and maintenance of the air pollution control equipment and monitoring systems or devices.

4. Except as specified Condition II.B.5, in the event of an emergency situation, the Permittee shall comply with the requirements specified in Conditions. For the purpose of complying with this Condition II.B.4.a through II.B.4.c, an emergency situation is any situation arising from sudden and reasonably unforeseeable events beyond the control of the Permittee that requires immediate corrective action to restore normal operation and that causes the affected source to exceed applicable emission limitation under 40 CFR 63 Subpart EEEEEE due to unavoidable increases in emissions attributable to the emergency. An emergency must not include noncompliance to the extent it is caused by improperly designed equipment, lack of preventive maintenance, careless or improper operation, or operator error.

   a. During the period of the emergency the Permittee shall implement all reasonable steps to minimize levels of emissions that exceeded the emission standards or other applicable requirements in 40 CFR 63 Subpart EEEEEE.

   b. The Permittee shall document through signed contemporaneous logs or other relevant evidence that an emergency occurred and the Permittee can identify the probable cause, the facility was being operated properly at the time the emergency occurred, and the corrective actions taken to minimize emissions as required by Condition II.B.4.a.

   c. The Permittee shall submit a notice of the emergency to the permitting authority within two working days of the time when emission limitations were exceeded due to the emergency (or an alternate timeframe acceptable to the Director). This notice must contain a description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.

5. As an alternative to the requirements in Condition II.B.4, the Permittee shall comply with the startup, shutdown, and malfunction requirements in 40 CFR 63.6(e)(3).

C. Recordkeeping Requirements

[40 CFR 63.11148(g)]

1. The Permittee shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected source subject to 40 CFR 63 Subpart EEEEEE; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative.

2. The Permittee shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all

continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this section recorded in a permanent form suitable for inspection. The file must be retained for at least 5 years following the date of such measurements, maintenance, reports.

D. Notification Requirements

The notification of compliance status required by 40 CFR §63.9(h) shall include the following information:

[40 CFR 63.11150(c)]

1. If the Permittee conducts a new performance test to demonstrate initial compliance with the PM emissions limits in 40 CFR §63.11148(a)(1), (a)(3)(ii), and (a)(4)(iv), the notification of compliance status shall include the results of the performance test, including required monitoring data.

2. The notification of compliance status shall include this certification of compliance, signed by a responsible official, for the work practice standards in 40 CFR §63.11148(a)(2), and (a)(4)(iii): "This facility complies with the requirement to vent captured process gases to a gas cleaning system controlling PM and to a sulfuric acid plant in accordance with 40 CFR §63.11148(a)(2) and (a)(4)(iii)."

3. The notification of compliance status shall include this certification of compliance, signed by a responsible official, for the work practice standard in §63.11148(a)(3)(i): "This facility complies with the requirement to operate capture systems to collect gases and fumes released when copper matte or slag is tapped from the smelting vessel in accordance with §63.11148(a)(3)(i)."

4. The notification of compliance status shall include this certification of compliance, signed by a responsible official, for the work practice standard in §63.11148(a)(4): "This facility complies with the requirement to operate capture systems to collect gases and fumes released during batch copper converter operations in accordance with §63.11148(a)(4)."

E. Reporting Requirements

1. The Permittee shall prepare and submit to the Director an excess emissions and monitoring systems performance report and summary report every calendar quarter.

[40 CFR 63.11148(h)]

2. The summary report shall include the following information:

   a. The magnitude of excess emissions computed, any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emissions. The process operating time during the reporting period.

   b. Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.

c. The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments.

d. When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information must be stated in the report.

F. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 63.11148(f), (g) and (h), 63.11150(a) and 63.11150(c).

[A.A.C R18-2-325]

III. FACILITYWIDE LIMITATIONS FOR SMELTER

A. Operational Limitations

1. *Unless otherwise specified in this Attachment, the Permittee shall only use natural gas fuel for operation of the flash furnace burners, converters, concentrate dryers, and anode furnaces, except for natural gas curtailment periods when the natural gas is not available. During the curtailment periods, the Permittee shall be allowed to use low sulfur fuel as emergency backup to fire the concentrate dryers and anode furnaces*. For the purpose of this Condition, the curtailment periods shall not include durations when the natural gas market price is considered high for any reason.

[Condition I.E of Operating Permit No. 1000042, A.A.C. R18-2-331.A.3.a]
[Material permit conditions are indicated by italics and underline]

2. The Permittee shall complete CRP no later than December 1, 2018.

[CD CV-15-02206-PHX-DLR 8.a]

3. The Converter Retrofit Project shall constitute of the following improvements:

[CD CV-15-02206-PHX-DLR 6.j]

a. The installation of improved primary and secondary hooding systems,

b. The installation of new tertiary hooding systems, and

c. The replacement of the five (5) existing Peirce-Smith converters with three (3) new Peirce-Smith converters of increased size (approximately 15 feet by 35 feet),

d. The increase in the size of ladles used for matte transfer to a minimum of two hundred eighty (280) cubic feet;

B. Feed Limitations

1. Throughput Restrictions

The Permittee shall limit the maximum feed rate of concentrate to 693,500 tons per year into the flash furnace, calculated as a 365-day rolling sum.

[Condition XVI.B.1 of Permit No. 60647, A.A.C. R18-2-306.01 and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

2. Monitoring, Recordkeeping, and Reporting Requirements

a. *No later than June 1, 2019, the Permittee shall install, calibrate*, maintain, and operate *a measurement system that will measure and record the weight, or other parameter from which weight can be derived, of the Copper-Bearing Feed charged to the smelting vessel on a daily basis (each 24-hour block encompassing a complete calendar day). The measurement system shall be capable of ascertaining the weight of the Copper-Bearing Feed with an accuracy of +/- two (2) percent. The measurement system shall be calibrated at a minimum once per month, or more frequently if recommended by the manufacturer*.

[CD CV-15-02206-PHX-DLR 24.a and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are identified by italics and underline]

b. At the end of each calendar day, the Permittee shall calculate and record the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel.

[CD CV-15-02206-PHX-DLR 24.c]

c. The Permittee shall log and maintain daily records of the amounts of concentrate feed to the flash furnace. At the end of each day, the Permittee shall update the 365-day rolling total of concentrate feed. These records shall be available to ADEQ upon request.

[A.A.C. R18-2-306.A.3.c]

d. The Permittee shall keep a monthly record of the total smelter charge and the weight percent (dry basis) of arsenic, antimony, lead and zinc contained in the charge. The analytical methods and procedures employed to determine the weight of the total smelter charge and the weight percent of arsenic, antimony, lead and zinc shall be approved by the Director and shall be accurate within plus or minus 10 percent.

[40 C.F.R. 60.165(a)]

3. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 C.F.R. 60.165(a), Condition XVI.B.1 of Permit No. 60647, and CD CV-15-02206-PHX-DLR 6.j, 8a, 24.a, and 24.c.

[A.A.C R18-2-325]

C. Capture Systems Requirements

1. The Permittee shall exhaust the process off gas from each smelting vessel to a control device according to the following requirements:

[40 CFR 63.11148(a)(2)]

a. During periods when copper ore concentrate feed is charged to and smelted to form molten copper matte and slag layers in the smelting vessel, the Permittee shall exhaust the process off gas from the smelting vessel to a gas cleaning system controlling PM and to a sulfuric acid plant prior to discharge to the atmosphere.

b. During periods when no copper ore concentrate feed is charged to the smelting vessel but the smelting vessel remains in operation to temporarily hold molten material in the vessel before resuming copper production, the Permittee shall exhaust the process off gas from the smelting vessel to an electrostatic precipitator or a baghouse prior to discharge to the atmosphere

2. *At all times when copper matte or slag is tapped from the smelting furnace, the Permittee shall operate a capture system that collects the gases and fumes released from the tapping port in use. The design and placement of this capture system shall be such that the tapping port opening, launder, and receiving vessel (e.g., ladle, slag pot) are positioned within the confines or influence of the capture system's ventilation draft during those times when the copper matte or slag is flowing from the tapping port opening.*

[40 CFR 63.11148(a)(3)(i)), CD CV-15-02206-PHX-DLR 19, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

3. *The Permittee shall operate a primary capture system that collects the process off gas vented when one or more batch copper converters are Blowing*. The capture system design shall include use of a primary hood that covers the entire mouth of each batch copper converter vessel when the copper converter is positioned for Blowing. The capture system may use multiple intake and duct segments through which the ventilation rates are controlled independently of each other.

[40 CFR 63.11148(a)(4)(i), A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

4. *The Permittee shall operate a secondary capture system that collects gases and fumes released from the batch copper converter when the converter mouth is rotated out partially or totally from within the confines or influence of the primary capture system's ventilation draft during charging, skimming, pouring, or holding.* The capture system design must use additional hoods (e.g., sliding secondary hoods, air curtain hoods) or other capture devices (e.g., building evacuation systems). The capture system may use multiple intake and duct segments through which the ventilation rates are controlled independently of each other, and individual duct segments may be connected to separate PM control devices.

[40 CFR 63.11148(a)(4)(ii), A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

5. The Permittee shall exhaust the process off gas captured by the primary capture system that is used to comply with Condition III.C.3 to a gas cleaning system controlling PM and to a sulfuric acid plant prior to discharge to the atmosphere.

[40 CFR 63.11148(a)(4)(iii)]

6. *At all times that a vessel is used for the production of copper matte, blister copper, or refined anode copper, the Permittee shall operate one or more capture systems to collect gases and fumes released from such production and convey each collected gas stream from the primary and secondary ventilation systems to a baghouse or other particulate matter control device*. The Permittee shall at all times, including periods of startup, shutdown, and/or malfunction, implement good air pollution control practices to minimize emissions from control devices, including capture systems and PM control devices.

[CD CV-15-02206-PHX-DLR 7 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

7. At all times material is being processed in the copper converter department, the Permittee shall operate a capture system that:

[CD CV-15-02206-PHX-DLR 8]

a. Collects the process off gas vented from each copper converter;

b. Includes the use of a primary hood that covers the entire mouth of the converter vessel when the copper converter is Blowing; and

c. Includes the use of a secondary hood at all times when each copper converter is Blowing or is engaged in secondary operations. All gases captured by a primary hood shall be routed to the acid plant.

8. All gases captured by the secondary hoods shall be routed to either the acid plant or the secondary baghouse. Upon installation of each improved hooding capture system, all gases captured by an improved secondary hood while that converter is Blowing shall be routed to the acid plant.

[CD CV-15-02206-PHX-DLR 8.c]

9. Upon installation, the tertiary hooding system shall be operated at all times that material is being processed in the copper converter department.

[CD CV-15-02206-PHX-DLR 8.d]

10. The Permittee shall identify monitoring parameters and limits that will ensure, to the maximum extent practicable, that each hooding system is consistently operated in a manner so as to maximize gas capture and minimize fugitive emissions.

[CD CV-15-02206-PHX-DLR 9]

11. No later than December 1, 2019, at all times that any hooding in the improved gas capture system is operational, the Permittee shall continuously comply with the operational parameters and limits in the Operation and Maintenance Plan required pursuant to Attachment "B", Condition III.C.1. Also, no later than December 1, 2019, the operating limits shall be as below unless and until an alternative parameter and/or limit is approved by EPA:

[CD CV-15-02206-PHX-DLR 9.a]

a. Primary Hooding

A minimum air infiltration ratio for a primary hood of 1:1 during all times of converter Blowing at the converter served by that hood, averaged over 24 converter Blowing hours and rolled hourly. The minimum air infiltration ratio shall be calculated by comparing:

(1) The measured volumetric flow rate in the ductwork leaving the primary hood less the volumetric flow rate of tuyere Blowing; and

(2) The measured volumetric flow rate of tuyere Blowing.

b. Secondary Hooding

(1) A minimum exhaust rate of 35,000 SCFM for a secondary hood during all times of converter Blowing at the converter served by that hood, averaged over 24 converter Blowing

hours and rolled hourly.

(2) A minimum exhaust rate of 133,000 SCFM for a secondary hood during all non-Blowing operations (including receiving matte and other charged materials, skimming slag, and casting copper) at the converter served by that hood, averaged over 24 converter non-Blowing operations hours and rolled hourly.

(3) A minimum negative pressure drop across the secondary hood when secondary hood doors are in the closed position equivalent to 0.03 millimeters of mercury (0.007 inches of water).

c. Tertiary Hooding

A minimum exhaust rate of 400,000 actual cubic feet per minute (ACFM) for the tertiary hooding during all times material is being processed in the copper converter department, averaged over 24 hours of converter department material processing and rolled hourly.

12. Capture System Monitoring Requirements

a. *No later than December 1, 2019, the Permittee shall install, calibrate*, maintain, and operate *a monitoring device that continuously records the volumetric flow rate or, upon approval by EPA, other parameter that has a direct relationship to volumetric flow for one or more hoods, at a representative point in the hooding system and in accordance with good engineering practices for each of the primary hoods, each of the secondary hoods, and the tertiary hood*.

[CD CV-15-02206-PHX-DLR 9.b and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

(1) Upon installation of each primary hood, the Permittee shall also install, calibrate, maintain, and operate a monitoring device that continuously records the volumetric flow rate of tuyere Blowing at that primary hood.

(2) All monitoring devices shall have an accuracy of plus or minus 10 percent over the normal process operating range and must be calibrated according to manufacturer's instructions.

(3) If the Permittee wishes to monitor and record a parameter other than volumetric flow rate at one or more of the monitoring locations, the Permittee must, no later than June 1, 2019, submit to EPA for approval a detailed proposal that includes the following:

(a) Identification of parameter(s) to be monitored in lieu of volumetric flow rate;

(b) Identification of where in the hooding system such monitor(s) would be placed and how such location will give appropriate and representative measurements in accordance with good engineering practices;

(c) a detailed explanation, including sample calculations, of how such parameter(s) has a direct relationship to volumetric flow rate in the hooding system and how such parameter(s) will allow the Permittee to have sufficient information to ensure proper operation in accordance with design at all times, including detecting any degraded hooding performance over time (i.e. decreased fan performance, buildup in the ducting, holes in the ducting, etc.); and

(d) Proposed limit(s), including sample calculations, for the selected parameter(s) that would replace a relevant limit set forth in Condition III.C.11 (Default Hooding Operational Parameters and Limits) above and a demonstration of how such limit(s) correlates to equivalent performance and operation of the relevant hooding.

(e) If EPA approves the Permittee's proposal, the proposed limit(s) shall replace the relevant volumetric flow rate limit specified in Condition III.C.11 and shall be enforceable thereunder.

b. No later than December 1, 2019, the Permittee may propose alternative limit(s) to replace a limit set forth in Condition III.C.11 above (or substituted pursuant Condition III.C.12.a(3) above). In any such proposal, the Permittee shall have the burden of demonstrating that each proposed alternative limit(s) will not lead to additional emissions and will not reduce the capture efficiency of the improved gas capture system, as compared to the emissions and efficiencies achieved or achievable by operation of the hooding systems in compliance with the limit to be replaced in Condition III.C.11. Such demonstration shall include a detailed description of the rationale(s) for the proposed alternative limit(s) as required in CD CV-15-02206-PHX-DLR 9.c. If EPA approves the Permittee's proposal, the proposed alternative limit(s) shall be considered to replace the relevant limit in Condition III.C.11 and shall be enforceable thereunder.

[CD CV-15-02206-PHX-DLR 9.c]

13. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 63.11148(a)(3) & (a)(4) and CD CV-15-02206-PHX-DLR 7, 8, 8.c, 8.d, 9 and 19.

[A.A.C R18-2-325]

D. PM and Opacity

1. Emission Limits

a. *Upon CRP startup, the Permittee shall not exceed the combined particulate matter emissions limit from the acid plant tail gas, secondary* *hood baghouse, vent gas baghouse and tertiary ventilation system gas streams of 197.3 tons per year (filterable only) on 12-month rolling total basis.*

[Condition XVI.C.2.a of SPR 60647, A.A.C. R18-2-306.02.A and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. No later than December 1, 2019, the Permittee shall comply with the following emission limits from any combination of stacks, vents, or other openings on furnaces, reactors, or other types of process vessels used for the production of anode copper from copper sulfide ore concentrates. Such process equipment shall include all processing steps from the copper concentrate dryers through the anode casting department, inclusive of those end points.

[CD CV-15-02206-PHX-DLR 24]

(1) At all times that the average rate of copper-bearing feed into the smelting flash furnace over a 2-day period (48-hour block encompassing 2 complete calendar days) is greater than or equal to twenty-five (25) tons per hour, including periods of startup, shutdown, and malfunction, the Permittee shall not discharge to the atmosphere exhaust gases that contain total PM in excess of 0.6 pounds per ton of Copper-Bearing Feed charged to the smelting vessel on a rolling 2-day average basis (each 48-hour block encompassing 2 complete calendar days) rolled daily (each 24 hours).

(2) At all other times, the Permittee shall not discharge to the atmosphere exhaust gases that contain total PM in excess of fifteen (15) pounds per hour, as determined on a daily average basis (each 24-hour block encompassing a complete calendar day), including periods of startup, shutdown, and malfunction.

c. No later than December 1, 2020, the Permittee may submit to EPA a request for an alternative emissions breakpoint to more closely match the actual emission profile. The proposed breakpoint in any such request shall not be greater than fifty (50) tons per hour, corresponding to an emission rate of thirty (30) pounds per hour as determined on a daily average basis. EPA may grant or deny the request in whole or in part, subject to Dispute Resolution.

[CD CV-15-02206-PHX-DLR 24.e]

d. No later than one hundred eighty (180) days after completion of the Converter Aisle Retrofit Project, the Permittee shall operate the gas capture systems such that any visible emissions exiting the roof of the building housing the copper converter department meet an opacity limit of four (4) percent based on EPA Method 9, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 12]

2. Air Pollution Control Requirements

a. *The Permittee shall operate the Inter-pass Absorption Tower and Final*

Absorption tower in the acid plant to control particulate matter emissions from the flash furnace, converters and converter secondary hood during Blowing operations.

[Condition XVI.C.2.b(1) of SPR 60647 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

b. *The Permittee shall operate* and maintain *a baghouse to minimize particulate emissions from the converter secondary hood capture system*.

[Condition XVI.C.2.b(2) of SPR 60647 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

c. *Upon startup of CRP the Permittee shall install, operate* and maintain a *vent gas baghouse to minimize particulate emissions from the flash furnace matte tapping and slag skimming operations*.

[Condition XVI.C.2.b(3) of SPR 60647 and A.A.C. R18-2-331.A.3.d and e]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping and Reporting Requirements

a. *The Permittee shall calibrate*, maintain, and continuously *operate the Inter-pass Absorption Tower and Final Absorption Tower acid flow meters in accordance with the manufacturer's specifications*. The system shall record block hourly values of the acid flows.

[Condition XVI.C.2.f(1) of SPR 60647 and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

b. *The Permittee shall install, calibrate*, maintain, and operate *bag leak detection systems (BLDS) for the secondary hood baghouse and vent gas baghouse in accordance with Section X of this Attachment*.

[Condition XVI.C.2.f(2) of SPR 60647, CD CV-15-02206-PHX-DLR 26.a and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. *The Permittee shall install, calibrate*, operate and maintain *PM CEMS on the following streams in accordance with the requirements in Condition IX.B of this Attachment*:

(1) R&R Cottrell ESP Replacement Baghouse Gas Stream

(2) Acid Plant Tail Gas Stream

(3) Secondary Hood Baghouse Gas Stream

(4) Tertiary Hooding Gas Stream

(5) Anode Furnaces Baghouse Gas Stream

d. Opacity Monitoring for Buildings

Except as provided in Condition III.D.3.d(3) below, within six (6) months of completion of the initial Fugitive Emissions Study, the Permittee shall install and continuously operate *three (3) long-path optical density/opacity monitors on the outside of the building housing the flash furnace, converters, and anode furnaces*. The optical density/opacity monitors shall be designed and installed to maximally cover areas where fugitive emissions may exit the building, as identified during the initial

Fugitive Emissions Study, and each optical density/opacity monitor shall be calibrated to measure opacity from approximately 0 to 10% over the full range of the instrument.

[CD CV-15-02206-PHX-DLR 23 and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

(1) For any instance of measurable opacity greater than 4% over a six (6) minute period exiting the building housing the flash furnace, converters, and anode furnaces, the Permittee shall take one or more corrective actions within thirty (30) minutes of the commencement of the event to abate the opacity, including but not limited to the following:

(a) Increasing secondary and tertiary hood exhaust rates,

(b) Closing primary and secondary hood doors, and/or

(c) Making adjustments to materials handling operations within the building. The Permittee shall document all measures taken to address the opacity event as well as the final resolution of the problem.

(2) If the corrective actions pursued by the Permittee fail to control the opacity event within one (1) hour of the start of the event, the Permittee shall perform a root cause analysis within seventy-two (72) hours after any instance of measurable opacity greater than 4% over a six (6) minute period, which would identify the cause of the visible emissions and 1) propose permanent operational adjustments or other corrective actions to prevent recurrence as a result of the identified cause; and/or 2) provide the EPA with an analysis of why a specific operational process or step leads to fugitive emissions of limited duration and opacity that cannot reasonably be eliminated or sufficiently controlled to prevent visible emissions. the Permittee shall submit to EPA for review and approval the root cause analysis, along with the recommended corrective actions and/or request for approval of a limited duration for allowed visible emissions associated with a particular operational activity, and the Permittee's documentation of all measures taken to address the emissions at the time of the event, as described in Condition III.D.3.d(1). In no case shall such submittal seek allowance of fugitive emissions with opacity of greater than 5% over a fifteen (15) minute period, as measured by an optical density/opacity monitor. Once approved by EPA, any new operational adjustments or other corrective actions shall become permanent and ongoing enforceable requirements of this Consent Decree.

(3) After at least two (2) years of operation of the long-path optical density/opacity monitors, the Permittee may attempt to demonstrate that it is infeasible or overly burdensome in relation to the benefits to continue operating one or more of

the long-path optical density/opacity monitors. As part of such demonstration, the Permittee shall submit to EPA an analysis of operation and maintenance of such monitor to-date, to include a summary of measurements triggering corrective actions, corrective actions taken, and all root cause analyses performed in response to monitor readings. If EPA rejects the Permittee's demonstration that it is infeasible or overly burdensome in relation to the benefits to continue operating one or more of the long-path optical density/optical monitors, such conclusions are subject to Dispute Resolution pursuant to Section XIII of the CD. Operation of a long-path optical density/optical monitor shall be considered infeasible if (a) the monitor cannot be kept in working condition for sufficient periods of time to produce reliable, adequate, or useful measurements; or (b) recurring, chronic, or unusual equipment adjustment, servicing, or replacement needs cannot be resolved through reasonable expenditures of resources. If EPA determines that operation is infeasible or overly burdensome in relation to the benefits, the Permittee shall be entitled to discontinue operation of and remove the long-path optical density/optical monitor.

4. Performance Test Requirements

a. Performance Test for Particulate Matter

[Condition XVI.C.2.c of SPR 60647, A.A.C. R18-2-312 and A.A.C. R18-2-306.A.3.c]

(1) No later than 180 days after CRP startup, the Permittee shall conduct or cause to be conducted, an initial performance test on the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams for particulate matter emissions. Subsequent performance tests shall be conducted annually. EPA Reference Method 5 in 40 CFR 60 Appendix A shall be used to determine particulate matter emissions.

(2) In addition to EPA Reference Method 5 in 40 CFR 60 Appendix A to determine the emissions of PM, the Permittee shall use Reference Method 201 or 201A and Method 202 specified in 40 CFR 51, Appendix M to determine emissions of PM_{10} and $PM_{2.5}$.

b. Performance Test for Roofline Opacity

(1) Within sixty (60) days after completion of the Converter Aisle Retrofit Project, the Permittee shall prepare, and submit to EPA for review and approval a written performance test plan for determining compliance with this opacity standard in Condition III.D.1.d. The test plan shall contain all information required under 40 C.F.R. § 63.1450(c). Within ninety (90) days after approval from EPA, the Permittee shall conduct a performance test in accordance with 40 C.F.R. § 63.1450(c) to determine compliance with this opacity

standard. In addition to viewing the building roof monitor sections, each visible emission observer shall also make note of the opacity of any visible plumes exiting the roofline from the sides or any other outlet. In accordance with 40 C.F.R. § 63.1450(c)(4)(ii), in situations when it is possible for an observer to distinguish two or more visible emission plumes from the building roof monitor sections or roof exhaust fan outlets, the observer must identify, to the extent feasible, the plume having the highest opacity and record his or her opacity reading for that plume as the opacity value for the I5-second interval.

[CD CV-15-02206-PHX-DLR 12.a]

(2) The Permittee shall conduct additional performance tests at least once each three hundred sixty-five (365) day period following the initial performance test. Any credible evidence, including opacity testing performed in accordance with EPA Method 9 (notwithstanding its consistency with Subpart QQQ test procedures), evidence collected by means specified in 40 § C.F.R. 63.1450(c), and evidence collected by means other than those specified in 40 § C.F.R. 63.1450(c), can be used to demonstrate noncompliance with the 4% roofline opacity.

[CD CV-15-02206-PHX-DLR 12.b]

(3) For each performance test conducted to demonstrate compliance with an opacity limit under Condition III.D.1.d, the Permittee shall keep the following records:

[A.A.C R18-2-306.A.3.c]

(a) Dates and time intervals of all opacity observation period segments;

(b) Description of overall smelter operating conditions during each observation period. Identify, if any, the smelter copper production process equipment that was out-of-service during the performance test and explain why this equipment was not in operation;

(c) Name, affiliation, and copy of current visible emission reading certification for each visible emission observer participating in performance test;

(d) Name, title, and affiliation for each indoor process monitor participating in the performance test;

(e) Copies of all visible emission observer opacity field data sheets;

(f) Copies of all indoor process monitor operating log sheets;

(g) Copies of all data summary sheets used for data reduction;

(h) Copy of calculation sheets of the average opacity value used to demonstrate compliance with the opacity limit; and

(i) Certify in the performance test report that during all observation period segments, the copper converter department capture system was operating at the values or settings established in the capture system operation and maintenance plan.

5. Compliance Requirements

a. Compliance with PM emission limit in Condition III.D.1.a.

[Condition XVI.C.2.d of SPR 60647]

(1) The Permittee shall calculate PM emissions in pounds per hour in the acid plant tail gas, secondary hood baghouse, vent gas baghouse or and tertiary ventilation streams based on the most recent performance test in accordance with Condition III.D.4.a.

(2) The Permittee shall maintain records of hours of operation of the following: acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams. If any emission unit associated with a stream operates during a calendar hour, it will constitute an operating hour. If no emission unit associated with a stream operates during a calendar hour, it will not constitute an operating hour.

(3) The Permittee shall calculate and record monthly emissions for the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams for PM based on the hourly emissions calculated in Condition III.D.5.a(1) and the monthly operating hours for each stream recorded in Condition III.D.5.a(2).

(4) No later than the fifth working day of the following month, the Permittee shall calculate and record rolling 12-month total of combined PM emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in Condition III.D.5.a(3) to demonstrate compliance with the emission limit in ConditionIII.D.1.a.

b. Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emissions

[Condition XVI.C.2.e of SPR 60647]

(1) The Permittee shall calculate hourly PM, PM_{10} and $PM_{2.5}$ emissions (Filterable + Condensable) from each stream based on most recent performance test in accordance with Condition III.D.4.a(2).

(2) The Permittee shall calculate and record monthly emissions for the acid plant tail gas, secondary hood baghouse, vent gas

baghouse and tertiary ventilation streams for PM, PM_{10} and $PM_{2.5}$ based on the hourly emissions calculated in Condition III.D.5.b(1) and the monthly operating hours for each stream recorded in Condition III.D.5.a(2).

(3) No later than the fifth working day of the following month, the Permittee shall calculate and record rolling 12-month total of combined PM, PM_{10} and $PM_{2.5}$ emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in Condition III.D.5.b(2)

(4) Based on the Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emissions data for 3 years, the Permittee shall apply for a permit revision no later than 180 days after completion of the third performance test pursuant to Condition III.D.4.a(2) for incorporation of emission limits for Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emission limits.

c. Compliance with Total PM Limit in Condition III.D.1.b(1)

(1) At the end of each calendar day, the Permittee shall calculate and record the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel.

[CD CV-15-02206-PHX-DLR 24.c]

(2) If the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel is greater than or equal to twenty-five (25) tons per hour, then the Permittee shall calculate and record the 2-day average pounds of total PM per ton of Copper-Bearing Feed charged to the smelting vessel for the preceding 48-hour period.

[CD CV-15-02206-PHX-DLR 24.c]

(3) If the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel is less than twenty-five (25) tons per hour, then the Permittee shall calculate and record the daily average pounds of total PM per hour for the preceding 24-hour period.

[CD CV-15-02206-PHX-DLR 24.c]

(4) Emission Calculation Procedure

[CD CV-15-02206-PHX-DLR 24.b]

(a) PM emissions from the acid plant, Secondary Baghouse, R&R Cottrell ESP Replacement Baghouse, and Anode Furnace Baghouse shall be calculated based on data collected from the PM CEMS.

(b) PM emissions from the Tertiary Hood Exhaust and any other emission point receiving off-gas from process equipment subject to the emissions limits shall be calculated based on data collected from a certified PM CEMS installed to measure such gas stream or, if no certified PM CEMS exists for a gas stream, engineering estimates based on one or more of the following, as available: stack test data, CPMS data, COMS data, and other process data.

(c) The Permittee shall determine and record the 2-day (each 48- hour block encompassing 2 complete calendar days) or, if necessary, daily (24-hour block encompassing a complete calendar day) value of PM emissions for each of these gas streams.

(d) The sum of those values shall be added to an estimate of 48-hour or, if necessary, daily fugitive PM emissions from all process equipment subject to the emission limits in Condition III.D.1.b(1), to include all fugitive emissions from the building(s) housing the flash furnace, copper converter department, and anode furnace and production operations.

(e) In the event that one or more certified PM CEMS on a relevant gas stream is malfunctioning for a portion or the entirety of any day, the Permittee shall use the eighth highest daily value of PM emissions that has been recorded at that CEMS in the previous six (6) months.

(f) Daily and 48-hour fugitive PM emissions shall be calculated based upon emission factors established during the most recent Fugitive Emissions Study. Prior to completion of the initial Fugitive Emissions Study required under CD, estimates from the 1994/1995 Fugitive Emissions Study shall be used for purposes of this calculation.

d. The Permittee shall maintain records of the calculations of pounds per ton, and pounds per hour rates and all supporting information and data.

[CD CV-15-02206-PHX-DLR 24.d]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Conditions XVI.C.2.a, b, c, d, e and f of SPR 60647, and CD CV-15-02206-PHX-DLR 12, 12.b, 23, 24.b, 24.c, 24.d, 24.e and 26.a.

[A.A.C R18-2-325]

E. Sulfur Dioxide (SO_2)

Note: *The Permittee shall comply with the requirements under Attachment "F" in addition to requirements under this Subsection until A.A.C, R18-2-715.I is approved into SIP by EPA. All the requirements from A.A.C. R18-2-B1302 (Limits on SO2 Emissions from the Hayden Smelter) are State Enforceable only until A.A.C. R18-2-B1302 is approved into Arizona SIP by EPA.*

1. Definitions

[A.A.C. R18-2-B1302.B]

a. “Operating day” means any calendar day in which any of the following occurs:

(1) Concentrate is smelted in the smelting furnace;

(2) Copper or sulfur bearing materials are processed in the converters;

(3) Blister or scrap copper is processed in the anode furnaces;

(4) Molten metal, including slag, matte or blister copper, is transferred between vessels; or

(5) Molten metal is cast into anodes or other intermediate or final products.

b. “Out of control period” means the time that begins with the completion of the fifth, consecutive, daily calibration drift check with a calibration drift in excess of two times the allowable limit, or the time corresponding to the completion of the daily calibration drift check preceding the daily calibration drift check that results in a calibration drift in excess of four times the allowable limit, and the time that ends with the completion of the calibration check following corrective action that results in the calibration drifts at both the zero (or low-level) and high level measurement points being within the corresponding allowable calibration drift limit.

c. "Continuous emissions monitoring system" or "CEMS" means the total equipment, required under the emission monitoring provisions in this Chapter, used to sample, condition (if applicable), analyze, and to provide, on a continuous basis, a permanent record of emissions.

2. Emission Limits

a. *The combined SO_2 emissions from exit of the acid plant tail gas, secondary hood baghouse, vent gas baghouse and the tertiary ventilation system shall not exceed 22,000 tons per year on a 365-day rolling total basis*.

[Conditions XVI.C.1.a of Permit 60647, A.A.C. R18-2-306.02.A and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. *No later than July 1, 2018, emissions from the Main Stack shall not exceed 1069.1 pounds per hour on a 14-operating day average unless 1,518 pounds or less is emitted during each hour of the 14-operating day period*.

[A.A.C. R18-2-B1302.C.1 and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

c. The Permittee shall not cause to be discharged into the atmosphere from any affected unit under 40 CFR 60, subpart P any gases which contain sulfur dioxide in excess of 0.065 percent by volume (the limit set forth in 40 CFR § 60.163(a)) (as in effect on July 1, 2016 and no later editions).

[40 CFR 60.163(a), A.A.C. R18-2-B1302.C.2]

3. Air Pollution Control Requirements

At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and *operate smelter processes and associated emission control and/or control equipment in a manner consistent with good air pollution control practices for minimizing SO_2 emissions to the levels required Condition III.E.2.b.* Determination of whether acceptable operating and maintenance procedures are being used will be based on all information available to the Director and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, and inspection of the relevant equipment.

[A.A.C. R18-2-B1302.D.1 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are identified by italics and underline]

4. Monitoring Requirements

a. *Except during periods of systems breakdown, repairs, maintenance, out-of-control periods, calibration checks, and zero and span adjustments, the Permittee shall install, calibrate*, maintain, and operate *CEMS for continuously monitoring and recording SO_2 concentrations and stack gas volumetric flow rates at the following locations accordance with the requirements in Condition IX.C of this Attachment.*

[A.A.C. R18-2-1302.E1 and 2]

(1) The exit of the acid plant;

(2) The exit of the secondary hood particulate control device after the High Surface Area (HSA) lime injection system;

(3) The exit of the flash furnace particulate control device after the HSA lime injection system;

(4) The tertiary ventilation system prior to mixing with any other exhaust streams; and

(5) The anode furnace baghouse stack prior to mixing with any other exhaust streams.

b. If the Permittee can demonstrate to the Director that measurement of stack gas volumetric flow rate in the outlet of any particular SO_2 control equipment would yield inaccurate results or would be technologically infeasible, the Director may allow measurement of the flow rate at an alternative sampling point.

[A.A.C. R18-2-1302.E.4]

c. The Permittee may petition the Department to substitute annual stack testing for the tertiary ventilation or the anode furnace baghouse stack CEMS if the Permittee demonstrates, for a period of two years, that either CEMS contribute(s) less than five percent individually of the total sulfur dioxide emissions. The Department must determine the demonstration adequate to approve the petition. Annual stack testing shall use EPA Methods 1, 4, and 6C in 40 CFR 60 Appendix A or an alternate method approved by the Department and EPA Region IX. Annual stack testing shall commence no later than the one year after the date the continuous emission monitoring system was removed. The Permittee shall submit a test protocol to the Department at least 30 days in advance of testing. The protocol shall provide for three or more 24-hour runs unless the Permittee justifies a different period and the Department approves such different period. Reports of testing shall be submitted to the Department no later than 60 days after testing or 30 days after receipt, whichever is later. The report shall provide an emissions rate, in the form of a pound per hour or pound per unit of production factor that shall be used in the compliance demonstration. Except as provided herein, the Permittee shall otherwise comply with A.A.C. R18-2-312 in conducting such testing.

[A.A.C. R18-2-1302.E.6]

5. Compliance Requirements

a. Compliance with Emission Limit in Condition III.E.2.a

(1) No later than 180 days after CRP startup, the Permittee shall demonstrate compliance with SO_2 emission limits in Condition III.E.2.a in accordance with following:

[Conditions XVI.C.1.a of Permit 60647, A.A.C. R18-2-306.A.3.c]

(a) The Permittee shall calculate and record daily total SO_2 emissions from acid plant tail gas, secondary hood baghouse, vent gas baghouse and the tertiary capture system streams based on CEMS.

(b) At the end of each day, the Permittee shall calculate and record daily and 365-day rolling total of SO_2 emissions from the acid plant tail gas, secondary hood baghouse vent gas baghouse and the tertiary ventilation system streams to demonstrate compliance with the emission limit in Condition III.E.2.a.

b. Compliance with Emission Limit in Condition III.E.2.b

For purposes of determining compliance the Permittee shall calculate emissions for each operating day as follows. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit

[A.A.C. R18-2-B1302.F.1 and 4]

(1) Sum the hourly pounds of SO_2 vented to each uncontrolled shutdown ventilation flue and through each monitoring point listed in Condition III.E.4.a for the current operating day and the preceding 13-operating days to calculate the total pounds of SO_2 emissions over the 14-operating day averaging period, as applicable.

(2) Divide the total amount of SO_2 emissions calculated from Condition III.E.5.b(1) by 336 to calculate the 14-operating day average SO_2 emissions.

(3) If the calculation in Condition III.E.5.b(1) exceeds 1069.1 pounds per hour, then the Permittee shall sum the hourly pounds of SO_2 vented to each uncontrolled shutdown ventilation flue and through each monitoring point listed in subsection (E)(1) for each hour of the current operating day and each hour of the preceding 13-operating days to ascertain if any hour exceeded 1,518 pounds per hour.

c. The Permittee shall demonstrate compliance with the limit in Condition III.E.2.c in accordance with the following. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit.

[A.A.C. R18-2-B1302.F.4 and 5]

(1) The Permittee shall utilize SO_2 CEMS to determine the SO_2 concentrations on a dry basis. The sampling time for each run shall be 6 hours. Six-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the four consecutive 6-hour periods of each operating day. Each six-hour average shall be determined as the arithmetic mean of the appropriate six contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system The monitoring system drift during the run may not exceed 2 percent of the span value.

[40 CFR 60.165(c) and 60.166(b)(2)]

(2) For the purpose of reports required under 40 CFR §60.7(c), periods of excess emissions that shall be reported are defined as all six-hour periods during which the average emissions of sulfur dioxide, as measured by the CEMS exceed the level of the standard. The Director will not consider emissions in excess of the level of the standard for less than or equal to 1.5 percent of the six-hour periods during the quarter as indicative of a potential violation of 40 CFR §60.11(d) provided the affected facility, including air pollution control equipment, is maintained and operated in a manner consistent with good air pollution control practice for minimizing emissions during these periods. Emissions in excess of the level of the standard during periods of startup, shutdown, and malfunction are not to be included within the 1.5 percent.

[40 CFR 60.165(d)]

6. Recordkeeping Requirements

[A.A.C. R18-2-B1302.G]

a. The Permittee shall maintain a record of each operation and maintenance plan required in Attachment "B".

b. The Permittee shall maintain the following records for at least five years:

(1) All measurements from the continuous monitoring system, including the date, place, and time of sampling or measurement; parameters sampled or measured; and results.

All measurements will be calculated daily.

(2) All records of quality assurance and quality control activities for emissions measuring systems.

(3) All records of calibration checks, adjustments, maintenance, and repairs conducted on the continuous monitoring systems; including records of all compliance calculations.

(4) All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining and casting emission units; any malfunction of the associated air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative or not operating correctly.

(5) All records of planned and unplanned shutdown ventilation flue utilization events and calculations used to determine emissions from shutdown ventilation flue utilization events if the Permittee chooses to use the alternative compliance determination method.

(6) All records of major maintenance activities and inspections conducted on emission units, capture system, air pollution control equipment, and CEMS, including those set forth in the operations and maintenance plan.

(7) All records of operating days and production records required for calculations.

(8) All records of fugitive emissions studies and study protocols conducted in accordance with A.A.C. R 18-2, Appendix 14.

(9) Records of reports and notifications required under Condition III.E.7.

7. Reporting Requirements

[A.A.C. R18-2-B1302.H]

a. The Permittee shall notify the Director in writing at least 30 days in advance of the start of relative accuracy test audit (RATA) procedures performed on the continuous monitoring systems.

b. Within 30 days after the end of each calendar quarter, the Permittee shall submit a data assessment report to the Director in accordance with 40 CFR Part 60, Appendix F for the continuous monitoring systems.

c. The Permittee shall submit an excess emissions and monitoring systems performance report or summary report form in accordance with 40 CFR § 60.7(c) to the Director quarterly for the SO2 CEMS. Excess emissions means any 14-operating day average as calculated in ConditionIII.E.5.b in excess of the emission limit in Condition III.E.2.b, any period in which the capture and control system was operating outside of its parameters specified in the capture system and control device operation and maintenance plan. For any 14-operating day period exceeding 1069.1 pounds per hour that the Permittee claims does not exceed the limit in Condition III.E.2.b because all hours in the operating period are below 1,518 pounds per hour, the Permittee shall submit the CEMS data for each hour during that period. All reports shall be postmarked by the 30th day following the end of each calendar quarter time period.

d. The Permittee shall provide the following to the Director:

(1) The Permittee shall notify the Director of commencement of construction of any equipment necessary to comply with the operational or emission limits.

(2) The Permittee shall submit semiannual progress reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for the preceding July-December period.

(3) The Permittee shall submit notification of initial startup of any such equipment within 15 business days of such startup.

8. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Conditions XVI.C.1.a and c of Permit 60647, A.A.C. R18-2-B1302, 40 CFR 60.163(a), 60.165 (b), (c) and 60.166(b)(2).

[A.A.C. R18-2-325]

F. Lead

Note*: Until A.A.C. R18-2-B1301 (Limits on lead Emissions from the Hayden Smelter) is approved by EPA, all the requirements from A.A.C. R18-2-B1301 in this Subsection are State Enforceable only.*

1. Applicability

a. The requirements under A.A.C. R18-2-B1301 shall become applicable on the earlier of July 1, 2018 or 180 days after completion of all project improvements authorized by Significant Permit Revision No. 60647.

b. The requirements under A.A.C. R18-2-B1301.01, except otherwise provided, shall become applicable on December 1, 2018.

[A.A.C. R18-2-B1301.01.A.2]

2. Definitions

[A.A.C. R18-2-B1301.B and B1301.01B]

a. "Anode furnace baghouse stack" means the dedicated stack that vents controlled off-gases from the anode furnaces to the Main Stack.

b. "Capture system" means the collection of components used to capture gases and fumes released from one or more emission units, and to convey the captured gases and fumes to one or more control devices or a stack. A capture system may include, but is not limited to, the following components as applicable to a given capture system design: duct intake devices, hoods, enclosures, ductwork, dampers, manifolds, plenums, and fans.

c. "Control device" means a piece of equipment used to clean and remove pollutants from gases and fumes released from one or more emission units that would otherwise be released to the atmosphere. Control devices may include, but are not limited to, baghouses, Electrostatic Precipitators (ESPs), and sulfuric acid plants.

d. "Main Stack" means the center and annular portions of the 1,000-foot stack, which vents controlled off-gases from the INCO flash furnace, the converters, and anode furnaces and also vents exhaust from the tertiary hoods.

e. "Smelting process-related fugitive lead emissions" means uncaptured and/or uncontrolled lead emissions that are released into the atmosphere from smelting copper in the INCO flash furnace, converters, and anode furnaces.

f. "Lead-bearing fugitive dust" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.

g. "Non-smelting process sources" means sources of leadbearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads..

3. Compliance Schedule

[A.A.C. R18-2-B1301.01.E.3]

a. Implementation of chemical dust suppression for unpaved roads -Within 30 days of Administrator approval of application intensity and schedules in Fugitive Dust Plan under CD CV-15-02206-PHX-DLR.

b. Implementation of wind fences for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate) - Within 120 days of Administrator approval of the Fugitive Dust Plan or the date of completion in the approved Fugitive Dust Plan, whichever is later.

c. Implementation of water sprays for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate) - Within 120 days of Administrator approval of the Fugitive Dust Plan or the date of completion in the approved Fugitive Dust Plan, whichever is later.

d. Implementation of new primary, secondary, and tertiary hooding systems for converter aisle for purposes of complying with requirements in R18-2-B1301 - July 1, 2018

e. Implementation of new ventilation system for matte tapping and slag skimming for flash furnace for purposes of complying with requirements in R18-2-B1301 - July 1, 2018.

4. Emission Limitation

a. *Upon CRP startup, the Permittee shall not exceed the combined lead emissions limit from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams of 2.9 tons per year on 12-month rolling total basis*.

[Condition XVI.C.3.a of SPR 60647 and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. No later than July 1, 2018 or 180 days after completion of all project improvements authorized by Significant Permit Revision No. 60647, the Permittee shall not exceed the emissions of lead from the Main Stack 0.683 pound of lead per hour.

[A.A.C. R18-2-B1301.C]

c. Opacity from lead-bearing fugitive dust emissions shall not exceed 20 percent from any part of the facility at any time.

[A.A.C. R18-2-B1301.01.A.7]

5. Air Pollution Control Requirements

a. At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate smelter processes and associated emission capture and/or control equipment in a manner consistent with good air pollution control practices for minimizing lead emissions. Determination of whether acceptable operating and maintenance procedures are being used shall be based on all information available to the Department and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, and inspection of the relevant equipment.

[A.A.C. R18-2-B1301.D.1]

b. At all times, the Permittee shall operate and maintain all non-smelting process sources, including all associated air pollution control equipment, control measures, and monitoring equipment, in a manner consistent with good air pollution control practices for minimizing lead-bearing fugitive dust, and in accordance with the fugitive dust plan, and performance and housekeeping requirements. A determination of whether acceptable operating and maintenance procedures are being used shall be based on all available information to the Department and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, review of fugitive dust plans, and inspection of the relevant equipment.

[A.A.C. R18-2-B1301.01.C.1]

c. Emissions from the anode furnace baghouse stack shall be routed to the

Main Stack.

[A.A.C. R18-2-B1301.D.3]

6. Performance Test Requirements

a. No later than 180 days after CRP startup, the Permittee shall conduct an initial performance test on the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams for lead emissions.

[Condition XVI.C.3.b of SPR 60647, A.A.C. R18-2-312 and A.A.C. R18-2-306.A.3.c]

b. No later than 180 calendar days after completion of the CRP improvements authorized by Significant Permit Revision No. 60647, the Permittee shall conduct initial performance tests on the following:

[A.A.C. R18-2-B1301.E.1]

(1) The gas stream exiting the anode furnaces baghouse prior to mixing with other gas streams routed to the Main Stack.

(2) The gas stream exiting the acid plant at a location prior to mixing with other gas streams routed to the Main Stack.

(3) The gas stream exiting the secondary baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

(4) The gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the Main Stack.

(5) The gas stream exiting the vent gas baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

c. The Permittee shall conduct subsequent performance tests on the gas streams specified in Conditions III.F.6.a and III.F.6.b at least annually.

[Permit 60647 Condition XVI.C.3.a, A.A.C. R18-2-312 and A.A.C. R18-2-B1301.E.2]

d. The Performance tests shall be conducted in accordance with 40 CFR 60, Appendix A, Reference Method 29.

[Permit 60647 Condition XVI.C.3.b, A.A.C. R18-2-312 and A.A.C. R18-2-B1301.E.3]

e. At least 30 calendar days prior to conducting a performance test, the Permittee shall submit a test plan, in accordance with A.A.C. R18-2-312(B) and the Arizona Testing Manual, to the Department for approval. The test plan must include the following:

[A.A.C. R18-2-B1301.E.4]

(1) Test duration;

(2) Test location(s);

(3) Test method(s), including those for test method performance audits conducted in accordance with g below; and

(4) Source operation and other parameters that may affect the test result.

f. The Permittee may use alternative or equivalent performance test methods as defined in 40 CFR § 60.2 when approved by the Department and EPA Region IX, as applicable, prior to the test.

[A.A.C. R18-2-B1301.E.5]

g. The Permittee shall include a test method performance audit during every performance test in accordance with 40 CFR § 60.8(g).

[A.A.C. R18-2-B1301.E.6]

7. Compliance Requirements

a. No later than 180 days from CRP startup, the Permittee shall demonstrate compliance with lead emission limits in Condition III.F.4.a above in accordance with following:

[Condition XVI.C.3.c of SPR 60647, A.A.C. R18-2-306.A.3.c]

(1) The Permittee shall calculate lead emissions in pounds per hour in the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the most recent performance test in Condition III.F.6.

(2) The Permittee shall maintain records of hours of operation of the each stream in Condition III.F.6.b. If any emission unit associated with a stream operates during a calendar hour, it will constitute an operating hour. If no emission unit associated with a stream operates during a calendar hour, it will not constitute an operating hour.

(3) The Permittee shall calculate and record monthly lead emissions for the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the hourly emissions calculated in Condition III.F.7.a(1) above and the monthly operating hours for each stream recorded in Condition III.F.7.a(2).

(4) At the end of each month, the Permittee shall calculate and record rolling 12-month total of combined lead emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in Condition III.F.7.a(3) above to demonstrate compliance with the emission limit in ConditionIII.F.4.a.

b. For purposes of determining compliance with the Main Stack emission limit in Condition III.F.4.b, the Permittee shall calculate the combined lead emissions in pounds per hour from the gas streams identified in Condition III.F.6.b based on the most recent performance tests conducted in accordance with Condition III.F.6. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit.

[A.A.C. R18-2-B1301.F.1 and 3]

c. Opacity Monitoring

(1) In the event ongoing visible emissions at a non-smelting process source covered by the lead fugitive dust plan are observed, Reference Method 9-certified observer, shall promptly evaluate the emissions and conduct a Reference Method 9 in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-B1301.01.D.7.b]

(2) A Reference Method 9-certified observer shall conduct a weekly visible emissions survey of all non-smelting process sources covered by the lead fugitive dust plan and perform a Reference Method 9 reading in accordance with Condition X.B.3 of Attachment "B" for any plumes that on an instantaneous basis appear to exceed 15 percent opacity.

[A.A.C. R18-2-B1301.01.D.7.c]

(3) The Permittee shall not allow visible emissions from unpaved roads to exceed 20 percent opacity and shall not allow silt loading equal to or greater than 0.33 oz/ft2. However, if silt loading is equal to or greater than 0.33 oz/ft2, then the Permittee shall allow the average percent silt content to exceed 6 percent. Compliance with these requirements shall be determined by the test methods described in Appendix 15.

[A.A.C. R18-2-B1301.01.D.10]

(4) For any non-smelting process source that produces visible emissions that appear to exceed 15 percent opacity, the Permittee shall perform an analysis of the root cause, and implement a strategy designed to prevent, to the extent feasible, the ongoing recurrence of the source of visible emissions. Within 14 days of completion of its analysis, if appropriate, the Permittee shall modify the fugitive dust plan for any changes identified from the analysis differing from the current provisions of the fugitive dust plan.

[A.A.C. R18-2-B1301.01.D.8.a]

d. At any time that the Permittee becomes aware that provisions of the fugitive dust plan and/or performance and housekeeping provisions required by this Section are not being met, the Permittee shall take prompt action to return to compliance, which may include modifications to monitoring, recordkeeping, and reporting requirements in the fugitive dust plan. This includes, but is not limited to, the actions in A.A.C. R18-2-B1301.01.D.8.b.

[A.A.C. R18-2-B1301.01.D.8.b]

8. Recordkeeping Requirements

The Permittee shall maintain the following records for at least five years and keep on-site for at least two years:

[A.A.C. R18-2-B1301.G and 1301.01.H]

a. All records of major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment, including those set forth in the operations and maintenance plan.

b. All records of performance tests, test plans, and audits required by Condition III.F.6.

c. All records of compliance calculations required by Conditions III.F.7.a and III.F.7.b.

d. All records of fugitive emission studies and study protocols conducted in accordance with A.A.C. R18-2, Appendix 14.

e. All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining, and casting emission units; and any malfunction of the associated air pollution control equipment that is inoperative or not operating correctly.

f. All records of reports and notifications required by Condition III.F.9.

g. All records required under A.A.C. R18-2-B1301.01.H.

9. Reporting Requirements

a. The Permittee shall comply with the following requirements:

[A.A.C. R18-2-B1301.H]

(1) Notification of commencement of construction of any equipment necessary to comply with the operational or emission limits.

(2) Semiannual progress reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for the preceding July- December period.

(3) Notification of initial startup of any such equipment within 15 business days of such startup.

(4) Whenever the Permittee becomes aware of any exceedance of the emission limit set forth in Condition III.F.4 the Permittee shall notify the Department orally or by electronic or facsimile transmission as soon as practicable, but no later than two business days after the Permittee first knew of the exceedance.

(5) Reports from performance testing conducted pursuant to Condition III.F.6 shall be submitted to the Department within 60 calendar days of completion of the performance test. The reports shall be submitted in accordance with the Arizona Testing Manual and A.A.C. R18-2-312(A).

b. Within 30 days after the end of each calendar-year quarter, the Permittee shall submit a quarterly report to the Department for the preceding quarter that shall include all the reporting requirements specified in A.A.C. R18-2-B1301.01.I.

[A.A.C. R18-2-B1301.01.I]

10. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition XVI.C.3.a, b and c of SPR 60647; A.A.C. R18-2-B1301 and B1301.01.

[A.A.C R18-2-325]

IV. CONCENTRATE DRYERS/FLASH FURNCE MATTE TAPPING OPERATIONS

A. PM and Opacity

1. Emission Limits

a. The Permittee shall not cause to be discharged to the atmosphere from the dryer vent any gases that contain total PM in excess of 50 mg/dscm (0.022 grains per dry standard cubic foot (gr/dscf)) Emissions in excess of the emission limit during periods of startup, shutdown, and malfunction shall not be considered a violation of the applicable emission limit.

[40 CFR 60.162(a), 40 CFR 63.11148(a)(1) and CD CV-15-02206-PHX-DLR 19]

b. For each new copper concentrate dryer that the Permittee may choose to install, the Permittee shall not cause to be discharged to the atmosphere from the dryer vent any gases that contain total particulate matter in excess of 23 mg/dscm.

[CD CV-15-02206-PHX-DLR 19]

c. Gases discharged from the Vent Gas Baghouse and the tapping emissions capture system shall not contain total particulate matter in excess of 23 mg per dscm..

[40 CFR 63.11148(a)(3)(ii), CD CV-15-02206-PHX-DLR 19]

d. PM Emission Limits Monitored with PM CEMS.

(1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions IV.A.1.a, b and c above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 19a]

(2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a

longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

e. *At all times except for periods of startup, shutdown, and malfunction as defined in 40 CFR §60.2, the Permittee shall not cause to be discharged into the atmosphere from any dryer any visible emissions that exhibit greater than 20 percent opacity*. Opacity readings of portions of plumes, which contain condensed, uncombined water vapor, shall not be used for purposes of determining compliance with the opacity standard.

[40 CFR 60.164(a), A.A.C. R18-2-331.A.3.f]

[Material permit conditions are indicated by italics and underline]

f. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

2. Air Pollution Control Requirements

a. *No later than May 1, 2018, the Permittee shall install and operate a baghouse designed to handle the maximum potential volumetric flow of gas from the copper concentrate dryers and smelting flash furnace matte tapping and slag skimming operations and rated to perform with an outlet loading value between 0.002 grains per standard cubic foot (~4 mg/Nm^3) and 0.005 grains per standard cubic foot (~11 mg/Nm^3).*

[CD CV-15-02206-PHX-DLR 13, A.A.C. R18-2-331.A.3.d and e]

[Material permit conditions are indicated by italics and underline]

b. *Until the vent gas baghouse is installed, the Permittee shall continue to operate the R&R Cottrell ESP in accordance with the manufacturer's recommendations to minimize particulate matter emissions.*

[A.A.C R18-2-306.A.3.c and 331.A.3.e]

[Material permit conditions are indicated by italics and underline]

3. Monitoring, Recordkeeping and Reporting Requirements

a. Opacity Monitoring Requirements

(1) Until installation and startup of the Vent Gas Baghouse, the Permittee shall operate Continuous Opacity Monitoring System (COMS) installed at the outlet of the vent gas electrostatic precipitator (ESP) stream to monitor and record the opacity of gases discharged into the atmosphere from the dryers. The span of this system shall be set at 80 to 100 percent opacity. The COMS shall be installed in accordance with Condition IX.A.

[40 CFR 60.165(b)(1), 40 CFR 63.11148(b)(1)]

(2) After installation and startup of the Vent Gas Baghouse, the Permittee shall operate Continuous Opacity Monitoring System (COMS) installed at the outlet of the vent gas baghouse stream to monitor and record the opacity of gases discharged into the atmosphere from the dryers. The span of this system shall be set at 80 to 100 percent opacity. The COMS shall be installed in accordance with Condition IX.A.

[40 CFR 60.165(b)(1), 40 CFR 63.11148(b)(1)]

(3) Permittee shall evaluate opacity measurements from the vent gas COMS on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[40 CFR 63.11148(b)(3), A.A.C. R18-2-306.A.3.c]

(4) Opacity excess emissions are defined as any six-minute period during which the average opacity, as measured by the COMS as in Condition IV.A.3.a(1), exceeds the 20 percent opacity standard, as specified in Condition IV.A.1.e.

[40 CFR 60.165(d)(1) and A.A.C. R18-2-306.A.3.c]

(5) The Permittee shall log in ink or electronic format and maintain a record of 24-hour opacity measurements performed in accordance with Condition IV.A.3.a(3) and any corrective actions taken, if any. A record of corrective actions taken must include the date and time during which the 24-hour rolling average opacity exceeded 15 percent and the date, time and type of the corrective action.

[40 CFR 63.11148(b)(4)]

b. PM Continuous Monitoring System (CEMS) Requirements

(1) No later than May 1, 2018, The Permittee shall install, calibrate, operate and maintain PM CEMS in accordance with

the requirements in Condition IX.B on the gas stream exiting the R&R Cottrell ESP Replacement Baghouse at a location prior to mixing with other gas streams that are routed to the main stack.

[CD CV-15-02206-PHX-DLR 14.e]

(2) Should the Permittee choose to stop routing emissions from one or more copper concentrate dryers or the tapping emissions capture system to the R&R Cottrell ESP (or the R&R Cottrell ESP Replacement Baghouse), no later than the date of rerouting, the Permittee shall install a PM CEMS in accordance with the requirements in Condition IX.B on such gas stream post applicable PM controls, such as the current dryer baghouse, but pre-mixing with any other gas streams.

[CD CV-15-02206-PHX-DLR 20]

4. Compliance Requirements

a. Prior to installation and certification of PM CEMS, compliance with Vent Gas Baghouse PM Emission Limit shall be determined using the test methods in Condition IV.A.5.c.

[CD CV-15-02206-PHX-DLR 19, 20]

b. Upon installation and certification of PM CEMS,

(1) Compliance shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction; or

[CD CV-15-02206-PHX-DLR 19a, 20a]

(2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

[CD CV-15-02206-PHX-DLR 19b, 20b]

c. Within 180 days of issuance of this permit, the Permittee shall conduct a performance test in accordance with the EPA Reference Method 5 to demonstrate compliance with the PM emissions limits in Conditions IV.A.1.a and IV.A.1.c. A minimum of three valid test runs are needed to comprise a PM performance test. The Permittee shall repeat the performance test every 2.5 years.

[40 CFR 63.11148(e)]

5. Testing Requirements

a. The Permittee shall determine compliance with the dryer particulate matter standard of 0.022 gr/dscf in Condition IV.A.1.a, using EPA Reference Method 5 testing annually for the vent gas baghouse exit to determine the particulate matter concentration. The sampling time and sample volume for each run shall be at least 60 minutes and 0.85 dscm (30 dscf).

[40 CFR 60.166(b)(1)]

b. The Permittee shall perform an annual opacity observation of emissions from the flash furnace, converters, and Nos. 1 and 2 fluid bed dryers in accordance with EPA Reference Method 9 to determine compliance with the visible emission standard of 20 percent opacity.

[40 CFR 60.166(b)(3)]

c. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[CD CV-15-02206-PHX-DLR 19, 20]

d. Performance testing, if required, for the limit in Condition IV.A.1.f shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).

[40 CFR 52.126(b)(5)]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 52.126(b), 40 CFR 60.162(a), 164(a), 165(b)(1) & (d)(1), and166(b)(1); 40 CFR 63.11148(a)(1), 11148(a)(3)(ii), 11148(b)(1), (3) & (4), 11148(e); and CD CV-15-02206-PHX-DLR 13, 14.e, 19, 20 and 21.

[A.A.C R18-2-325]

B. Sulfur Dioxide (SO_2)

1. Emission Limits

a. Except as provided in Condition IV.B.1.b below, upon installation and operation of the Vent Gas Baghouse, at all times that SO_2 emissions are routed to the baghouse, the Permittee shall inject High-Surface-Area (HSA) Hydrated Lime to reduce SO_2 emissions by at least 50 percent based on a 365-day rolling average, for all SO_2 emissions routed to the Vent Gas Baghouse. Commencing no later than 365 days after the installation and operation of the Vent Gas Baghouse, the Permittee shall demonstrate compliance with the SO_2 reduction requirement in accordance with Condition IV.B.3.

[Condition XVI.C.1.b of Permit 60647 and CD CV-15-02206-PHX-DLR 11.b]

b. If during the first three (3) years after monitoring control efficiency achieved through injection of High-Surface-Area Hydrated Lime, the Permittee believes that despite design, installation, operation, and maintenance of controls to minimize emissions to the greatest extent practicable, it is technically infeasible to achieve a fifty (50) percent control efficiency through injection of High-Surface-Area Hydrated Lime for gases routed to the vent gas baghouse despite design, installation, operation and maintenance of controls to minimize emissions to the greatest extent practicable, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a lower control efficiency limit, not to be less than forty (40) percent control efficiency. The requirements for this application and procedure for revision are set forth in paragraph 11.c of the CD. The Permittee shall, prior to submission of any such demonstration, employ a third-party consultant with experience in similar dry lime scrubbing applications to recommend equipment and/or operational enhancements to achieve the 50% control efficiency target. EPA may grant or deny the Permittee's request in whole or in part, subject to the dispute resolution provisions of the CD. If EPA approves the Permittee's demonstration, such lower control efficiency limit(s) shall be deemed to have replaced the 50% control efficiency limit(s) during the time during which achievement was of the 50% control efficiency limit was infeasible (including any period of time that occurred prior to submittal of the demonstration, during the pendency of EPA's review of the Permittee's demonstration, and during the pendency of any dispute resolution under the CD.

[CD CV-15-02206-PHX-DLR 11.c]

2. Monitoring, Recordkeeping and Reporting Requirements

a. *Prior to operation of the Vent Gas Baghouse, the Permittee shall install, certify, calibrate, maintain, and operate an SO2 CEMS both upstream of the lime injection point and at the outlet of the Vent Gas Baghouse in accordance with Condition IX.C of this Attachment..*

[CD CV-15-02206-PHX-DLR 11.b, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

b. After three (3) years of monitoring in accordance with the requirements of Condition a above, the Permittee may submit to EPA a request for an alternative monitoring plan for one or more control efficiency requirements. Such request shall contain a detailed proposal that describes an alternative monitoring plan and demonstrates how such plan: 1) will ensure continuous compliance with the control efficiency requirement(s); 2) identifies the indicator(s) of performance, measurement techniques, monitoring frequency, and the averaging time for the alternative monitoring procedure as referenced in 40 C.F.R. § 63.8(f)(4); and 3) complies with all relevant EPA regulations and guidance. EPA may grant or deny the request in whole or in part.

[CD CV-15-02206-PHX-DLR 11.d]

3. Compliance Requirements

No later than three-hundred-sixty-five (365) days after installation and operation of the Vent Gas Baghouse, the Permittee shall demonstrate compliance, and thereafter continuously comply, with a control efficiency requirement of at least 50 percent, based on a 365-day rolling average, for all SO2 emissions routed to the Vent Gas Baghouse. Compliance with the 50 percent control efficiency requirement in Condition IV.B.1.a shall be demonstrated by summing the hourly pounds of SO_2 exiting the Vent Gas Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS on the outlet of the Vent Gas Baghouse, and then dividing that value by the sum of the hourly pounds of SO_2 routed to the Vent Gas Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS upstream of the lime injection point. The value obtained shall then be subtracted from one and the difference multiplied by one hundred to calculate the 365-day rolling SO_2 emission control efficiency achieved as a percentage.

[CD CV-15-02206-PHX-DLR 11.b]

4. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition XVI.C.1.b of Permit 60647 and CD CV-15-02206-PHX-DLR 11.b, 11.c and 11.d.

[A.A.C R18-2-325]

V. SLAG SCREENING & TRANSPORT

A. Applicability

This Section shall be applicable to the process of screening and transporting slag to the track hopper for reintroduction into the concentrator and loading slag for offsite shipment.

B. Operating Limitation

The amount of slag processed through the grizzly screen and loaded for offsite shipment shall not collectively exceed 1,063,000 tons per year.

[A.A.C R18-331.A.3.a, and-306.01.A]
[Material Permit Conditions are indicated by underline and italics]

C. ~~Monitoring,~~ Recordkeeping and ~~Reporting~~ Requirements

The Permittee shall maintain a record of the monthly and 12-month rolling totals of the material processed through the grizzly screen and loaded for offsite shipment.

[A.A.C. R18-2-306.A.3.c]

D. Particulate Matter and Opacity

1. Emission Limits and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

   a. The Permittee shall screen slag only within an area protected by a wind fence

   [CD CV-15-02206-PHX-DLR B.18, A.A.C. R18-2-606]

   b. The Permittee shall wet the surface of all slag to be screened or loaded for offsite shipment with sufficient moisture to minimize emissions to the greatest extent practicable.

   [CD CV-15-02206-PHX-DLR B.19, B.27, A.A.C. R18-2-606]

   c. The Permittee shall comply with the requirements applicable to slag screening and loose material piles as identified in the Fugitive Dust Plan.

   [CD CV-15-02206-PHX-DLR B]

3. Monitoring, Recordkeeping and Reporting Requirements

   The Permittee shall conduct visible emissions surveys as required by the Fugitive Dust Plan.

   [CD CV-15-02206-PHX-DLR B.29, A.A.C. R18-2-306.A.3.c]

E. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715 D, and CD CV-15-02206-PHX-DLR B.18, B.19, B.27, and B.29.

[A.A.C. R18-2-325]

VI. FLASH FURNACE/CONVERTERS/ACID PLANT

A. Operating Limits

1. Blowing on any converter shall not exceed a maximum rate of 32,000 SCFM, averaged over 5 minutes of converter Blowing and rolled each minute.

   [CD CV-15-02206-PHX-DLR 8]

2. No later than May 1, 2018, the Permittee shall permanently cease operation of the five (5) existing converters, and shall complete installation of two (2) of the three (3) new converters.

   a. The Permittee shall not have more than one (1) converter Blowing at any given time.

   [CD CV-15-02206-PHX-DLR 8.a]

   b. Total combined Blowing time at all converters shall not exceed twenty-one (21) hours in any 24-hour period, rolled hourly, unless and until the Permittee accepts 100 ppm SO_2 emission limit from the acid plant on a 365-day rolling basis including periods of startup, shutdown, and malfunction, and as measured and recorded by SO_2 CEMS located on the main stack center.

[CD CV-15-02206-PHX-DLR 8.b]

3. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with CD CV-15-02206-PHX-DLR 8, 8.a, and 8.b.

[A.A.C R18-2-325]

B. PM and Opacity

1. Emission Limits

a. For the secondary capture system, the Permittee shall not cause to be discharged to the atmosphere any gases that contain total particulate matter in excess of 0.022 grains/dscf).

[40 CFR 63.11148(a)(4)(iv)]

b. The Permittee shall not cause to be discharged from the acid plant that contain non-sulfuric acid PM in excess of 6.2 mg/dscm.

[CD CV-15-02206-PHX-DLR 16]

c. The Permittee shall not cause to be discharged to the atmosphere from the secondary baghouse any gases that contain total PM in excess of 23 mg per dscm.

[CD CV-15-02206-PHX-DLR 17]

d. PM Emission Limits Monitored with PM CEMS.

(1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions VI.B.1.b and VI.B.1.c above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 16.a and 17a]

(2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

e. *At all times except for periods of startup, shutdown, and malfunction as defined in 40 CFR §60.2, the Permittee shall not cause to be discharged into the atmosphere any visible emissions from the acid plant which exhibit greater than 20 percent opacity*. Opacity readings of portions of plumes, which contain condensed, uncombined water vapor, shall not be used for purposes of determining compliance with the opacity standard.

[40 CFR 60.164 (b), A.A.C. R18-2-331.a.3.f]

[Material permit conditions are indicated by italics and underline]

f. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

2. Air Pollution Control Requirements

a. The Permittee shall route process off-gas from the smelting flash furnace to the acid plant.

[CD CV-15-02206-PHX-DLR 16]

b. All gases captured by a primary hood shall be routed to the acid plant.

[CD CV-15-02206-PHX-DLR 8]

c. *<u>The Permittee shall operate</u>* and maintain *<u>the converter secondary hoods baghouse to minimize particulate emissions from the secondary hoods</u>*.

[A.A.C. R18-2-306.A.3.c, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

d. *<u>The Permittee shall operate the Inter-pass Absorption Tower and Final Absorption tower in the acid plant to control particulate matter emissions from the flash furnace, converters and converter secondary hood during Blowing operations</u>*.

[SPR 60647, A.A.C. R18-2-306.A.3.c and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping and Reporting Requirements

a. Opacity Monitoring Requirements

(1) The Permittee shall operate Continuous Opacity Monitoring System (COMS) installed at the outlet of Acid Plant Tail Gas stream to monitor and record the opacity of gases. The span of this system shall be set at 80 to 100 percent opacity. The COMS shall be installed in accordance with Condition IX.A.

[Permit 60647 Condition II.D.1.b, CD CV-15-02206-PHX-DLR 19]

(2) Permittee shall evaluate opacity measurements on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[A.A.C. R18-2-306.A.3.c]

b. PM Continuous Monitoring System (CEMS) Requirements

(1) *The Permittee shall install, calibrate*, operate and maintain *PM CEMS on the gas streams exiting the acid plant and the Secondary Baghouse at a location prior to mixing with other gas streams that are routed to the main stack in accordance with Condition IX.B*.

[CD CV-15-02206-PHX-DLR 14.b and c]

(2) *No later than May 1, 2018, The Permittee shall install, calibrate*, operate and maintain *PM CEMS on the gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the main stack in accordance with Condition IX.B.*

[CD CV-15-02206-PHX-DLR Item 14.d and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. Secondary Hood Baghouse Bag Leak Detection System (BLDS) Requirements

The Permittee shall install, calibrate, maintain, and continuously operate *a BLDS on the secondary hood baghouse in accordance with the requirements of Condition X*.

[40 CFR 63.11148(c) and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

4. Compliance Requirements

a. Prior to installation and certification of PM CEMS, compliance with PM Emission Limits in Conditions VI.B.1.b and VI.B.1.c shall be determined using the test methods in Condition VI.B.5.

[CD CV-15-02206-PHX-DLR 16 and 17]

b. Upon installation and certification of PM CEMS,

[CD CV-15-02206-PHX-DLR 16 and 17]

(1) Compliance shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction; or

(2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

c. Within 180 days of issuance of this permit, the Permittee shall conduct a performance test in accordance with the EPA Reference Method 5 to demonstrate compliance with the PM emissions limits in Condition VI.B.1.a. A minimum of three valid test runs are needed to comprise a PM performance test. The Permittee shall repeat the performance test every 2.5 years.

[40 CFR 63.11148(e)]

5. Testing Requirements

a. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test to demonstrate compliance with the total PM Emission Limits in Condition VI.B.1.c in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[CD CV-15-02206-PHX-DLR 17]

b. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test for the non-sulfuric acid particulate matter emission limit in Condition VI.B.1.b in accordance with 40 C.F.R. § 63.1450(b). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[CD CV-15-02206-PHX-DLR 16]

c. Performance testing, if required, for the limit in Condition VI.B.1.f shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).

[40 CFR 52.126(b)(5)]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition II.D.1.b of Permit, 60647, Permit 1000042, 40 CFR 63.11148(a)(4)(iv) and 11148(e), 40 CFR 52.126, 40 CFR 60.164 (b) and CD CV-15-02206-PHX-DLR 8, 14.b, 14.c, 14.d, 16, 17 and 19 .

[A.A.C R18-2-325]

C. Sulfur dioxide SO_2

1. Emission Limits

a. The Permittee shall not cause to be discharged into the atmosphere from smelting furnace, or copper converter any gases which contain sulfur dioxide in excess of 0.065 percent by volume. For gases routed to the acid plant, the limit does not apply during periods of startup, shutdown, or malfunction. For gases routed to the Secondary Baghouse and tertiary hood, the limit shall apply at all times, including periods of startup, shutdown, and malfunction.

[40 CFR 60.163(a), CD CV-15-02206-PHX-DLR 10]

b. If the Permittee elects to accept a limit of 100 ppmv SO_2 from the gas exiting the acid plant on a 365-day rolling average basis, including periods of startup, shutdown, and malfunction, the Permittee shall provide EPA with written notice of the effective date of its election to accept the 100 ppmv SO_2 limit in the next quarterly report following such election.

[CD CV-15-02206-PHX-DLR 8.b]

c. No later than May 1, 2018 at all times that SO_2 emissions are routed to the Secondary Baghouse, the Permittee shall inject High-Surface-Area (HSA) Hydrated Lime to reduce SO_2 emissions by at least 50 percent based on a 365-day rolling average, for all SO_2 emissions routed to the Secondary Baghouse. Commencing no later than May 1, 2019, the Permittee shall demonstrate compliance with the SO_2 reduction requirement in accordance with Condition VI.C.4.d.

[Permit 60647, Cond. XVI.C.1.b, CD CV-15-02206-PHX-DLR 11.a]

d. If during the first three (3) years after monitoring control efficiency achieved through injection of High-Surface-Area Hydrated Lime, the Permittee believes ~~finds~~ that despite design, installation, operation, and maintenance of controls to minimize emissions to the greatest extent practicable, it is technically infeasible to achieve a fifty (50) percent control efficiency through injection of High-Surface-Area Hydrated Lime for gases routed to the vent gas baghouse despite design, installation, operation and maintenance of controls to minimize emissions to the greatest extent practicable, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a lower control efficiency limit, not to be less than forty (40) percent control efficiency. The requirements for this application and procedure for revision are set forth in paragraph 11.c of the CD. The Permittee shall, prior to submission of any such demonstration, employ a third-party consultant with experience in similar dry lime scrubbing applications to recommend equipment and/or operational enhancements to achieve the 50% control efficiency target. EPA may grant or deny the Permittee's request in whole or in part, subject to the dispute resolution provisions of the CD. If EPA approves the Permittee's demonstration, such lower control efficiency limit(s) shall be deemed to have replaced the 50% control efficiency limit(s) during the time during which achievement was of the 50% control efficiency limit was infeasible (including any period of time that occurred prior to submittal of the demonstration, during the pendency of EPA's review of the Permittee's demonstration, and during the pendency of any dispute resolution under the CD.

[CD CV-15-02206-PHX-DLR 11.c]

2. Air Pollution Control Requirements

The Permittee shall operate the double contact sulfuric acid plant to comply with the flash furnace and converters sulfur dioxide standard of 0.065 percent by volume set forth in Condition VI.C.1. *At all times, including periods of startup, shutdown, and malfunction, Permittee shall, to the extent practicable, continue to operate* and maintain *the flash furnace, converters and the double contact acid plant in a manner consistent with good air pollution control practice for minimizing sulfur dioxide emissions.*

[40 CFR 60.11(d) and 60.164(b), A.A.C. R18-2-331.A.3.e]

[Material Permit Conditions are indicated by italics and underline]

3. Monitoring, Recordkeeping and Reporting Requirements

a. *The Permittee shall install, certify, calibrate*, maintain, and operate *SO_2 CEMS at the acid plant exhaust stream in accordance with requirements in Condition IX.C of this Attachment.*

[40 CFR 60.165(b) and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

b. *Upon installation of the tertiary hooding system, the Permittee shall install, certify, calibrate*, maintain, and operate *SO_2 CEMS on the tertiary hood exhaust stream (prior to mixing with other gas streams in the stack) in accordance with requirements in Condition IX.C of this Attachment*.

[CD CV-15-02206-PHX-DLR 10.c and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

c. *No later than May 1, 2018, the Permittee shall install, certify, calibrate,* maintain, and operate *SO_2 CEMS both upstream of the lime injection point and at the outlet of the Secondary Baghouse in accordance with requirements in Condition IX.C of this Attachment*.

[CD CV-15-02206-PHX-DLR 11.a and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

d. After three (3) years of monitoring in accordance with the requirements of Condition VI.C.3.c above, the Permittee may submit to EPA a request for an alternative monitoring plan for one or more control efficiency requirements. Such request shall contain a detailed proposal that describes an alternative monitoring plan and demonstrates how such plan: 1) will ensure continuous compliance with the control efficiency requirement(s); 2) identifies the indicator(s) of performance, measurement techniques, monitoring frequency, and the averaging time for the alternative monitoring procedure as referenced in 40 C.F.R. § 63.8(f)(4); and 3) complies with all relevant EPA regulations and guidance. EPA may grant or deny the request in whole or in part.

[CD CV-15-02206-PHX-DLR 11.d]

4. Compliance Requirements

a. Compliance with the NSPS emission limit in Condition VI.C.1.a

(1) The Permittee shall demonstrate compliance with the emission limit in Condition VI.C.1.a by SO2 CEMS to determine the SO_2 concentrations on a dry basis. The sampling time for each run shall be 6 hours. Six-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the four consecutive 6-hour periods of each operating day. Each six-hour average shall be determined as the arithmetic mean of the appropriate six contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system The monitoring system drift during the run may not exceed 2 percent of the span value.

[CD CV-15-02206-PHX-DLR 10.a, 40 CFR 60.165(c) and 60.166(b)(2)]

(2) For the purpose of reports required under §60.7(c), periods of excess emissions that shall be reported are defined as all six-hour periods during which the average emissions of sulfur dioxide, as measured by the CEMS exceed the level of the standard. The Director will not consider emissions in excess of the level of the standard for less than or equal to 1.5 percent of the six-hour periods during the quarter as indicative of a potential violation of §60.11(d) provided the affected facility, including air pollution control equipment, is maintained and operated in a manner consistent with good air pollution control practice for minimizing emissions during these periods. Emissions in excess of the level of the standard during periods of startup, shutdown, and malfunction are not to be included within the 1.5 percent.

[40 CFR 60.165(d)]

b. For gases routed to the Secondary Baghouse, compliance with this limit shall be demonstrated by a three (3) hour rolling average of data recorded by SO_2 CEMS located at the secondary hood baghouse outlet duct before it mixes with other gas streams in the main stack annulus.

[CD CV-15-02206-PHX-DLR 10.b]

c. Beginning no later than ninety (90) days after installation of the tertiary hooding system, compliance with this limit shall be demonstrated by a three (3) hour rolling average of data recorded by SO_2 CEMS located at the tertiary hood exhaust gas stream before it mixes with other gas streams in the main stack annulus.

[CD CV-15-02206-PHX-DLR 10.c]

d. No later than May 1, 2019, the Permittee shall demonstrate compliance with Condition VI.C.1.c, and thereafter continuously comply, with a control efficiency requirement of at least 50 percent for the secondary baghouse HSA lime injection, based on a 365-day rolling average, for all SO_2 emissions routed to the Secondary Baghouse. Compliance shall be demonstrated by summing the hourly pounds of SO_2 exiting the Secondary Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS on the outlet of the Secondary Baghouse, and then dividing that value by the sum of the hourly pounds of SO_2 routed to the Secondary Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS upstream of the lime injection point. The value obtained shall then be subtracted from one and the difference multiplied by one hundred to calculate the 365-day rolling SO_2 emission control efficiency achieved as a percentage

[CD CV-15-02206-PHX-DLR 11.a]

e. Upon the Permittee's acceptance of 100 ppmv SO_2 emission limit from the gas exiting the acid plant, the Permittee shall demonstrate compliance with this limit on a 365-day rolling average basis, including periods of startup, shutdown, and malfunction, based on the SO_2 CEMS located on the main stack center.

[CD CV-15-02206-PHX-DLR 8.b]

5. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with on 40 CFR 60.163(a), 60.164(b), 60.165(c) and (d), 60.166(b)(2), Condition XVI.C.1.b of Permit 60647, and CD CV-15-02206-PHX-DLR 8.b, 10.a, 10.b, 10.c, 11.a, 11.c, and 11.d.

[A.A.C R18-2-325]

VII. ANODE FURNACE/ANODE CASTING

A. PM and Opacity

1. Operation Limitation

   a. The Permittee may operate any of the three anode furnaces under this section, provided only two furnaces can be in operation at a time.

   [Permit 1000042]

   b. Operate for purposes of Condition VII.A.1.a means holding or processing metal in the furnace, but does not include curing, preheating or sweating of refractory or transferring of metal from one furnace to another.

   [Permit 60647, Condition IX.D.2]

2. Emission Limits

   a. The Permittee shall not cause to be discharged into the atmosphere from the stack of the baghouse any gases which contain particulate matter in excess of 0.003 grain per standard cubic foot (gr/scf).

   [Permit 54251 and A.A.C R18-2-306.A.2]

   b. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from the stack of anode furnaces bag house, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

   [A.A.C. R18-2-715.D]

   c. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from the anode launder burners and/or the anode ladle burners, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

   [A.A.C. R18-2-702.B.1]

   d. The Permittee shall not cause to be discharged to the atmosphere from the anode furnace baghouse any gases that contain total PM in excess of 23 mg per dscm.

   [CD CV-15-02206-PHX-DLR 18]

   e. PM Emission Limits Monitored with PM CEMS.

      (1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions VII.A.2.d above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 18.a]

(2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

f. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

3. Air Pollution Control Requirements

a. At all times that any Anode Furnace is operating, its hood shall be engaged and continuously operating so as to collect and convey process off-gases to the Anode Furnaces Baghouse. "Operating" shall mean: holding or processing metal in the furnace, but does not include, curing, preheating or sweating of refractory, or transferring of metal from one furnace to another.

[CD CV-15-02206-PHX-DLR 18]

b. *The Permittee shall install, operate*, and maintain *a capture system for capturing the emissions from the anode furnaces and ducting them to the anode furnace baghouse*.

[Permit 54251, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

c. *At all times when any anode furnace in operation, the Permittee shall operate* and maintain *a baghouse to minimize particulate emissions*.

[Permit 54251, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

4. Monitoring, Recordkeeping and Reporting Requirements

   a. *The Permittee shall install, calibrate*, operate and maintain *one beta attenuation PM CEMS and one light scatter PM CEMS on the stack exiting the Anode Furnaces Baghouse in accordance with Condition IX.B*.
   [CD CV-15-02206-PHX-DLR 14.a]

   b. *The Permittee shall install, calibrate,* maintain, and operate *a bag leak detection system (BLDS) for the anode furnace baghouse in a manner consistent with the manufacturer's written specifications and recommendation, and in accordance with Section X of this Attachment*.
   [A.A.C. R18-2-306.A.3.c and -331.A.3.c]
   [Material permit conditions are indicated by underline and italics]

   c. A certified EPA Reference Method 9 observer shall conduct a bi-weekly survey of visible emissions emanating from the stack of the anode furnace baghouse stack as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".
   [A.A.C. R18-2-306.A.3.c]

5. Compliance Requirements

   a. Prior to installation and certification of PM CEMS, compliance with the Emission Limit shall be determined using the test methods in Condition VII.A.6.
   [CD CV-15-02206-PHX-DLR 18]

   b. Upon installation and certification of PM CEMS,
   [CD CV-15-02206-PHX-DLR 18]

      (1) Compliance shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction; or

      (2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

6. Testing Requirements

   a. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test for total particulate matter in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.
   [CD CV-15-02206-PHX-DLR 18]

   b. Performance testing, if required, for the limit in Condition VII.A.2.f shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).
   [40 CFR 52.126(b)(5)]

B. Permit Shield

Compliance with the Conditions under this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-702.B.1, 715. D, Permit 54251, Condition IX.D.2 of Permit 60647, Permit 1000042 and CD CV-15-02206-PHX-DLR 14.a,18, 18.a, and 21. .

[A.A.C. R18-2-325]

VIII. COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

A. Applicability

1. The Compliance Assurance Monitoring requirements under this Section shall be applicable only till the operation and certification of PM CEMS are established.

2. If at any time, the Permittee is permitted to discontinue use of PM CEMS, the Compliance Assurance Monitoring requirements shall again become applicable.

3. These requirements are applicable to following emission units

   a. Acid Plant Tail Gas

   b. Secondary Hood Baghouse

   c. Vent Gas Baghouse

   d. Anode Furnace Baghouse

B. Acid Plant Tail Gas

1. Primary Indicators

   Circulating acid flow rates of the Interpass Absorption Tower and the Final Absorption Tower.

   [SPR 60647, 40 CFR 64.3(a)(1)]

2. Monitoring Approach

   [SPR 60647, 40 CFR 64.3(b)(4)(iii)]

   a. At the time of annual performance test, the Permittee shall reestablish the average acid flow rates for the Interpass Absorption Tower and the Final Absorption Tower.

   b. During flash furnace and converter operation, the Permittee shall maintain hourly average acid flow rates for the Interpass Absorption Tower and the Final Absorption Tower within ± 30% of the average acid flow rates recorded during the most recent performance tests.

   c. Excursions of hourly average values beyond the established ranges above shall trigger an alarm. The data acquisition system (DAS) shall maintain record of all alarm events.

3. Quality Assurance/Quality Control (QA/QC)

   [40 CFR 64.3(b)(3)]

   The Interpass Absorption Tower and Final Absorption Tower acid flow meters will be calibrated, maintained, and operated in accordance with the manufacturer's specifications.

4. Excursion Determination

a. Hourly average acid flow rates outside of the ranges above shall be deemed an excursion. If there is an excursion on an hourly basis, the Permittee shall inspect the system for proper operation, and will make adjustments as necessary. Inspection and adjustments will be recorded in the operating log. At least once each operating day, Asarco personnel will review electronic log to ensure proper recording and alarms addressed.

[40 CFR 64.6(c)(2)]

b. The Permittee shall log in ink or electronic format and maintain a record of installation, calibration, maintenance, and operation of the monitoring systems in accordance with Section XIII, Attachment "A" of this permit. In the case of any excursion incident, the record shall include an identification of the date and time of all excursions, their cause, and an explanation of the corrective actions taken, if any.

[A.A.C. R18-2-306.A.3.c and 40 CFR §64.6]

c. An excursion does not constitute a deviation unless either the Permittee fails to initiate the investigation or take corrective action as required.

[A.A.C. R18-2-306.A.2]

C. Secondary Hood Baghouse, Vent Gas Baghouse and Anode Furnace Baghouse

1. Primary Indicators

[40 CFR 64.3(a)(1)]

The alarm on the bag leak detection system shall be the primary indicator of the baghouse performance.

2. Monitoring Approach

[40 CFR 64.3(b)(4)(iii)]

The bag leak detection system signal shall be monitored continuously. The bag leak detection system shall be equipped with an alarm system that will sound automatically when an increase in relative particulate emissions over a preset level is detected. The alarm shall be located where it is easily heard by plant operating personnel and displayed on the operator's control system's computer screen.

3. Quality Assurance/Quality Control (QA/QC)

[40 CFR 64.3(b)(3)]

The bag leak detection system probes will be inspected once a month for dust buildup.

4. Excursion Determination

a. An excursion is defined as an alarm from the bag leak detection system. If an excursion is detected, then the Permittee shall initiate an investigation within 24 hours of the first discovery of the excursion incident and take corrective action as soon as practicable to adjust or repair to minimize possible exceedances of the particulate matter emissions.

[40 CFR 64.6(c)(2)]

b. The Permittee shall log in ink or electronic format and maintain a record of installation, calibration, maintenance, and operation of the monitoring systems in accordance with Section XIII, Attachment "A" of this permit. In the case of any excursion incident, the record shall include an identification of the date and time of all excursions, their cause, and an explanation of the corrective actions taken, if any.

[A.A.C. R18-2-306.A.3.c and 40 CFR §64.6]

c. An excursion does not constitute a deviation unless either the Permittee fails to initiate the investigation or take corrective action as required

[A.A.C. R18-2-306.A.2]

D. In addition to above, the Permittee shall comply with all the General Compliance Assurance Monitoring Requirements under Section IV of Attachment "B".

[40 CFR 64]

IX. CONTINUOUS MONITORING SYSTEMS REQUIREMENTS

A. Requirements for Continuous Opacity Monitoring System (COMS)

1. The Permittee shall operate COMS installed

a. At the outlet of the Vent Gas Baghouse to monitor and record the opacity of gases discharged into the atmosphere from the dryers. The span of this system shall be set at 80 to 100 percent opacity.

[40 CFR 60.165(b)(1)]

b. At the outlet of the acid plant.

[CD CV-15-02206-PHX-DLR 16]

2. The COMS shall meet the following requirements:

a. The COMS shall comply with 40 CFR 60, Appendix B, "Performance Specification 1 - Specification and Test Procedures for Opacity Continuous Emission Monitoring Systems in Stationary Sources":

[40 CFR 60.13(c)]

b. Quality Assurance Requirements:

[40 CFR 60.13, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

(1) Calibration checks

<u>The Permittee shall automatically, intrinsic to the opacity monitor, check the zero and upscale (span) calibration drifts at least once daily.</u> For a particular COMS, the acceptable range of zero and upscale calibration materials is as defined in Performance Specification 1 in 40 CFR §60, Appendix B.

(2) Zero and span drift adjustments

(a) The zero and span shall, as a minimum, be adjusted whenever the 24-hr zero drift or 24-hr span drift exceeds 4% opacity.

(b) The system shall allow for the amount of excess zero and span drift measured at the 24-hour interval checks to be recorded and quantified.

(c) The optical surfaces exposed to the effluent gases shall be cleaned prior to performing the zero and span drift adjustments, except for systems using automatic zero adjustments.

(d) For systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds 4% opacity.

(3) System checks

The Permittee shall, as minimum procedures, apply a method for producing a simulated zero opacity condition and an upscale (span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of the light beam. All procedures applied shall provide a system check of the analyzer internal optical surfaces and all electronic circuitry including the lamp and photo detector assembly.

(4) Minimum frequency of operation

Except during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments, the COMS shall be in continuous operation and shall complete a minimum of one cycle of sampling and analyzing for each successive 10-second period and one cycle of data recording for each successive 6-minute period.

(5) Data reduction procedures

(a) The Permittee shall reduce all data from the COMS to 6-minute averages. Six-minute opacity averages shall be calculated from 36 or more data points equally spaced over each 6-minute period.

(b) Data recorded during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages. An arithmetic or integrated average of all data may be used.

c. The Permittee shall evaluate opacity measurements from the COMS on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, the Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[A.A.C. R18-2-306.A.3.c]

d. Permittee shall implement and follow the EPA approved plan detailing the corrective action triggers based on COMS readings on the exhaust stream from the acid plant.

[CD CV-15-02206-PHX-DLR 16]

B. Requirements for PM CEMS

1. The Permittee shall install the following PM CEMS as per the schedule below:

a. Acid Plant PM CEMS - The Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS on the gas stream exiting the acid plant at a location prior to mixing with other gas streams that are routed to the main stack.

[CD CV-15-02206-PHX-DLR 14.b]

b. Secondary Hood Baghouse PM CEMS - The Permittee shall install, certify, maintain and operate one light scatter PM CEMS (in situ or extractive) on the gas stream exiting the Secondary Baghouse at a location prior to mixing with other gas streams in the stack.

[CD CV-15-02206-PHX-DLR 14.c]

c. Tertiary Hooding PM CEMS - No later than May 1, 2018, the Permittee shall install, certify, maintain and operate light scatter PM CEMS (in situ or extractive) on the gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the main stack.

[CD CV-15-02206-PHX-DLR 14.d]

d. Vent Gas Baghouse PM CEMS -No later than May 1, 2018, the Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS and one light scatter PM CEMS (in situ or extractive) on the gas stream exiting the Vent Gas Baghouse at a location prior to mixing with other gas streams that are routed to the main stack.

[CD CV-15-02206-PHX-DLR 14.e]

e. Anode Furnaces Baghouse PM CEMS - the Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS and one light scatter PM CEMS (in situ or extractive) on the stack exiting the Anode Furnaces Baghouse.

[CD CV-15-02206-PHX-DLR 14.a]

2. *<u>The Permittee shall certify, calibrate</u>*, maintain, and operate *<u>PM CEMS according to EPA Performance Specification 11 in 40 C.F.R. Part 60, Appendix B (PS-11) and the quality assurance requirements of Procedure 2 in 40 C.F.R. Part 60, Appendix F.</u>*

[CD CV-15-02206-PHX-DLR 14 A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

3. Acid Plant, Secondary Baghouse and Tertiary Hooding PM CEMS requirements

[CD CV-15-02206-PHX-DLR 14.b, c and d]

a. Within 90 days from the date of installation, the Permittee shall conduct PS-11 testing in accordance with the Installation, Certification, and QA/QC Protocol to certify the CEMS. The Permittee shall submit the results of the PS-11 testing to EPA.

b. If the PM CEMS fails to certify, the Permittee shall conduct a second round of PS-11 testing in accordance with the revised Installation, Certification, and QA/QC Protocol within ninety (90) days from the date that EPA approves such revised Protocol.

4. Anode Furnaces Baghouse and Vent Gas Baghouse PM CEMS
[CD CV-15-02206-PHX-DLR 14.b, c and d]

a. Within 90 days from the date of installation, the Permittee shall conduct simultaneous PS-11 testing for both PM CEMS in accordance with the Installation, Certification, and QA/QC Protocol in order to certify both of the PM CEMS. The Permittee shall submit the results of the PS-11 testing for both of the PM CEMS to EPA.

b. If one or both of the PM CEMS fails to certify, the Permittee shall conduct a second round of PS-11 testing for such PM CEMS in accordance with the revised Installation, Certification, and QA/QC Protocol within ninety (90) days from the date that EPA approves such revised Protocol.

c. The Permittee shall submit the results of any second round PS-11 testing for both of the PM CEMS to EPA.

d. Following successful certification of both PM CEMS or completion of the second round of PS-11 testing pursuant to the EPA-approved revised Protocol, the Permittee may discontinue operation of and remove one of the PM CEMS.

e. If both PM CEMS are certified, the Permittee may choose which PM CEMS shall be removed. If only one PM CEMS is certified, the Permittee may remove the PM CEMS that did not certify.

f. If neither PM CEMS is certified, the Permittee shall submit a proposal for EPA review and approval as to which PM CEMS should be removed and which shall remain in place as a CPMS, to be based on an analysis of data collected to-date from each PM CEMS and evaluation as to which PM CEMS will provide more useful data. Upon receiving EPA approval of the Permittee's proposal for PM CEMS removal, the Permittee may remove that PM CEMS.

5. Each PM CEMS shall comprise a continuous particle mass monitor to measure and record PM concentration, directly or indirectly, and gas stream flow rates on an hourly average basis. The Permittee shall maintain, in an electronic database, the hourly average emission values of all certified PM CEMS in milligrams per dry standard cubic meter (mg/dscm) and pounds per hour (lbs/hr).
[CD CV-15-02206-PHX-DLR 14]

6. If certification is unsuccessful for any PM CEMS, the Permittee shall consult with the PM CEMS vendor and EPA and then within sixty (60) days of completion of

the PS-11 testing (including receipt of the results) that was conducted pursuant to the original Installation, Certification, and QA/QC Protocol for that PM CEMS submit a revised Installation, Certification, and QA/QC Protocol for that PM CEMS to EPA for review and approval.

[CD CV-15-02206-PHX-DLR 14]

7. In the event that no PM CEMS is successfully certified on any of the below-specified gas streams, the Permittee shall within ninety days of completion of the second round of PS-11 testing (including receipt of the results) submit an alternative PM monitoring plan for such gas stream(s) for review and approval by EPA that will propose a methodology for using data from the PM CEMS as continuous parametric monitoring systems (CPMS) and stack performance test data to ensure continuous compliance with the relevant PM emission limits. Upon approval by EPA, the Permittee shall continuously operate the PM CEMS as a CPMS consistent with the final PM monitoring plan.

[CD CV-15-02206-PHX-DLR 14]

8 . The Permittee shall use reasonable efforts to keep each PM CEMS running and producing data whenever any gas at that location is being exhausted to the atmosphere. The Permittee shall operate at least one PM CEMS for at least twelve (12) months on each of the exhaust streams specified in Condition IX.B.1 for monitoring of compliance with applicable emission limits.

[CD CV-15-02206-PHX-DLR 15]

a. After at least twelve (12) months of operation, the Permittee may attempt to demonstrate that it is infeasible to continue operating one or more of the PM CEMS. As part of such demonstration, the Permittee shall submit an alternative PM monitoring plan for review and approval by the EPA. The plan shall explain the basis for stopping operation of each PM CEMS and propose an alternative monitoring plan for each affected exhaust stream.

b. Operation of a PM CEMS shall be considered infeasible if

(1) the PM CEMS cannot be kept in working condition for sufficient periods of time to produce reliable, adequate, or useful data consistent with the QA/QC protocol (including, without limitation, PS-11 and Procedure 2); or

(2) Recurring, chronic, or unusual equipment adjustment, servicing, or replacement needs in relation to other types of continuous emission monitors cannot be resolved through reasonable expenditures of resources.

c. If EPA determines that the PM CEMS operation is infeasible, the Permittee shall be entitled to discontinue operation of and remove that PM CEMS. At that point, the Permittee shall comply with the approved alternative PM monitoring plan.

C. Requirements for SO_2 Continuous Emission Monitoring System (CEMS)

1. The SO_2 CEMS shall meet 40 CFR Part 60, Appendix B, "Performance Specification 6 - Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources." The CMS shall follow a quality

assurance procedure equivalent to 40 CFR 60 Appendix F. The SO_2 CEMS installed and operated shall meet the quality assurance requirements of 40 CFR 60, Appendix F.

[A.A.C. R18-2-B1302.E.4.b, 40 CFR 60.13(a)]

2. All the stack gas volumetric flow rate monitoring systems shall meet 40 CFR Part 60, Appendix B, "Performance Specification 6- Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources".

3. For the purpose of the SO_2 CEMS performance evaluation, the reference method for Relative Accuracy Test procedure under 40 CFR Part 60, Appendix B, Performance Specification 2 shall be Method 6. For the performance evaluation, each concentration measurement shall be of one hour duration. The pollutant gas used to prepare the calibration gas mixtures required under Performance Specification 2 of appendix B, and for calibration checks under §60.13 (d), shall be sulfur dioxide. The span of the SO_2 CEMS shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

[40 CFR 60.165(b)(2)(ii)]

4. Continuous monitoring means the taking and recording of at least one measurement of SO_2 concentration and stack gas flow rate reading from the effluent of each affected stack, outlet, or other approved measurement location in each 15-minute period when the associated process units are operating. Fifteen-minute periods start at the beginning of each clock hour, and run consecutively. All CEMS shall complete at least one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

[A.A.C. R18-2-B1302.E.3]

5. The Director shall approve the location of all sampling points for monitoring SO_2 concentration and stack gas volumetric flow rates and the appropriate span values for the monitoring systems. This approval shall be in writing before installation and operation of the measurement instruments.

[A.A.C. R18-2-B1302.E.5.d]

6. The measurement system is subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per operating day unless the manufacturer specifies or recommends calibration at shorter intervals, in which case the Permittee shall follow those specifications or recommendations. The Permittee shall make available a record of these procedures that clearly shows instrument readings before and after zero adjustment and calibration.

[A.A.C. R18-2-B1302.E.5.e]

7. The SO_2 CEMS shall meet the following quality assurance requirements:

a. Calibration drift checks

Permittee shall check the zero (or low-level value between 0 and 20% of span value) and span (50 to 100 percent of span value) calibration drifts (CD) at least once daily in accordance with a written procedure prescribed by the manufacturer. The pollutant gas used to prepare the calibration gas mixtures for the calibration drift checks shall be sulfur dioxide.

[40 CFR 60.13(d)(1) and 165(b)(2)(ii)]

b. Zero and span drift adjustments

(1) The zero and span shall, as a minimum, be adjusted whenever the 24-hr zero drift or 24-hr span drift exceeds 100 ppm.

[40 CFR 60.13(d)(1)]

(2) The SO_2 CEMS shall allow for the amount of excess zero and span drift measured at the 24-hour interval checks to be recorded and quantified. If the data are automatically adjusted to the corrected calibration values (e.g., microprocessor control), Permittee shall program the SO_2 CEMS to record the unadjusted concentration measured in the calibration drift prior to resetting the calibration, if performed, or record the amount of adjustment.

[40 CFR 60.13(d)(1)]

c. The CEMS on the anode furnace baghouse stack and tertiary ventilation system shall complete an initial Relative Accuracy Test Audit (RATA) in accordance with Performance Specification 2. The RATA runs shall be tied to when the anode furnace is in use and, for the tertiary system, when the converters are in operation and/or material is being transferred in the converter aisle. Asarco may petition the Department and EPA Region IX on the criteria for subsequent RATAs for the anode furnace baghouse stack or tertiary ventilation system CEMS. The petition shall include submittal of CEMS data during the year.

[A.A.C. R18-2-B1302.E.5.a]

d. The Permittee shall notify the Director in writing at least 30 days in advance of the start of the RATA performed on the CEMS.

[A.A.C. R18-2-B1302.E.5.c]

e. Minimum frequency of operation

[40 CFR 60.13(e)(2)]

Except during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments, the SO_2 CEMS shall be in continuous operation and shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

f. Data reduction procedures

[40 CFR 60.13(h)]

Permittee shall reduce all data from the SO_2 CEMS to 1-hour averages. The 1-hour averages shall be computed from four or more data points equally spaced over each 1-hour period. Data recorded during periods of continuous system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages. An arithmetic or integrated average of all data may be used. The data may be recorded in reduced or non-reduced form (e.g., ppm pollutant and percent O_2 or ng/J of pollutant).

g. Data Substitution

[A.A.C. R18-2-B1302.F.1]

When no valid hour or hours of data have been recorded by a CEMS and the associated process unit is operating, the Permittee shall calculate substitute data for each such period according to the following procedures:

(1) For a missing data period less than or equal to 24 hours, substitute the average of the hourly SO_2 concentrations recorded by the system for the hour before and the hour after the missing data period.

(2) For a missing data period greater than 24 hours, substitute the greater of:

(a) The 90th percentile hourly SO_2 concentrations recorded by the system during the previous 720 quality-assured monitor operating hours.

(b) The average of the hourly SO_2 concentrations recorded by the system for the hour before and the four hours after the missing data period.

h. Excessive audit inaccuracy

If the SO_2 CEMS is out-of-control in terms of the excessive audit inaccuracy as defined in 40 CFR Part 60, Appendix F.5.2.3, the Permittee shall take necessary corrective action to eliminate the problem. Following corrective action, Permittee shall audit the CEMS with a relative accuracy test audit, cylinder gas audit, or relative accuracy audit, to determine if the CEMS is operating within the performance specifications.

[40 CFR Part 60, Appendix F.5.2]

i. Repeated excessive inaccuracy

Whenever excessive inaccuracies as defined in 40 CFR Part 60, Appendix F.5.2.3 occur for two consecutive quarters, Permittee shall revise the written procedures, or modify or replace the SO_2 CEMS to correct the deficiency causing the repeated excessive inaccuracy.

[40 CFR Part 60, Appendix F.5.3]

j. The Permittee shall maintain on hand and ready for immediate installation sufficient spare parts or duplicate systems for the CEMS required by this Section to allow for the replacement within six hours of any monitoring equipment part that fails or malfunctions during operation.

[A.A.C. R18-2-1302.E.5.f]

D. Recordkeeping and Reporting Requirements

1. The Permittee shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility under this Condition; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is in operative.

[40 CFR 60.7(b) and A.A.C. R18-2-306.A.3.c]

2. The Permittee shall maintain a file of all measurements, including continuous

monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this Condition recorded in a permanent form suitable for inspection. The file shall be retained for at least five years following the date of such measurements, maintenance, reports and records.

[40 CFR 60.7(f) and A.A.C. R18-2-306.A.4.b]

3. Semiannual SO_2 excess emissions and monitoring systems performance reports

a. The Permittee shall submit an Excess Emissions and Monitoring Systems Performance (EEMSP) report and/or a summary report form to the Department semiannually, unless the total duration of excess emissions for the reporting period is less than 1 percent of the total operating time for the reporting period and the continuous monitoring system downtime for the reporting period is less than 5 percent of the total operating time for the reporting period, in which case only the summary report form shall be submitted and the excess emissions report need not be submitted unless requested by the Department. All semiannual reports shall be postmarked by the 30th day following the end of each six-month period.

[40 CFR 60.7(c) and (d)]

b. The summary report form submission shall be in the format specified in 40 CFR 60.7(d). Each EEMSP report shall include the following information:

[40 CFR 60.7(d)]

(1) The magnitude of excess emissions computed, any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emissions. The process operating time during the reporting period.

(2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.

(3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments.

(4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

X. REQUIREMENTS FOR BAGHOUSES

A. Monitoring Requirements

The Permittee shall install, calibrate, maintain, and continuously operate *a baghouse leak* *detection system for each baghouse located at the facility to monitor baghouse performance.*

[CD CV-15-02206-PHX-DLR 26.a, 40 CFR 63.11148(c)(1), A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

1. Baghouses must be operated such that no bag leak detection system alarms for more than five (5) percent of the total operating time in any six (6) month period. For purposes of determining compliance with this limit, a bag leak detection system shall be deemed to alarm from the time the alarm sounds until such time as all investigation and corrective actions have been completed such that the baghouse has been restored to performance below the alarm set point. A bag leak detection system shall also be deemed to alarm during all periods that the system was not in service or believed to be malfunctioning.

   [CD CV-15-02206-PHX-DLR 26.a.v]

2. Each baghouse leak detection system must include a visual alarm that is displayed in a control room that is permanently staffed, on a twenty-four (24) hour basis.

   [CD CV-15-02206-PHX-DLR 26.a.i]

3. The baghouse leak detection systems shall meet the following specifications and requirements:

   [40 CFR 63.11148(c)(2), CD CV-15-02206-PHX-DLR 26.a.ii]

   a. Each system must be certified by the manufacturer to be capable of detecting PM emissions at concentrations that can effectively discern any dysfunctional leaks of the baghouse;

   b. Each system sensor must provide output of relative PM loadings.

   c. Each system shall be equipped with an alarm system that will sound automatically when an increase in sensor output over a preset level that is protective of the applicable PM emissions limit is detected, and the alarm must be located where it is easily heard by plant operating personnel.

   d. Each system must be installed downstream of the baghouse;

   e. Each system must be installed, operated, calibrated, and maintained in accordance with the manufacturer's written specifications and recommendations, and the Calibration system must, at a minimum, consist of establishing the relative baseline output level by adjusting the sensitivity of the device and establishing the alarm set points and the alarm delay time.

4. If a bag leak detection system alarm sounds, the Permittee must initiate investigation of the baghouse within one (1) hour of the first discovery of the alarm and, if necessary, take corrective action, in accordance with the written procedures specified in O&M Plan, as soon as practicable to adjust or repair the baghouse to minimize any increased PM emissions. The corrective actions may include, but not limited to

   [40 CFR 63.11148(c)(3), CD CV-15-02206-PHX-DLR 26.a.iii]

   a. Inspecting the baghouse for air leaks, torn or broken bags or filter media, or any other condition that may cause an increase in emissions.

b. Sealing off defective bags;

c. Replacing defective bags or otherwise repairing the control device;

d. Sealing off a defective baghouse compartment;

e. Cleaning the bag leak detection system probe, or otherwise repair the bag leak detection system; and

f. Shutting down the process producing the particulate emissions

5. The Permittee shall maintain in spare parts inventory no less than 5% of the total bags used in equipment as backup for timely replacement in case of failure.
[CD CV-15-02206-PHX-DLR 26.a.vi]

B. Inspection of Baghouses

The Permittee shall conduct weekly inspections of baghouses to ensure the equipment is functioning in accordance with the requirements of the Dust Plan.
[CD CV-15-02206-PHX-DLR B28.B.ii]

C. Recordkeeping Requirements

1. The Permittee must log in ink or electronic format and maintain a record of installation, calibration, maintenance, and operation of the bag leak detection systems.
[CD CV-15-02206-PHX-DLR 26.a.iv, 40 CFR 63.11148(c)(4)]

2. If a bag leak detection system alarm sounds, the records must include an identification of the dates, times, and durations of all bag leak detection alarms, their cause, and an explanation of the corrective actions taken, if any and the date on which corrective action was completed.
[CD CV-15-02206-PHX-DLR 26.a.iv, 40 CFR 63.11148(c)(4)]

3. The Permittee shall also record any dates, times, and durations when the bag leak detection system was not in service or believed to be malfunctioning.
[CD CV-15-02206-PHX-DLR 26.a.iv]

XI. CONVERTERS ARSENIC CHARGING RATE MONITORING REQUIREMENTS

A. General Provisions

1. The requirements of this section apply to any copper converter under this permit where the total arsenic charging rate for the copper converter department averaged over a 1-year period is less than 75 kg/hr. At such time that the Permittee becomes aware of the 1-year period average total equal to or greater than 75 kg/hr, the Permittee shall submit an application for permit revision in accordance with Section XIII, Attachment "A".
40 CFR 61.172(a)]

2. Arsenic charging rate means the hourly rate at which arsenic is charged to the copper converters based on the arsenic content of the copper matte and of any lead matte that is charged to the copper converters.
[40 CFR 61.171]

B. Monitoring Requirements

The Permittee shall determine the converter arsenic charging rate as follows:

1. Collect daily grab samples of copper matte charged to the copper converters.

[40 CFR 61.174(f)(1)]

2. Each calendar month, from the daily grab samples collected under Condition XI.B.1 above, put together a composite copper matte sample and a composite lead matte sample. Analyze the composite samples individually using Method 108A, 108B, or 108C to determine the weight percent of inorganic arsenic contained in each sample.

[40 CFR 61.174(f)(2)]

3. Calculate the converter arsenic charging rate once per month using the following equation:

[40 CFR 61.174(f)(3)]

$$Rc = \sum (i=1 \text{ to } n) : \frac{(A_c \cdot W_{ci})}{100\, H_c}$$

R_c= Converter arsenic charging rate (kg/hour or pounds/hour).

A_c= Monthly average weight percent of arsenic in the copper matte charged during the month (%) as determined under Condition IX.B.2 above.

W_{ci}= Total weight of copper matte charged to a copper converter during the month (kg or pound).

H_c= Total number of hours the copper converter department was in operation during the month.

n= Number of copper converters in operation during the month.

4. Determine an annual arsenic charging rate for the copper converter department once per month by computing the arithmetic average of the 12 monthly converter arsenic charging rate values (R_c) for the preceding 12-month period.

[40 CFR 61.174(f)(4)]

C. Recordkeeping and Reporting Requirements

1. The Permittee shall maintain at the source for a period of at least 2 years and make available to the Director upon request the following records:

   a. For all converters, a daily record of the amount of copper matte charged to the converters and total hours of operation.

   [40 CFR 61.176(c)(1)]

   b. For all converters, a monthly record of the weight percent of arsenic contained in the copper matte as determined under Condition XI.B.2.

   [40 CFR 61.176(c)(2)]

   c. For all converters, the monthly calculations of the average annual arsenic charging rate for the preceding 12-month period as determined under Condition XI.B.4.

[40 CFR 61.176(c)(3)]

2. The Permittee shall submit annually a written report to the Director that includes the monthly computations of the average annual converter arsenic charging rate as calculated under Condition XI.B.4. The annual report shall be postmarked by the 30th day following the end of each calendar year.

[40 CFR 61.177(f)]

D. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 CFR 61.171, 40 CFR 61.172(a), 40 CFR 61.174(f), 40 CFR 61.176(c)(1), 40 CFR 61.176(c)(2), 40 CFR 61.176(c)(3), and 40 CFR 61.177(f).

[A.A.C. R18-2-325]

XII. BRICK CRUSHER

A. Applicability

This Section shall be applicable to equipment associated with the Brick Crusher identified in the Equipment List as applicable to this Section.

B. Operating Limitation

1. The amount of material processed in the brick crushing plant shall not exceed 42,000 tons per year.

[Condition 8 of Installation Permit No. 1215]

2. The Permittee shall conduct refractory brick crushing operations only within the current Refractory Crushing Area, the Smithco's revert crusher, or in a fully enclosed building whose emissions are vented through a particulate matter control device, such as a baghouse or a scrubber.

[CD CV-15-02206-PHX-DLR B.5.A]

3. The Permittee shall operate a baghouse with the brick crushing plant subject to the requirements of this section with rated efficiency no lower than 99%.

[Installation Permit 1215, Conditions 2 and 3]

4. Monitoring, Recordkeeping and Reporting Requirements

   a. The Permittee shall record the date, hours of operation and process weight rate in tons-mass per hour to the brick crushing system.

   [A.A.C. R18-2-306.A.3.c]

   b. The Permittee shall maintain a record of monthly and 12-month rolling total of the material processed in the brick crushing plant.

   [A.A.C. R18-2-306.A.3.c]

C. Particulate Matter and Opacity

1. Emission Limits and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

a. Brick crushing plant

(1) *The Permittee shall continue to operate* and maintain *the ventilation system and baghouse associated with the brick crushing plant in accordance with good air pollution control practices for minimizing particulate matter emissions to the greatest extent practicable*.

[Conditions 2 and 3 of Permit 1215, CD CV-15-02206-PHX-DLR B.5.B and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

(2) Particulates captured in the baghouses shall be handled and disposed in a manner which prevents re-entrainment into the atmosphere.

[Condition 5 of Installation Permit No. 1215]

(3) All conveyor transfer points shall be enclosed.

[Condition 6 of Installation Permit No. 1215]

(4) Spray bars shall be used at every dumping and conveyor transfer point, as necessary to minimize the particulate matter emissions.

[Condition 7 of Installation Permit No. 1215]

(5) The Permittee shall, at all times, comply with the requirements applicable to uncrushed brick handling, brick

crushing operations, and storage piles for uncrushed as well as crushed brick as identified in the fugitive dust plan.

[CD CV-15-02206-PHX-DLR B.3 and 4]

3. Monitoring, Recordkeeping and Reporting Requirements

   a. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from the baghouse and all other affected facilities associated with the brick crushing plant as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

   [A.A.C. R18-2-306.A.3.c]

   b. The baseline opacity for the brick crushing plant shall be 5%, established via Method 9 evaluation on March 26, 2003.

   [A.A.C. R18-2-306.A.3.c]

      (1) If the observer sees visible emissions from the revert crushing plant that on an instantaneous basis appear to exceed the baseline level, then the observer shall if practicable take a six-minute Method 9 observation of the plume.

      [A.A.C. R18-2-306.A.3.c]

      (2) If the six-minute opacity of the plume exceeds the baseline level but is less than the opacity standard, the Permittee shall initiate corrective action, as necessary, to reduce opacity to or below the baseline level. The Permittee shall make a record of the location, date, and time of the test; the results of the Method 9 observation: and any corrective actions taken.

      [A.A.C. R18-2-306.A.3.c]

      (3) If the six-minute opacity of the plume exceeds the opacity standard, then the Permittee shall adjust or repair the controls or equipment to reduce opacity to or below the baseline level; and report the event as an excess emission for opacity.

      [A.A.C. R18-2-306.A.3.c]

      (4) If corrective actions fail to reduce opacity to or below the baseline level, the Permittee shall document all corrective action taken, and re-establish the baseline within 48 hours in accordance with Condition XII.C.3.b(5) below.

      [A.A.C. R18-2-306.A.3.c]

      (5) If necessitated by the results of the opacity monitoring, the Permittee may reestablish the baseline opacity level. Reestablishment of the baseline shall be performed by conducting 3 certified Method 9 observations, and determining the average of the 3 observations. Within 30 days of reestablishing the baseline opacity, the Permittee shall report the results to the Director. The report shall also contain a description of the need for re-establishing the baseline.

      [A.A.C. R18-2-306.A.3.c]

4. Performance Testing Requirements

The Permittee shall determine compliance with the particulate matter standards set forth in ConditionXII.C.1.a by conducting performance tests on the baghouse at least once during the permit term using EPA Reference Method 5 or 17 to determine the particulate matter concentration.

[A.A.C. R18-2-312.A]

D. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715 D, Conditions 2, 3, 5, 6 and 7 of Installation Permit No. 1215 and CD CV-15-02206-PHX-DLR B.3, B4, B.5.a and B.5.b.

[A.A.C. R18-2-325]

XIII. MATERIAL HANDLING FACILITIES

A. Applicability

1. This Section shall be applicable to the equipment identified in the Equipment list as applicable to this Sections, and material handling operations associated with the following activities:

   a. Concentrate storage, handling and unloading operations,

   b. Bedding operations

   c. Furnace and converter silica flux handling and storage operations

   d. Flash furnace feed system

   e. Converter dust handling operations

   f. Acid plant scrubber blowdown drying system

   g. Revert Screens

B. Particulate Matter and Opacity

1. Emission Limits and Standards

   a. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

   [40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60

80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

a. *The Permittee shall continue to operate* and maintain *the silo vent baghouses in accordance with good air pollution control practices for minimizing particulate matter emissions*.

[A.A.C. R18-2-306.A.3.c, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

b. The Permittee shall, at all times, comply with the requirements applicable to Concentrate Storage, Handling, and Unloading Operations, bedding operations, furnace/converter silica flux handling and storage operations, converter dust handling operations as identified in the fugitive dust plan.

[CD CV-15-02206-PHX-DLR B.6, 7, 8, 9 and 11]

3. Monitoring, Recordkeeping and Reporting Requirements

a. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from baghouses associated with material storage facilities as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

b. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from all other affected facilities as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715. D, and CD CV-15-02206-PHX-DLR B.6, 7, 8, 9 and 11.

[A.A.C. R18-2-325]

XIV. WET GAS CLEANING SYSTEM

A. Applicability

The requirements of this Section are applicable to the following equipment:

1. WGC Thickener

2. WGC Filter Press

3. WGC Filter Cake Dryer

4. WGC Filter Cake Packaging System

B. Particulate Matter and Opacity

1. Emissions Limitations and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter from the wet gas cleaning system into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from wet gas cleaning system, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

[A.A.C. R18-2-715.C]

2. Air Pollution Control Requirements

<u>Emissions from the thickener, dryer and packaging system shall be vented through a packed gas cooling tower to minimize particulate emissions</u>.

[A.A.C. R18-2-306.A.3.c and -331.A.3.c]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping, and Reporting Requirements

A certified EPA Reference Method 9 observer shall conduct a bi-weekly survey of visible emissions from the Wet Gas Cleaning equipment in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with the terms of this Section shall be deemed compliance with 40 C.F.R. § 52.126 and A.A.C. R18-2-, 715.C.

[A.A.C. R18-2-325]

ATTACHMENT "E": SMELTER (WITH 40 CFR 63 SUBPART QQQ)

I. This Attachment shall become applicable upon the effective date that the Permittee accepts all NESHAP Subpart QQQ requirements for the affected facility. The Permittee shall communicate this effective date to the EPA and Director in writing. After this effective date the Permittee shall comply with the requirements of Attachment "E" in lieu of Attachment "D".

II. GENERAL FACILITYWIDE REQUIREMENTS FROM 40 CFR 63 SUBPART QQQ

A. 40 CFR 63 Subpart QQQ General Requirements

In addition to specific requirements in this Attachment, the following general requirements shall be applicable to all National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 63 Subpart QQQ affected sources.

1. The Permittee shall comply with the following general provisions of 40 CFR Part 63, Subpart "A":

   40 CFR 63.1, 63.2, 63.3, 63.4, 63.5, 63.6 (a)-(g), 63.6 (i)-(j), 63.7 (a)(3) and (b)-(h), 63.8 excluding 63.8(a)(4), (c)(4), and (f)(6), 63.9 excluding 63.9(g)(5), 63.10 excluding 63.10(b)(2)(xiii) and (c)(7)-(8), 63.12, and 63.13-63.15.

   [40 CFR 63.1457]

2. The Permittee shall control particulate matter emissions from fugitive dust sources at the primary copper smelter by operating according to a written fugitive dust control plan that has been approved by the Director. For the purposes of complying with this requirement, the Permittee shall use the fugitive dust plan approved by EPA set forth in Attachment "B", Condition III.B .

   [40 CFR 63.1445]

3. The Permittee shall always operate and maintain the affected source, including air pollution control and monitoring equipment, in a manner consistent with good air pollution control practices for minimizing emissions at least to the levels required by 40 CFR 63 Subpart LLL.

   [40 CFR 63.1447(a)]

4. The Permittee shall develop and implement a written startup, shutdown, and malfunction plan according to the provisions in 40 CFR 63.6(e)(3).

   [40 CFR 63.1448(c)]

B. Compliance Requirements

1. The Permittee shall comply with the emission limitations, work practice standards, and operation and maintenance requirements at all times, except during periods of startup, shutdown, and malfunction as defined in 40 CFR 63.2.

   [40 CFR 63.1448(a)]

2. The Permittee shall demonstrate continuous compliance by implementing the fugitive dust control measures specified for the sources in the written fugitive dust control plan specified in Attachment "B", Condition III.B.

   [40 CFR 63.1453(f)]

C. Monitoring Requirements

1. *For each operating limit established under the capture system operation and maintenance plan for the copper converter department, the Permittee shall install*, operate, and maintain *an appropriate monitoring device according the requirements in 40 CFR 63.1452(a) to measure and record the operating limit value or setting at all times the copper converter department capture system is operating during batch copper converter Blowing*. Dampers that are manually set and remain in the same position at all times the capture system is operating are exempted from the requirements under this condition.

[40 CFR 63.1452(a) and A.A.C. R18-2-331.A.3.c]
[Material Permit Condition identified by underline]

2. Except for monitoring malfunctions, associated repairs, and required quality assurance or control activities (including as applicable, calibration checks and required zero and span adjustments), the Permittee shall monitor continuously (or collect data at all required intervals) at all times an affected source is operating.

[40 CFR 63.1452(e)]

3. The Permittee shall not use data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities in data averages and calculations used to report emission or operating levels or to fulfill a minimum data available requirement, if applicable. The Permittee shall use all the data collected during all other periods in assessing compliance.

[40 CFR 63.1452(f)]

4. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitor to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.

[40 CFR 63.1452(g)]

D. Recordkeeping Requirements

1. The Permittee shall keep the following records:

[40 CFR 63.1456(a)]

a. A copy of each notification and report submitted to comply with 40 CFR 63, Subpart QQQ, including all documentation supporting any initial notification or notification of compliance status submitted according to the requirements in 40 CFR 63.10(b)(2)(xiv).

[40 CFR 63.1456(a)(1)]

b. The records in 40 CFR 63.6(e)(3)(iii) through (v) related to startup, shutdown, and malfunction.

[40 CFR 63.1456(a)(2)]

c. Records or performance tests and performance evaluations as required in 40 CFR 63.10(b)(2)(viii).

[40 CFR 63.1456(a)(3)]

d. For each monitoring system, the Permittee shall keep records specified below:

[40 CFR 63.1456(a)(4)]

(1) Records described in 40 CFR 63.10(b)(2)(vi) through (xi).

(2) Monitoring data recorded by the monitoring system during a performance evaluation as required in 40 CFR 63.6(h)(7)(i) and (ii).

(3) Previous (i.e., superseded) versions of the performance evaluation plan as required in 40 CFR 63.8(d)(3).

(4) Records of the date and time that each deviation started and stopped, and whether the deviation occurred during a period of startup, shutdown, or malfunction or during another period.

2. Records shall be in a form suitable and readily available for expeditious review, according to 40 CFR 63.10(b)(1).

[40 CFR 63.1456(b)]

3. As specified in 40 CFR 63.10(b)(1), the Permittee shall keep each record for 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record.

[40 CFR 63.1456(c)]

4. The Permittee shall keep each record on site for at least 2 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record, according to 40 CFR 63.10(b)(1). The Permittee may keep the records off site for the remaining 3 years.

[40 CFR 63.1456(d)]

E. Notification Requirements

1. The Permittee shall submit all of the notifications in 40 CFR 63.7(b) and (c), 63.8(f)(4), and 63.9(b) through (h) by the specified dates.

[40 CFR 63.1454(a)]

2. The Permittee shall submit a notification of intent to conduct a performance test at least 60 calendar days before the performance test is scheduled to begin as required in 40 CFR 63.7(b)(1).

[40 CFR 63.1454(d)]

F. Reporting Requirements

1. The Permittee shall submit each of the following reports as applicable:

[40 CFR 63.1455(a)]

a. The Permittee shall submit a compliance report semiannually in accordance with Condition VII of Attachment "A.". The report shall contain the information in Condition II.F.2 below.

[40 CFR 63.1455(a)(1) and 1455(b)]

b. The Permittee shall submit an immediate startup, shutdown, and malfunction report if there was a startup, shutdown, or malfunction during the reporting period that is not consistent with the startup, shutdown, and malfunction plan. The Permittee shall report the actions taken for the event by fax or telephone within 2 working days after starting actions inconsistent with the plan. The Permittee shall submit the information in 40 CFR § 63.10(d)(5)(ii) by letter within 7 working days after the end of the event unless alternate arrangements have been made with the Director.

[40 CFR 63.1455(a)(2)]

2. Each compliance report shall contain the following information in Conditions II.F.2.a through II.F.2.c below and, as applicable, Conditions II.F.2.d through II.F.2.h below.

[40 CFR 63.1455(c)]

a. Company name and address.

[40 CFR 63.1455(c)(1)]

b. Statement by a responsible official, as defined in 40 CFR 63.2, with that official's name, title, and signature, certifying the accuracy and completeness of the content of the report.

[40 CFR 63.1455(c)(2)]

c. Date of report and beginning and ending dates of the reporting period.

[40 CFR 63.1455(c)(3)]

d. If there was a startup, shutdown or malfunction during the reporting period and actions were taken consistent with the startup, shutdown, and malfunction plan, the compliance report shall include the information in 40 CFR 63.10(d)(5)(i).

[40 CFR 63.1455(c)(4)]

e. If there are no deviations from any emission limitations (emission limit, operating limit, opacity limit) that apply to this source and there are no deviations from the requirements for work practice standards in 40 CFR 63, Subpart QQQ, a statement that there were no deviations from the emission limitations, work practice standards, or operation and maintenance requirements during the reporting period.

[40 CFR 63.1455(c)(5)]

f. If there were no periods during which an operating parameter monitoring system was out-of-control as specified in 40 CFR 63.8(c)(7), a statement that there were no periods during which the monitoring system was out-of-control during the reporting period.

[40 CFR 63.1455(c)(6)]

g. For each deviation from an emission limitation (emission limit, operating limit, opacity limit) and for each deviation from the requirements for work practice standards that occurs at an affected source where the Permittee is not using a continuous monitoring system to comply with the emission limitations or work practice standards in Subpart QQQ, the compliance report shall contain the information in Conditions through d above and the information in Conditions II.F.2.g(1) and II.F.2.g(2) below. This includes periods of startup, shutdown, and malfunction.

[40 CFR 63.1455(c)(7)]

(1) The total operating time of each affected source during the reporting period.

[40 CFR 63.1455(c)(7)(i)]

(2) Information on the number, duration, and cause of deviations (including unknown cause, if applicable), as applicable, and the corrective action taken.

[40 CFR 63.1455(c)(7)(ii)]

h. For each deviation from an emission limitation (emission limit, operating limit, opacity limit, and visible emission limit) occurring at an affected source where the Permittee is using an operating parameter monitoring system to comply with the emission limitation in Subpart QQQ, the Permittee shall include the information in Conditions II.F.2.a through II.F.2.d above and the information in Conditions II.F.2.h(1) through II.F.2.h(11) below. This includes periods of startup, shutdown, and malfunction.

[40 CFR 63.1455(c)(8)]

(1) The date and time that each malfunction started and stopped.

[40 CFR 63.1455(c)(8)(i)]

(2) The date and time that each monitoring system was inoperative, except for zero (low-level) and high-level checks.

[40 CFR 63.1455(c)(8)(ii)]

(3) The date, time and duration that each monitoring system was out-of-control, including the information in 40 CFR 63.8(c)(8).

[40 CFR 63.1455(c)(8)(iii)]

(4) The date and time that each deviation started and stopped, and whether each deviation occurred during a period of startup, shutdown, or malfunction or during another period.

[40 CFR 63.1455(c)(8)(iv)]

(5) A summary of the total duration of the deviation during the reporting period and the total duration as a percent of the total source operating time during that reporting period.

[40 CFR 63.1455(c)(8)(v)]

(6) A breakdown of the total duration of the deviations during the reporting period into those that are due to startup, shutdown, control equipment problems, process problems, other known causes, and other unknown causes.

[40 CFR 63.1455(c)(8)(vi)]

(7) A summary of the total duration of monitoring system downtime during the reporting period and the total duration of monitoring system downtime as a percent of the total source operating time during that reporting period.

[40 CFR 63.1455(c)(8)(vii)]

(8) A brief description of the process units.

[40 CFR 63.1455(c)(8)(viii)]

(9) A brief description of the monitoring system.

[40 CFR 63.1455(c)(8)(ix)]

(10) The date of the latest monitoring system certification or audit.

[40 CFR 63.1455(c)(8)(x)]

(11) A description of any changes in continuous monitoring systems, processes, or controls since the last reporting period.

[40 CFR 63.1455(c)(8)(xi)]

3. The Permittee shall report all deviations from the applicable requirements of 40 CFR 63, Subpart QQQ in the semiannual monitoring report required pursuant to Condition II.F.1 above. If the semiannual compliance report includes all required information concerning deviations from any emission limitation (including any operating limit), or work practice requirement in Subpart QQQ, submission of the compliance report is deemed to satisfy the obligation to report the same deviations in the semiannual monitoring report. However, submission of a compliance report does not otherwise affect any obligation the Permittee may have to report deviations from permit requirements to the Director.

[40 CFR 63.1455(d)]

G. Permit Shield

Compliance with the Conditions under this Section shall be deemed compliance with 40 CFR 63.1445(a), 63.1447(a) and (b), 63.1448(a), (c), 63.1452(a), (e), (f) and (g), 63.1453(f), 63.1454(a) and (d), 63.1455(a), (b), (c) and (d), 63.1456(a), (b), (c) and (d), and 63.1457.

[A.A.C. R18-2-325]

III. FACILITYWIDE LIMITATIONS FOR SMELTER

A. Operational Limitations

1. *Unless otherwise specified in this Attachment, the Permittee shall only use natural gas fuel for operation of the flash furnace burners, converters, concentrate dryers, and anode furnaces, except for natural gas curtailment periods when the natural gas is not available. During the curtailment periods, the Permittee shall be allowed to use low sulfur fuel as emergency backup to fire the concentrate dryers and anode furnaces*. For the purpose of this Condition, the curtailment periods shall not include durations when the natural gas market price is considered high for any reason.

[Condition I.E of Operating Permit No. 1000042, A.A.C. R18-2-331.A.3.a]
[Material permit conditions are indicated by italics and underline]

2. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition I.E of Operating Permit No. 1000042.

[A.A.C. R18-2-325]

B. Feed Limitations

1. Throughput Restrictions

The Permittee shall limit the maximum feed rate of concentrate to 693,500 tons per year into the flash furnace, calculated as a 365-day rolling sum.

[Condition XVI.B.1 of Permit No. 60647, A.A.C. R18-2-306.01 and A.A.C. R18-2-331.A.3.a]

2. Monitoring, Recordkeeping, and Reporting Requirements

   a. *No later than June 1, 2019, the Permittee shall install, calibrate*, maintain, and operate *a measurement system that will measure and record the weight, or other parameter from which weight can be derived, of the Copper-Bearing Feed charged to the smelting vessel on a daily basis (each 24-hour block encompassing a complete calendar day). The measurement system shall be capable of ascertaining the weight of the Copper-Bearing Feed with an accuracy of +/- two (2) percent. The measurement system shall be calibrated at a minimum once per month, or more frequently if recommended by the manufacturer*.

   [CD CV-15-02206-PHX-DLR 24.a and A.A.C. R18-2-331.A.3.c]
   [Material permit conditions are identified by italics and underline]

   b. At the end of each calendar day, the Permittee shall calculate and record the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel.

   [CD CV-15-02206-PHX-DLR 24.c]

   c. The Permittee shall log and maintain daily records of the amounts of concentrate feed to the flash furnace. At the end of each day, the Permittee shall update the 365-day rolling total of concentrate feed. These records shall be available to ADEQ upon request.

   [A.A.C. R18-2-306.A.3.c]

   d. The Permittee shall keep a monthly record of the total smelter charge and the weight percent (dry basis) of arsenic, antimony, lead and zinc contained in the charge. The analytical methods and procedures employed to determine the weight of the total smelter charge and the weight percent of arsenic, antimony, lead and zinc shall be approved by the Director and shall be accurate within plus or minus 10 percent.

   [40 C.F.R. 60.165(a)]

3. Permit Shield

   Compliance with the Conditions under this Subsection shall be deemed compliance with 40 C.F.R. 60.165(a), Condition XVI.B.1 of Permit No. 60647, and CD CV-15-02206-PHX-DLR 24.a and 24.c.

   [A.A.C R18-2-325]

C. Capture Systems Requirements

1. *At all times when copper matte or slag is tapped from the smelting furnace, the Permittee shall operate a capture system that collects the gases and fumes released from the tapping port in use. The design and placement of this capture system shall be such that the tapping port opening, launder, and receiving vessel (e.g., ladle, slag pot) are positioned within the confines or influence of the capture system's ventilation draft during those times when the copper matte or slag is flowing from the tapping port opening.*

   [40 CFR 63.1444(b)(2)(i), CD CV-15-02206-PHX-DLR 19, A.A.C. R18-2-331.A.3.e]
   [Material permit conditions are indicated by italics and underline]

2. *<u>The Permittee shall operate a capture system that collects the process off gas vented from each batch copper converter. At all times when one or more batch copper converters are Blowing, the Permittee shall operate the capture system according to the written operation and maintenance plan that has been prepared according to the requirements in Condition III.C.2 of Attachment "B".</u>* The capture system design shall include use of a primary hood that covers the entire mouth of the converter vessel when the copper converter is positioned for Blowing. Additional hoods (e.g., secondary hoods) or other capture devices must be included in the capture system design as needed to achieve the opacity limit in Condition III.D.1.d. The capture system design may use multiple intake and duct segments through which the ventilation rates are controlled independently of each other, and individual duct segments may be connected to separate control devices.

[40 CFR 63.1444(d)(1) and (2), A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

3. *<u>At all times that a vessel is used for the production of copper matte, blister copper, or refined anode copper, the Permittee shall operate one or more capture systems to collect gases and fumes released from such production and convey each collected gas stream from the primary and secondary ventilation systems to a baghouse or other particulate matter control device</u>*. The Permittee shall at all times, including periods of startup, shutdown, and/or malfunction, implement good air pollution control practices to minimize emissions from control devices, including capture systems and PM control devices.

[CD CV-15-02206-PHX-DLR 7 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

4. At all times material is being processed in the copper converter department, the Permittee shall operate a capture system that:

[CD CV-15-02206-PHX-DLR 8]

   a. Collects the process off gas vented from each copper converter;

   b. Includes the use of a primary hood that covers the entire mouth of the converter vessel when the copper converter is Blowing; and

   c. Includes the use of a secondary hood at all times when each copper converter is Blowing or is engaged in secondary operations. All gases captured by a primary hood shall be routed to the acid plant.

5. All gases captured by the secondary hoods shall be routed to either the acid plant or the secondary baghouse. Upon installation of each improved hooding capture system, all gases captured by an improved secondary hood while that converter is Blowing shall be routed to the acid plant.

[CD CV-15-02206-PHX-DLR 8.c]

6. Upon installation, the tertiary hooding system shall be operated at all times that material is being processed in the copper converter department.

[CD CV-15-02206-PHX-DLR 8.d]

7. The Permittee shall identify monitoring parameters and limits that will ensure, to the maximum extent practicable, that each hooding system is consistently operated in a manner so as to maximize gas capture and minimize fugitive emissions.

[CD CV-15-02206-PHX-DLR 9]

8. No later than December 1, 2019, at all times that any hooding in the improved gas capture system is operational, the Permittee shall continuously comply with the operational parameters and limits in the Operation and Maintenance Plan required pursuant to Attachment "B", Condition III.C.1. Also, no later than December 1, 2019, The initial operating limits shall be as below unless and until an alternative parameter and/or limit is approved by EPA:

[CD CV-15-02206-PHX-DLR 9.a]

a. Primary Hooding

A minimum air infiltration ratio for a primary hood of 1:1 during all times of converter Blowing at the converter served by that hood, averaged over 24 converter Blowing hours and rolled hourly. The minimum air infiltration ratio shall be calculated by comparing:

(1) The measured volumetric flow rate in the ductwork leaving the primary hood less the volumetric flow rate of tuyere Blowing; and

(2) The measured volumetric flow rate of tuyere Blowing.

b. Secondary Hooding

(1) A minimum exhaust rate of 35,000 SCFM for a secondary hood during all times of converter Blowing at the converter served by that hood, averaged over 24 converter Blowing hours and rolled hourly.

(2) A minimum exhaust rate of 133,000 SCFM for a secondary hood during all non-Blowing operations (including receiving matte and other charged materials, skimming slag, and casting copper) at the converter served by that hood, averaged over 24 converter non-Blowing operations hours and rolled hourly.

(3) A minimum negative pressure drop across the secondary hood when secondary hood doors are in the closed position equivalent to 0.03 millimeters of mercury (0.007 inches of water).

c. Tertiary Hooding

A minimum exhaust rate of 400,000 actual cubic feet per minute (ACFM) for the tertiary hooding during all times material is being processed in the copper converter department, averaged over 24 hours of converter department material processing and rolled hourly.

9. Capture System Monitoring Requirements

a. _No later than December 1, 2019, the Permittee shall install, calibrate_, maintain, and operate _a monitoring device that continuously records the volumetric flow rate or other parameter that has a direct relationship to volumetric flow rate for one or more hoods, at a representative point in the hooding system and in accordance with good engineering practices_

<u>for each of the primary hoods, each of the secondary hoods, and the tertiary hood</u>.

[CD CV-15-02206-PHX-DLR 9.b and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

(1) Upon installation of each primary hood, the Permittee shall also install, calibrate, maintain, and operate a monitoring device that continuously records the volumetric flow rate of tuyere Blowing at that primary hood.

(2) All monitoring devices shall have an accuracy of plus or minus 10 percent over the normal process operating range and must be calibrated according to manufacturer's instructions.

(3) If the Permittee wishes to monitor and record a parameter other than volumetric flow rate at one or more of the monitoring locations, the Permittee must, no later than June 1, 2019, submit to EPA for approval a detailed proposal that includes the following:

(a) Identification of parameter(s) to be monitored in lieu of volumetric flow rate;

(b) Identification of where in the hooding system such monitor(s) would be placed and how such location will give appropriate and representative measurements in accordance with good engineering practices;

(c) a detailed explanation, including sample calculations, of how such parameter(s) has a direct relationship to volumetric flow rate in the hooding system and how such parameter(s) will allow the Permittee to have sufficient information to ensure proper operation in accordance with design at all times, including detecting any degraded hooding performance over time (i.e. decreased fan performance, buildup in the ducting, holes in the ducting, etc.); and

(d) Proposed limit(s), including sample calculations, for the selected parameter(s) that would replace a relevant limit set forth in Condition III.C.8 (Default Hooding Operational Parameters and Limits) above and a demonstration of how such limit(s) correlates to equivalent performance and operation of the relevant hooding.

(e) If EPA approves the Permittee's proposal, the proposed limit(s) shall replace the relevant volumetric flow rate limit specified in Condition III.C.8 and shall be enforceable thereunder.

b. No later than December 1, 2019, the Permittee may propose alternative limit(s) to replace a limit set forth in Condition III.C.8 above (or substituted pursuant Condition III.C.9.a(3) above). In any such proposal, the Permittee shall have the burden of demonstrating that each proposed alternative limit(s) will not lead to additional emissions and will not reduce the capture efficiency of the improved gas capture system, as compared to the emissions and efficiencies achieved or achievable by operation of the hooding systems in compliance with the limit to be replaced in Condition III.C.8. Such demonstration shall include a detailed description of the rationale(s) for the proposed alternative limit(s) as required in CD CV-15-02206-PHX-DLR 9.c. If EPA approves the Permittee's proposal, the proposed alternative limit(s) shall be considered to replace the relevant limit in Condition III.C.8 and shall be enforceable thereunder.

[CD CV-15-02206-PHX-DLR 9.c]

10. The Permittee shall demonstrate continuous compliance of the copper converter department capture system by meeting the following requirements:

[40 CFR §63.1453(b)]

a. Operate the copper converter department capture system at all times during Blowing at or above the lowest values or settings established for the operating limits and demonstrated to achieve the opacity limit according to the applicable requirements of 40 CFR Subpart 63;

b. Inspect and maintain the copper converter department capture system according to the applicable requirements in 40 CFR §63.1447 and recording all information needed to document conformance with these requirements;

c. Monitor the copper converter department capture system according to the requirements in 40 CFR §63.1452(a) and collecting, reducing, and recording the monitoring data for each of the operating limit parameters according to the applicable requirements of this 40 CFR Subpart 63; and

d. Conduct subsequent performance tests according to the requirements of §63.1450(c) following the initial performance test no less frequently than once per year to demonstrate that the opacity of any visible emissions exiting the roof monitors or roof exhaust fans on the building housing the copper converter department does not exceed 4 percent opacity.

11. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 63.1444(d)(1) and (2), 63.1453(b) and CD CV-15-02206-PHX-DLR 7, 8, 8.c, 8.d, 9, 9.a, 9.b, 9.c and 19.

[A.A.C R18-2-325]

D. PM and Opacity

1. Emission Limits

a. *Upon CRP startup, the Permittee shall not exceed the combined particulate matter emissions limit from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams of 197.3 tons per year (filterable only) on 12-month rolling total* *basis.*

[Condition XVI.C.2.a of SPR 60647, A.A.C. R18-2-306.02.A and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. No later than December 1, 2019, the Permittee shall comply with the following emission limits from any combination of stacks, vents, or other openings on furnaces, reactors, or other types of process vessels used for the production of anode copper from copper sulfide ore concentrates. Such process equipment shall include all processing steps from the copper concentrate dryers through the anode casting department, inclusive of those end points.

[CD CV-15-02206-PHX-DLR 24]

(1) At all times that the average rate of copper-bearing feed into the smelting flash furnace over a 2-day period (48-hour block encompassing 2 complete calendar days) is greater than or equal to twenty-five (25) tons per hour, including periods of startup, shutdown, and malfunction, the Permittee shall not discharge to the atmosphere exhaust gases that contain total PM in excess of 0.6 pounds per ton of Copper-Bearing Feed charged to the smelting vessel on a rolling 2-day average basis (each 48-hour block encompassing 2 complete calendar days) rolled daily (each 24 hours).

(2) At all other times, the Permittee shall not discharge to the atmosphere exhaust gases that contain total PM in excess of fifteen (15) pounds per hour, as determined on a daily average basis (each 24-hour block encompassing a complete calendar day), including periods of startup, shutdown, and malfunction.

c. No later than December 1, 2020, the Permittee may submit to EPA a request for an alternative emissions breakpoint to more closely match the actual emission profile. The proposed breakpoint in any such request shall not be greater than fifty (50) tons per hour, corresponding to an emission rate of thirty (30) pounds per hour as determined on a daily average basis. EPA may grant or deny the request in whole or in part, subject to Dispute Resolution under Section XIII of the CD.

[CD CV-15-02206-PHX-DLR 24.e]

d. No later than one hundred eighty (180) days after completion of the Converter Aisle Retrofit Project, the Permittee shall operate the gas capture systems such that any visible emissions exiting the roof of the building housing the copper converter department meet an opacity limit of four (4) percent based on EPA Method 9, including periods of startup, shutdown, and malfunction.

[40 CFR 63.1444(d), CD CV-15-02206-PHX-DLR 12]

2. Air Pollution Control Requirements

a. *The Permittee shall operate the Inter-pass Absorption Tower and Final Absorption tower in the acid plant to control particulate matter emissions from the flash furnace, converters and converter secondary hood during*

Blowing operations.

[Condition XVI.C.2.b(1) of SPR 60647 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

b. *The Permittee shall operate* and maintain *a baghouse to minimize particulate emissions from the converter secondary hood capture system*.

[Condition XVI.C.2.b(2) of SPR 60647 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

c. *Upon startup of CRP the Permittee shall install, operate* and maintain a *vent gas baghouse to minimize particulate emissions from the flash furnace matte tapping and slag skimming operations*.

[Condition XVI.C.2.b(3) of SPR 60647 and A.A.C. R18-2-331.A.3.d and e]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping and Reporting Requirements

a. *The Permittee shall calibrate*, maintain, and continuously *operate the Inter-pass Absorption Tower and Final Absorption Tower acid flow meters in accordance with the manufacturer's specifications*. The system shall record block hourly values of the acid flows.

[Condition XVI.C.2.f(1) of SPR 60647 and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

b. *The Permittee shall install, calibrate*, maintain, and operate *bag leak detection systems (BLDS) for the secondary hood baghouse and vent gas baghouse in accordance with Section X of this Attachment*.

[Condition XVI.C.2.f(2) of SPR 60647, CD CV-15-02206-PHX-DLR 26.a and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. *The Permittee shall install, certify*, operate and maintain *PM CEMS on the following streams in accordance with the requirements in Condition IX.B of this Attachment*:

(1) Vent Gas Baghouse Gas Stream

(2) Acid Plant Tail Gas Stream

(3) Secondary Hood Baghouse Gas Stream

(4) Tertiary Hooding Gas Stream

(5) Anode Furnaces Baghouse Gas Stream

d. Opacity Monitoring for Buildings

Except as provided in III.D.3.d(3) below, within six (6) months of completion of the initial Fugitive Emissions Study, the Permittee shall install and continuously operate *three (3) long-path optical density/opacity monitors on the outside of the building housing the flash furnace, converters, and anode furnaces*. The optical density/opacity monitors shall be designed and installed to maximally cover areas where fugitive emissions may exit the building, as identified during the initial Fugitive Emissions Study, and each optical density/opacity monitor shall be calibrated to measure opacity from approximately 0 to 10% over the full range of the instrument.

[CD CV-15-02206-PHX-DLR 23 and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

(1) For any instance of measurable opacity greater than 4% over a six (6) minute period exiting the building housing the flash furnace, converters, and anode furnaces, the Permittee shall take one or more corrective actions within thirty (30) minutes of the commencement of the event to abate the opacity, including but not limited to the following:

(a) Increasing secondary and tertiary hood exhaust rates,

(b) Closing primary and secondary hood doors, and/or

(c) Making adjustments to materials handling operations within the building. The Permittee shall document all measures taken to address the opacity event as well as the final resolution of the problem.

(2) If the corrective actions pursued by the Permittee fail to control the opacity event within one (1) hour of the start of the event, the Permittee shall perform a root cause analysis within seventy-two (72) hours after any instance of measurable opacity greater than 4% over a six (6) minute period, which would identify the cause of the visible emissions and 1) propose permanent operational adjustments or other corrective actions to prevent recurrence as a result of the identified cause; and/or 2) provide the EPA with an analysis of why a specific operational process or step leads to fugitive emissions of limited duration and opacity that cannot reasonably be eliminated or sufficiently controlled to prevent visible emissions. The Permittee shall submit to EPA for review and approval the root cause analysis, along with the recommended corrective actions and/or request for approval of a limited duration for allowed visible emissions associated with a particular operational activity, and the Permittee's documentation of all measures taken to address the emissions at the time of the event, as described in Condition III.D.3.d(1). In no case shall such submittal seek allowance of fugitive emissions with opacity of greater than 5% over a fifteen (15) minute period, as measured by an optical density/opacity monitor. Once approved by EPA, any new operational adjustments or other corrective actions shall become permanent and ongoing enforceable requirements of this Consent Decree.

(3) After at least two (2) years of operation of the long-path optical density/opacity monitors, the Permittee may attempt to demonstrate that it is infeasible or overly burdensome in relation to the benefits to continue operating one or more of the long-path optical density/opacity monitors. As part of such demonstration, the Permittee shall submit to EPA an

analysis of operation and maintenance of such monitor to-date, to include a summary of measurements triggering corrective actions, corrective actions taken, and all root cause analyses performed in response to monitor readings. If EPA rejects the Permittee's demonstration that it is infeasible or overly burdensome in relation to the benefits to continue operating one or more of the long-path optical density/optical monitors, such conclusions are subject to Dispute Resolution pursuant to Section XIII of the CD. Operation of a long-path optical density/optical monitor shall be considered infeasible if (a) the monitor cannot be kept in working condition for sufficient periods of time to produce reliable, adequate, or useful measurements; or (b) recurring, chronic, or unusual equipment adjustment, servicing, or replacement needs cannot be resolved through reasonable expenditures of resources. If EPA determines that operation is infeasible or overly burdensome in relation to the benefits, the Permittee shall be entitled to discontinue operation of and remove the long-path optical density/optical monitor.

4. Performance Test Requirements

a. Performance Test for Particulate Matter

[Condition XVI.C.2.c of SPR 60647, A.A.C. R18-2-312 and A.A.C. R18-2-306.A.3.c]

(1) No later than 180 days after CRP startup, the Permittee shall conduct or cause to be conducted, an initial performance test on the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams for particulate matter emissions. Subsequent performance tests shall be conducted annually. EPA Reference Method 5 in 40 CFR 60 Appendix A shall be used to determine particulate matter emissions.

(2) In addition to EPA Reference Method 5 in 40 CFR 60 Appendix A to determine the emissions of PM, the Permittee shall use Reference Method 201 or 201A and Method 202 specified in 40 CFR 51, Appendix M to determine emissions of PM_{10} and $PM_{2.5}$.

b. Performance Test for Roofline Opacity

(1) Within sixty (60) days after completion of the Converter Aisle Retrofit Project, the Permittee shall prepare, and submit to EPA for review and approval a written performance test plan for determining compliance with this opacity standard in Condition III.D.1.d. The test plan shall contain all information required under 40 C.F.R. § 63.1450(c). Within ninety (90) days after approval from EPA, the Permittee shall conduct a performance test in accordance with 40 C.F.R. § 63.1450(c) to determine compliance with this opacity standard. In addition to viewing the building roof monitor sections, each visible emission observer shall also make note

of the opacity of any visible plumes exiting the roofline from the sides or any other outlet. In accordance with 40 C.F.R. § 63.1450(c)(4)(ii), in situations when it is possible for an observer to distinguish two or more visible emission plumes from the building roof monitor sections or roof exhaust fan outlets, the observer must identify, to the extent feasible, the plume having the highest opacity and record his or her opacity reading for that plume as the opacity value for the 15-second interval.

[CD CV-15-02206-PHX-DLR 12.a]

(2) The Permittee shall conduct additional performance tests at least once each three hundred sixty-five (365) day period following the initial performance test. Any credible evidence, including opacity testing performed in accordance with EPA Method 9 (notwithstanding its consistency with Subpart QQQ test procedures), evidence collected by means specified in 40 § C.F.R. 63.1450(c), and evidence collected by means other than those specified in 40 § C.F.R. 63.1450(c), can be used to demonstrate noncompliance with the 4% roofline opacity.

[CD CV-15-02206-PHX-DLR 12.b]

(3) For each performance test conducted to demonstrate compliance with an opacity limit under Condition III.D.1.d, the Permittee shall keep the following records:

[40 CFR 63.1456(a)(5)]

(a) Dates and time intervals of all opacity observation period segments;

(b) Description of overall smelter operating conditions during each observation period. Identify, if any, the smelter copper production process equipment that was out-of-service during the performance test and explain why this equipment was not in operation;

(c) Name, affiliation, and copy of current visible emission reading certification for each visible emission observer participating in performance test;

(d) Name, title, and affiliation for each indoor process monitor participating in the performance test;

(e) Copies of all visible emission observer opacity field data sheets;

(f) Copies of all indoor process monitor operating log sheets;

(g) Copies of all data summary sheets used for data reduction;

(h) Copy of calculation sheets of the average opacity value used to demonstrate compliance with the opacity limit; and

(i) Certify in the performance test report that during all observation period segments, the copper converter department capture system was operating at the values or settings established in the capture system operation and maintenance plan.

5. Compliance Requirements

a. Compliance with PM emission limit in Condition III.D.1.a

[Condition XVI.C.2.d of SPR 60647]

(1) The Permittee shall calculate PM emissions in pounds per hour in the acid plant tail gas, secondary hood baghouse, vent gas baghouse or and tertiary ventilation streams based on the most recent performance test in accordance with Condition III.D.4.a.

(2) The Permittee shall maintain records of hours of operation of the following: acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams. If any emission unit associated with a stream operates during a calendar hour, it will constitute an operating hour. If no emission unit associated with a stream operates during a calendar hour, it will not constitute an operating hour.

(3) The Permittee shall calculate and record monthly emissions for the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams for PM based on the hourly emissions calculated in Condition III.D.5.a(1) and the monthly operating hours for each stream recorded in Condition III.D.5.a(2).

(4) No later than the fifth working day of the following month, the Permittee shall calculate and record rolling 12-month total of combined PM emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in III.D.5.a(3) to demonstrate compliance with the emission limit in Condition III.D.1.a.

b. Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emissions

[Condition XVI.C.2.e of SPR 60647]

(1) The Permittee shall calculate hourly PM, PM_{10} and $PM_{2.5}$ emissions (Filterable + Condensable) from each stream based on most recent performance test in accordance with Condition.III.D.4.a(2)

(2) The Permittee shall calculate and record monthly emissions for the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams for PM, PM_{10} and $PM_{2.5}$ based on the hourly emissions calculated in Condition III.D.5.b(1) and the monthly operating hours for each stream

recorded in Condition III.D.5.a(2).

(3) No later than the fifth working day of the following month, the Permittee shall calculate and record rolling 12-month total of combined PM, PM_{10} and $PM_{2.5}$ emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in Condition III.D.5.b(2)

(4) Based on the Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emissions data for 3 years, the Permittee shall apply for a permit revision no later than 180 days after completion of the third performance test pursuant to Condition III.D.4.a(2) for incorporation of emission limits for Filterable + Condensable PM, PM_{10} and $PM_{2.5}$ emission limits.

c. Compliance with Total PM Limit in Condition III.D.1.b(1)

(1) At the end of each calendar day, the Permittee shall calculate and record the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel.

[CD CV-15-02206-PHX-DLR 24.c]

(2) If the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel is greater than or equal to twenty-five (25) tons per hour, then the Permittee shall calculate and record the 2-day average pounds of total PM per ton of Copper-Bearing Feed charged to the smelting vessel for the preceding 48-hour period.

[CD CV-15-02206-PHX-DLR 24.c]

(3) If the 2-day average tons of Copper-Bearing Feed charged to the smelting vessel is less than twenty-five (25) tons per hour, then the Permittee shall calculate and record the daily average pounds of total PM per hour for the preceding 24-hour period.

[CD CV-15-02206-PHX-DLR 24.c]

(4) Emission Calculation Procedure

[CD CV-15-02206-PHX-DLR 24.b]

(a) PM emissions from the acid plant, Secondary Hood Baghouse, Vent Gas Baghouse, Tertiary Hood Exhaust, and Anode Furnace Baghouse shall be calculated based on data collected from the PM CEMS.

(b) PM emissions from the Tertiary Hood Exhaust and any other emission point receiving off-gas from process equipment subject to the emissions limits shall be calculated based on data collected from a certified PM CEMS installed to measure such gas stream or, if no certified PM CEMS exists for a gas stream, engineering estimates based on one or more of the following, as available: stack test data, CPMS data, COMS data, and other process data.

(c) The Permittee shall determine and record the 2-day (each 48- hour block encompassing 2 complete calendar days) or, if necessary, daily (24-hour block encompassing a complete calendar day) value of PM emissions for each of these gas streams.

(d) The sum of those values shall be added to an estimate of 48-hour or, if necessary, daily fugitive PM emissions from all process equipment subject to the emission limits in Condition III.D.1.b(1), to include all fugitive emissions from the building(s) housing the flash furnace, copper converter department, and anode furnace and production operations.

(e) In the event that one or more certified PM CEMS on a relevant gas stream is malfunctioning for a portion or the entirety of any day, the Permittee shall use the eighth highest daily value of PM emissions that has been recorded at that CEMS in the previous six (6) months.

(f) Daily and 48-hour fugitive PM emissions shall be calculated based upon emission factors established during the most recent Fugitive Emissions Study. Prior to completion of the initial Fugitive Emissions Study required under CD, estimates from the 1994/1995 Fugitive Emissions Study shall be used for purposes of this calculation.

d. The Permittee shall maintain records of the calculations of pounds per ton, and pounds per hour rates and all supporting information and data.

[CD CV-15-02206-PHX-DLR 24.d]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Conditions XVI.C.2.a, b, c, d, e and f of SPR 60647, 40 CFR 63.1444(d) and 63.1456(a)(5), and CD CV-15-02206-PHX-DLR 12, 12.a, 12.b, 23, 24, 24.b, 24.c, 24.d and 26.a.

[A.A.C R18-2-325]

E. Sulfur Dioxide (SO_2)

Note: *The Permittee shall comply with the requirements under Attachment "F" in addition to requirements under this Subsection until A.A.C, R18-2-715.I is approved into SIP by EPA. All the requirements from A.A.C. R18-2-B1302 (Limits on SO_2 Emissions from the Hayden Smelter) are State Enforceable only until A.A.C. R18-2-B1302 is approved into Arizona SIP by EPA.*

1. Definitions

[A.A.C. R18-2-B1302.B]

a. "Operating day" means any calendar day in which any of the following occurs:

(1) Concentrate is smelted in the smelting furnace;

(2) Copper or sulfur bearing materials are processed in the converters;

(3) Blister or scrap copper is processed in the anode furnaces;

(4) Molten metal, including slag, matte or blister copper, is transferred between vessels; or

(5) Molten metal is cast into anodes or other intermediate or final products.

b. "Out of control period" means the time that begins with the completion of the fifth, consecutive, daily calibration drift check with a calibration drift in excess of two times the allowable limit, or the time corresponding to the completion of the daily calibration drift check preceding the daily calibration drift check that results in a calibration drift in excess of four times the allowable limit, and the time that ends with the completion of the calibration check following corrective action that results in the calibration drifts at both the zero (or low-level) and high level measurement points being within the corresponding allowable calibration drift limit.

c. "Continuous emissions monitoring system" or "CEMS" means the total equipment, required under the emission monitoring provisions in this Chapter, used to sample, condition (if applicable), analyze, and to provide, on a continuous basis, a permanent record of emissions.

2. Emission Limits

a. *The combined SO_2 emissions from exit of the acid plant tail gas, secondary hood baghouse, vent gas baghouse and the tertiary ventilation system shall not exceed 22,000 tons per year on a 365-day rolling total basis*.
[Conditions XVI.C.1.a of Permit 60647, A.A.C. R18-2-306.02.A and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. *No later than July 1, 2018, emissions from the Main Stack shall not exceed 1069.1 pounds per hour on a 14-operating day average unless 1,518 pounds or less is emitted during each hour of the 14-operating day period*.
[A.A.C. R18-2-B1302.C.1 and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

c. The Permittee shall not cause to be discharged into the atmosphere from any affected unit under 40 CFR 60, subpart P any gases which contain sulfur dioxide in excess of 0.065 percent by volume (the limit set forth in 40 CFR § 60.163(a)) (as in effect on July 1, 2016 and no later editions).
[40 CFR 60.163(a), A.A.C. R18-2-B1302.C.2]

3. Air Pollution Control Requirements

At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and *operate smelter processes and associated emission control and/or control equipment in a manner consistent with good air pollution control practices for minimizing SO_2 emissions to the levels required Condition III.E.2.b.* Determination of whether acceptable operating and maintenance procedures are being used will be based on all information available to the Director and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, and inspection of the relevant equipment.

[A.A.C. R18-2-B1302.D.1 and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are identified by italics and underline]

4. Monitoring Requirements

a. *Except during periods of systems breakdown, repairs, maintenance, out-of-control periods, calibration checks, and zero and span adjustments, the Permittee shall install, calibrate*, maintain, and operate *CEMS for continuously monitoring and recording SO_2 concentrations and stack gas volumetric flow rates at the following locations accordance with the requirements in Condition IX.C of this Attachment.*

[A.A.C. R18-2-1302.E1 and 2]

(1) The exit of the acid plant;

(2) The exit of the secondary hood particulate control device after the High Surface Area (HSA) lime injection system;

(3) The exit of the flash furnace particulate control device after the HSA lime injection system;

(4) The tertiary ventilation system prior to mixing with any other exhaust streams; and

(5) The anode furnace baghouse stack prior to mixing with any other exhaust streams.

b. If the Permittee can demonstrate to the Director that measurement of stack gas volumetric flow rate in the outlet of any particular SO_2 control equipment would yield inaccurate results or would be technologically infeasible, the Director may allow measurement of the flow rate at an alternative sampling point.

[A.A.C. R18-2-1302.E.4]

c. The Permittee may petition the Department to substitute annual stack testing for the tertiary ventilation or the anode furnace baghouse stack SO_2 CEMS if the Permittee demonstrates, for a period of two years, that either CEMS contribute(s) less than five percent individually of the total sulfur dioxide emissions. The Department must determine the demonstration adequate to approve the petition. Annual stack testing shall use EPA Methods 1, 4, and 6C in 40 CFR 60 Appendix A or an alternate method approved by the Department and EPA Region IX. Annual stack testing shall commence no later than the one year after the date the continuous emission monitoring system was removed. The Permittee shall submit a test protocol to the Department at least 30 days in advance of testing. The protocol shall provide for three or more 24-hour runs unless the Permittee justifies a different period and the Department approves such different period. Reports of testing shall be submitted to the Department no later than 60 days after testing or 30 days after receipt, whichever is later. The report shall provide an emissions rate, in the form of a pound per hour or pound per unit of production factor that shall be used in the compliance demonstration. Except as provided herein, the Permittee shall otherwise comply with A.A.C. R18-2-312 in conducting such testing.

[A.A.C. R18-2-1302.E.6]

5. Compliance Requirements

a. Compliance with Emission Limit in Condition III.E.2.a

(1) No later than 180 days after CRP startup, the Permittee shall demonstrate compliance with SO_2 emission limits in Condition III.E.2.a in accordance with following:

[Conditions XVI.C.1.a of Permit 60647, A.A.C. R18-2-306.A.3.c]

(a) The Permittee shall calculate and record daily total SO_2 emissions from acid plant tail gas, secondary hood baghouse, vent gas baghouse and the tertiary capture system streams based on CEMS.

(b) At the end of each day, the Permittee shall calculate and record daily and 365-day rolling total of SO_2 emissions from the acid plant tail gas, secondary hood baghouse vent gas baghouse and the tertiary ventilation system streams to demonstrate compliance with the emission limit in Condition III.E.2.a.

b. Compliance with Emission Limit in Condition III.E.2.b

For purposes of determining compliance the Permittee shall calculate emissions for each operating day as follows. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit

[A.A.C. R18-2-B1302.F.1 and 4]

(1) Sum the hourly pounds of SO_2 vented to each uncontrolled shutdown ventilation flue and through each monitoring point listed in Condition III.E.4.a for the current operating day and the preceding 13-operating days to calculate the total pounds of SO_2 emissions over the 14-operating day averaging period, as applicable.

(2) Divide the total amount of SO_2 emissions calculated from Condition III.E.5.b(1) by 336 to calculate the 14-operating day average SO_2 emissions.

(3) If the calculation in Condition III.E.5.b(1) exceeds 1069.1 pounds per hour, then the Permittee shall sum the hourly

pounds of SO_2 vented to each uncontrolled shutdown ventilation flue and through each monitoring point listed in Condition III.E.4.a for each hour of the current operating day and each hour of the preceding 13-operating days to ascertain if any hour exceeded 1,518 pounds per hour.

c. The Permittee shall demonstrate compliance with the limit in Condition III.E.2.c in accordance with the following. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit.

[A.A.C. R18-2-B1302.F.4 and 5]

(1) The Permittee shall utilize SO_2 CEMS to determine the SO_2 concentrations on a dry basis. The sampling time for each run shall be 6 hours. Six-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the four consecutive 6-hour periods of each operating day. Each six-hour average shall be determined as the arithmetic mean of the appropriate six contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system The monitoring system drift during the run may not exceed 2 percent of the span value.

[40 CFR 60.165(c) and 60.166(b)(2)]

(2) For the purpose of reports required under 40 CFR §60.7(c), periods of excess emissions that shall be reported are defined as all six-hour periods during which the average emissions of sulfur dioxide, as measured by the CEMS exceed the level of the standard. The Director will not consider emissions in excess of the level of the standard for less than or equal to 1.5 percent of the six-hour periods during the quarter as indicative of a potential violation of 40 CFR §60.11(d) provided the affected facility, including air pollution control equipment, is maintained and operated in a manner consistent with good air pollution control practice for minimizing emissions during these periods. Emissions in excess of the level of the standard during periods of startup, shutdown, and malfunction are not to be included within the 1.5 percent.

[40 CFR 60.165(d)]

6. Recordkeeping Requirements

[A.A.C. R18-2-B1302.G]

a. The Permittee shall maintain a record of each operation and maintenance plan required in Attachment "B".

b. The Permittee shall maintain the following records for at least five years:

(1) All measurements from the continuous monitoring system, including the date, place, and time of sampling or measurement; parameters sampled or measured; and results. All measurements will be calculated daily.

(2) All records of quality assurance and quality control activities for emissions measuring systems.

(3) All records of calibration checks, adjustments, maintenance, and repairs conducted on the continuous monitoring systems; including records of all compliance calculations.

(4) All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining and casting emission units; any malfunction of the associated air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative or not operating correctly.

(5) All records of planned and unplanned shutdown ventilation flue utilization events and calculations used to determine emissions from shutdown ventilation flue utilization events if the Permittee chooses to use the alternative compliance determination method.

(6) All records of major maintenance activities and inspections conducted on emission units, capture system, air pollution control equipment, and CEMS, including those set forth in the operations and maintenance plan.

(7) All records of operating days and production records required for calculations.

(8) All records of fugitive emissions studies and study protocols conducted in accordance with A.A.C. R 18-2, Appendix 14.

(9) Records of reports and notifications required under Condition III.E.7.

7. Reporting Requirements

[A.A.C. R18-2-B1302.H]

a. The Permittee shall notify the Director in writing at least 30 days in advance of the start of relative accuracy test audit (RATA) procedures performed on the continuous monitoring systems.

b. Within 30 days after the end of each calendar quarter, the Permittee shall submit a data assessment report to the Director in accordance with 40 CFR Part 60, Appendix F for the continuous monitoring systems.

c. The Permittee shall submit an excess emissions and monitoring systems performance report or summary report form in accordance with 40 CFR § 60.7(c) to the Director quarterly for the SO_2 CEMS. Excess emissions means any 14-operating day average as calculated in Condition III.E.5.b in excess of the emission limit in Condition III.E.2.b, any period in which the capture and control system was operating outside of its parameters specified in the capture system and control device operation and maintenance plan. For any 14-operating day period exceeding 1069.1 pounds per hour that the Permittee claims does not exceed the limit in Condition III.E.2.b because all hours in the operating period are below 1,518 pounds per hour, the Permittee shall submit the CEMS data for each hour during that period. All reports shall be postmarked by the 30th day following the end of each calendar quarter time period.

[R18-2-B1302.H.3]

d. The Permittee shall provide the following to the Director:

(1) The Permittee shall notify the Director of commencement of construction of any equipment necessary to comply with the operational or emission limits.

(2) The Permittee shall submit semiannual progress reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for the preceding July-December period.

(3) The Permittee shall submit notification of initial startup of any such equipment within 15 business days of such startup.

[A.A.C R18-2-B1302.H.4]

8. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Conditions XVI.C.1.a and c of Permit 60647, A.A.C. R18-2-B1302, 40 CFR 60.163(a), 60.165 (b), (c) and 60.166(b)(2).

[A.A.C. R18-2-325]

F. Lead

Note*: Until A.A.C. R18-2-B1301 (Limits on lead Emissions from the Hayden Smelter) is approved by EPA, all the requirements from A.A.C. R18-2-B1301 in this Subsection are State Enforceable only.*

1. Applicability

a. The requirements under A.A.C. R18-2-B1301 shall become applicable on the earlier of July 1, 2018 or 180 days after completion of all project improvements authorized by Significant Permit Revision No. 60647.

b. The requirements under A.A.C. R18-2-B1301.01, except otherwise provided, shall become applicable on December 1, 2018.

[A.A.C. R18-2-B1301.01.A.2]

2. Definitions

[A.A.C. R18-2-B1301.B and B1301.01.B]

a. "Anode furnace baghouse stack" means the dedicated stack that vents controlled off-gases from the anode furnaces to the Main Stack.

b. "Capture system" means the collection of components used to capture gases and fumes released from one or more emission units, and to convey the captured gases and fumes to one or more control devices or a stack. A capture system may include, but is not limited to, the following components as applicable to a given capture system design: duct intake devices, hoods, enclosures, ductwork, dampers, manifolds, plenums, and fans.

c. "Control device" means a piece of equipment used to clean and remove pollutants from gases and fumes released from one or more emission units that would otherwise be released to the atmosphere. Control devices may include, but are not limited to, baghouses, Electrostatic Precipitators (ESPs), and sulfuric acid plants.

d. "Main Stack" means the center and annular portions of the 1,000-foot stack, which vents controlled off-gases from the INCO flash furnace, the converters, and anode furnaces and also vents exhaust from the tertiary hoods.

e. "Smelting process-related fugitive lead emissions" means uncaptured and/or uncontrolled lead emissions that are released into the atmosphere from smelting copper in the INCO flash furnace, converters, and anode furnaces.

f. "Lead-bearing fugitive dust" means uncaptured and/or uncontrolled particulate matter containing lead that is entrained in the ambient air and is caused by activities, including, but not limited to, the movement of soil, vehicles, equipment, and wind.

g. "Non-smelting process sources" means sources of leadbearing fugitive dust that are not part of the hot metal process, which includes smelting in the INCO flash furnace, converting, and anode refining and casting. Non-smelting process sources include storage, handling, and unloading of concentrate, uncrushed reverts, crushed reverts, and bedding material; acid plant scrubber blowdown solids; and paved and unpaved roads.

3. Compliance Schedule

[A.A.C. R18-2-B1301.01.E.3]

a. Implementation of chemical dust suppression for unpaved roads -Within 30 days of Administrator approval of application intensity and schedules in Fugitive Dust Plan under CD CV-15-02206-PHX-DLR.

b. Implementation of wind fences for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate) - Within 120 days of Administrator approval of the Fugitive Dust Plan or the date of completion in the approved Fugitive Dust Plan, whichever is later.

c. Implementation of water sprays for materials piles (uncrushed reverts, reverts crushing and crushed reverts, bedding materials, and concentrate) - Within 120 days of Administrator approval of the Fugitive Dust Plan or the date of completion in the approved Fugitive Dust Plan, whichever is later.

d. Implementation of new primary, secondary, and tertiary hooding systems for converter aisle for purposes of complying with requirements in R18-2-B1301 - July 1, 2018

e. Implementation of new ventilation system for matte tapping and slag skimming for flash furnace for purposes of complying with requirements in R18-2-B1301 - July 1, 2018.

4. Emission Limitation

a. *Upon CRP startup, the Permittee shall not exceed the combined lead emissions limit from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams of 2.9 tons per year on 12-month rolling total basis*.

[Condition XVI.C.3.a of SPR 60647 and A.A.C. R18-2-331.A.3.a]
[Material permit conditions are identified by italics and underline]

b. No later than July 1, 2018 or 180 days after completion of all project improvements authorized by Significant Permit Revision No. 60647, the Permittee shall not exceed 0.683 pounds of lead per hour from the Main Stack.

[A.A.C. R18-2-B1301.C]

c. Opacity from lead-bearing fugitive dust emissions shall not exceed 20 percent from any part of the facility at any time. Opacity shall be determined by using 40 CFR 60, Appendix A, Reference Method 9, except for unpaved roads, in which opacity shall be determined pursuant to R18-2-B1301(D)(10)(c).

[A.A.C. R18-2-B1301.01.D.7]

5. Air Pollution Control Requirements

a. At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate smelter processes and associated emission capture and/or control equipment in a manner consistent with good air pollution control practices for minimizing lead emissions. Determination of whether acceptable operating and maintenance procedures are being used shall be based on all information available to the Department and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, and inspection of the relevant equipment.

[A.A.C. R18-2-B1301.D.1]

b. At all times, the Permittee shall operate and maintain all non-smelting process sources, including all associated air pollution control equipment, control measures, and monitoring equipment, in a manner consistent with good air pollution control practices for minimizing lead-bearing fugitive dust, and in accordance with the fugitive dust plan, and performance and housekeeping requirements. A determination of whether acceptable operating and maintenance procedures are being used shall be based on all available information to the Department and EPA Region IX, which may include, but is not limited to, monitoring results, review of operating and maintenance procedures and records, review of fugitive dust plans, and inspection of the relevant equipment.

[A.A.C. R18-2-B1301.01.C.1]

c. Emissions from the anode furnace baghouse stack shall be routed to the Main Stack.

[A.A.C. R18-2-B1301.D.3]

6. Performance Test Requirements

a. No later than 180 days after CRP startup, the Permittee shall conduct an initial performance test on the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation system gas streams for lead emissions.

[Condition XVI.C.3.b of SPR 60647, A.A.C. R18-2-312 and A.A.C. R18-2-306.A.3.c]

b. No later than 180 calendar days after completion of the CRP improvements authorized by Significant Permit Revision No. 60647, the Permittee shall conduct initial performance tests on the following:

[A.A.C. R18-2-B1301.E.1]

(1) The gas stream exiting the anode furnaces baghouse prior to mixing with other gas streams routed to the Main Stack.

(2) The gas stream exiting the acid plant at a location prior to mixing with other gas streams routed to the Main Stack.

(3) The gas stream exiting the secondary baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

(4) The gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the Main Stack.

(5) The gas stream exiting the vent gas baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

c. The Permittee shall conduct subsequent performance tests on the gas streams specified in Conditions III.F.6.a and III.F.6.b at least annually.

[Permit 60647 Condition XVI.C.3.a, A.A.C. R18-2-312 and A.A.C. R18-2-B1301.E.2]

d. The Performance tests shall be conducted in accordance with 40 CFR 60, Appendix A, Reference Method 29.

[Permit 60647 Condition XVI.C.3.b, A.A.C. R18-2-312 and A.A.C. R18-2-B1301.E.3]

e. At least 30 calendar days prior to conducting a performance test, the Permittee shall submit a test plan, in accordance with A.A.C. R18-2-312(B) and the Arizona Testing Manual, to the Department for approval. The test plan must include the following:

[A.A.C. R18-2-B1301.E.4]

(1) Test duration;

(2) Test location(s);

(3) Test method(s), including those for test method performance audits conducted in accordance with g below; and

(4) Source operation and other parameters that may affect the test result.

f. The Permittee may use alternative or equivalent performance test methods as defined in 40 CFR § 60.2 when approved by the Department and EPA Region IX, as applicable, prior to the test.

[A.A.C. R18-2-B1301.E.5]

g. The Permittee shall include a test method performance audit during every performance test in accordance with 40 CFR § 60.8(g).

[A.A.C. R18-2-B1301.E.6]

7. Compliance Requirements

a. No later than 180 days from CRP startup, the Permittee shall demonstrate compliance with lead emission limits in Condition III.F.4.a above in accordance with following:

[Condition XVI.C.3.c of SPR 60647, A.A.C. R18-2-306.A.3.c]

(1) The Permittee shall calculate lead emissions in pounds per hour in the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the most recent performance test in Condition III.F.6.

(2) The Permittee shall maintain records of hours of operation of the each stream in Condition III.F.6.b. If any emission unit associated with a stream operates during a calendar hour, it will constitute an operating hour. If no emission unit associated with a stream operates during a calendar hour, it will not constitute an operating hour.

(3) The Permittee shall calculate and record monthly lead emissions for the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the hourly emissions calculated in Condition III.F.7.a(1) above and the monthly operating hours for each stream recorded in Condition III.F.7.a(2).

(4) At the end of each month, the Permittee shall calculate and record rolling 12-month total of combined lead emissions from the acid plant tail gas, secondary hood baghouse, vent gas baghouse and tertiary ventilation streams based on the monthly emissions calculated in Condition III.F.7.a(3) above to demonstrate compliance with the emission limit in Condition III.F.4.a.

b. For purposes of determining compliance with the Main Stack emission limit in Condition III.F.4.b, the Permittee shall calculate the combined lead emissions in pounds per hour from the gas streams identified in Condition III.F.6.b based on the most recent performance tests conducted in accordance with Condition III.F.6. The Permittee shall include periods of startup, shutdown, malfunction, or other upset conditions when determining compliance with the emission limit.

[A.A.C. R18-2-B1301.F.1 and 3]

c. Opacity Monitoring Requirements

(1) In the event ongoing visible emissions at a non-smelting process source covered by the lead fugitive dust plan are observed, Reference Method 9-certified observer shall promptly evaluate the emissions and conduct opacity monitoring in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-B1301.01.D.7.b]

(2) A Reference Method 9-certified observer shall conduct a weekly visible emissions survey of all non-smelting process sources covered by the lead fugitive dust plan and perform a Reference Method 9 reading in accordance with Condition X.B.3 of Attachment "B" for any plumes that on an instantaneous basis appear to exceed 15 percent opacity.

[A.A.C. R18-2-B1301.01.D.7.c]

(3) The Permittee shall not allow visible emissions from unpaved roads to exceed 20 percent opacity and shall not allow silt loading equal to or greater than 0.33 oz/ft^2. However, if silt loading is equal to or greater than 0.33 oz/ft^2, then the Permittee shall allow the average percent silt content to exceed 6 percent. Compliance with these requirements shall be determined by the test methods described in Appendix 15.

[A.A.C. R18-2-B1301.01.D.10]

(4) For any non-smelting process source that produces visible emissions that appear to exceed 15 percent opacity, the Permittee shall perform an analysis of the root cause, and implement a strategy designed to prevent, to the extent feasible, the ongoing recurrence of the source of visible emissions. Within 14 days of completion of its analysis, if appropriate, the Permittee shall modify the fugitive dust plan for any changes identified from the analysis differing from the current provisions of the fugitive dust plan.

[A.A.C. R18-2-B1301.01.D.8.a]

d. At any time that the Permittee becomes aware that provisions of the fugitive dust plan and/or performance and housekeeping provisions required by this Section are not being met, the Permittee shall take prompt action to return to compliance, which may include modifications to monitoring, recordkeeping, and reporting requirements in the fugitive dust plan. This includes, but is not limited to, the actions in A.A.C. R18-2-B1301.01.D.8.b.

[A.A.C. R18-2-B1301.01.D.8.b]

8. Recordkeeping Requirements

The Permittee shall maintain the following records for at least five years and keep on-site for at least two years:

[A.A.C. R18-2-B1301.G and 1301.01.H]

a. All records of performance tests, test plans, and audits required by Condition III.F.6.

b. All records of major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment, including those set forth in the operations and maintenance plan.

c. All records of compliance calculations required by Conditions III.F.7.a and b.

d. All records of fugitive emission studies and study protocols conducted in accordance with A.A.C. R18-2, Appendix 14.

e. All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining, and casting emission units; and any malfunction of the associated air pollution control equipment that is inoperative or not operating correctly.

f. All records of reports and notifications required by Condition III.F.9.

g. All records required under A.A.C. R18-2-B1301.01.H.

9. Reporting Requirements

a. The Permittee shall comply with the following requirements:

[A.A.C. R18-2-B1301.H]

(1) Notification of commencement of construction of any equipment necessary to comply with the operational or emission limits.

(2) Semiannual progress reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for the preceding July- December period.

(3) Notification of initial startup of any such equipment within 15 business days of such startup.

(4) Whenever the Permittee becomes aware of any exceedance of the emission limit set forth in Condition III.F.4 the Permittee shall notify the Department orally or by electronic or facsimile transmission as soon as practicable, but no later than two business days after the Permittee first knew of the exceedance.

(5) Reports from performance testing conducted pursuant to Condition III.F.6 shall be submitted to the Department within 60 calendar days of completion of the performance test. The reports shall be submitted in accordance with the Arizona Testing Manual and A.A.C. R18-2-312(A).

b. Within 30 days after the end of each calendar-year quarter, the Permittee shall submit a quarterly report to the Department for the preceding quarter that shall include all the reporting requirements specified in A.A.C. R18-2-B1301.01.I.

[A.A.C. R18-2-B1301.01.I]

10. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition XVI.C.3.a, b and c of SPR 60647; A.A.C. R18-2-B1301 and B1301.01.

[A.A.C R18-2-325]

IV. CONCENTRATE DRYERS/FLASH FURNACE MATTE TAPPING OPERATIONS

A. PM and Opacity

1. Emission Limits

a. The Permittee shall not cause to be discharged to the atmosphere from the dryer vent any gases that contain total PM in excess of 50 mg/dscm. Emissions in excess of the emission limit during periods of startup, shutdown, and malfunction shall not be considered a violation of the applicable emission limit.

[40 CFR 60.162(a), 40 CFR 63.1444(a)(1) and CD CV-15-02206-PHX-DLR 19]

b. For each new copper concentrate dryer that the Permittee may choose to install, the Permittee shall not cause to be discharged to the atmosphere from the dryer vent any gases that contain total particulate matter in excess of 23 mg/dscm.

[40 CFR 63.1444(a)(2), CD CV-15-02206-PHX-DLR 19]

c. Gases discharged from the Vent Gas Baghouse shall not contain total particulate matter in excess of 23 mg per dscm.

[40 CFR 63.14444(b)(2)(1), CD CV-15-02206-PHX-DLR 19]

d. PM Emission Limits Monitored with PM CEMS.

(1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions IV.A.1.a, b and c above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 19a]

(2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at

operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

e. *At all times except for periods of startup, shutdown, and malfunction as defined in 40 CFR §60.2, the Permittee shall not cause to be discharged into the atmosphere from any dryer any visible emissions that exhibit greater than 20 percent opacity*. Opacity readings of portions of plumes, which contain condensed, uncombined water vapor, shall not be used for purposes of determining compliance with the opacity standard.

[40 CFR 60.164(a), A.A.C. R18-2-331.A.3.f]
[Material permit conditions are indicated by italics and underline]

f. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

2. Air Pollution Control Requirements

The Permittee shall install and operate a baghouse designed to handle the maximum potential volumetric flow of gas from the copper concentrate dryers and smelting flash furnace matte tapping and slag skimming operations and rated to perform with an outlet loading value between 0.002 grains per standard cubic foot (~4 mg/Nm^3) and 0.005 grains per standard cubic foot (~11 mg/Nm^3).

[CD CV-15-02206-PHX-DLR 13, A.A.C. R18-2-331.A.3.d and e]
[Material permit conditions are indicated by italics and underline]

3. Monitoring, Recordkeeping and Reporting Requirements

a. Opacity Monitoring Requirements

(1) The Permittee shall operate Continuous Opacity Monitoring System (COMS) installed at the outlet of the Vent Gas Baghouse stream to monitor and record the opacity of gases discharged into the atmosphere from the dryers. The span of this system shall be set at 80 to 100 percent opacity. The COMS shall be installed in accordance with Condition IX.A.

[40 CFR 60.165(b)(1)]

(2) Permittee shall evaluate opacity measurements from the vent gas baghouse COMS on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[Condition II.D.3 of Permit 1000042, A.A.C. R18-2-306.A.3.c]

(3) Opacity excess emissions are defined as any six-minute period during which the average opacity, as measured by the COMS as in Condition IV.A.3.a(1) exceeds the 20 percent opacity standard, as specified in Condition IV.A.1.e.

[40 CFR 60.165(d)(1) and A.A.C. R18-2-306.A.3.c]

b. PM Continuous Monitoring System (CEMS) Requirements

(1) <u>*No later than May 1, 2018, The Permittee shall install, certify*</u>, operate and maintain <u>*PM CEMS in accordance with the requirements in Condition IX.B on the gas stream exiting the Vent Gas Baghouse at a location prior to mixing with other gas streams that are routed to the main stack*</u>.

[CD CV-15-02206-PHX-DLR 14.e]

(2) Should the Permittee choose to stop routing emissions from one or more copper concentrate dryers or the tapping emissions capture system to the Vent Gas Baghouse, no later than the date of rerouting, the Permittee shall install a PM CEMS in accordance with the requirements in Condition IX.B on such gas stream post applicable PM controls, such as the current dryer baghouse, but pre-mixing with any other gas streams.

[CD CV-15-02206-PHX-DLR 20]

4. Compliance Requirements

a. Prior to installation and certification of PM CEMS, compliance with Vent Gas Baghouse PM Emission Limit shall be determined using the test methods in Condition IV.A.5.c.

[40 CFR 63.1453, CD CV-15-02206-PHX-DLR 19, 20]

b. Upon installation and certification of PM CEMS,

(1) Compliance shall be determined on the basis of an eight (8)

hour rolling average limit, including periods of startup, shutdown, and malfunction; or

[CD CV-15-02206-PHX-DLR 19a, 20a]

(2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

[CD CV-15-02206-PHX-DLR 19b, 20b]

5. Testing Requirements

a. The Permittee shall determine compliance with the dryer particulate matter standard of 0.022 gr/dscf in Condition IV.A.1.a, using EPA Reference Method 5 testing annually for the vent gas baghouse exit to determine the particulate matter concentration. The sampling time and sample volume for each run shall be at least 60 minutes and 0.85 dscm (30 dscf).

[40 CFR 60.166(b)(1)]

b. The Permittee shall perform an annual opacity observation of emissions from the flash furnace, converters, and Nos. 1 and 2 fluid bed dryers in accordance with EPA Reference Method 9 to determine compliance with the visible emission standard of 20 percent opacity.

[40 CFR 60.166(b)(3)]

c. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[40 CFR 63.1453(a)(1), CD CV-15-02206-PHX-DLR 19, 20]

d. Performance testing, if required, for the limit in Condition IV.A.1.f shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).

[40 CFR 52.126(b)(5)]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 52.126(b), 40 CFR 60.162(a), 164(a), 165(b)(1) & (d)(1), and166(b)(1); 40 CFR 63.1444(a)(1) & (2) and 1453; and CD CV-15-02206-PHX-DLR 13, 19, 20 and 21.

[A.A.C R18-2-325]

B. Sulfur Dioxide (SO_2)

1. Emission Limits

a. Except as provided in Condition IV.B.1.b below, upon installation and operation of the Vent Gas Baghouse, at all times that SO_2 emissions are routed to the baghouse, the Permittee shall inject High-Surface-Area (HSA) Hydrated Lime to reduce SO_2 emissions by at least 50 percent based on a 365-day rolling average, for all SO_2 emissions routed to the Vent Gas Baghouse. Commencing no later than 365 days after the installation and operation of the Vent Gas Baghouse, the Permittee shall demonstrate compliance with the SO_2 reduction requirement in accordance with Condition IV.B.3.

[Condition XVI.C.1.b of Permit 60647 and CD CV-15-02206-PHX-DLR 11.b]

b. If during the first three (3) years after monitoring control efficiency achieved through injection of High-Surface-Area Hydrated Lime, the Permittee believes that despite design, installation, operation, and maintenance of controls to minimize emissions to the greatest extent practicable, ~~finds~~ that it is technically infeasible to achieve a fifty (50) percent control efficiency through injection of High-Surface-Area Hydrated Lime for gases routed to the vent gas baghouse despite design, installation, operation and maintenance of controls to minimize emissions to the greatest extent practicable, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a lower control efficiency limit, not to be less than forty (40) percent control efficiency. The requirements for this application and procedure for revision are set forth in paragraph 11.c of the CD. The Permittee shall, prior to submission of any such demonstration, employ a third-party consultant with experience in similar dry lime scrubbing applications to recommend equipment and/or operational enhancements to achieve the 50% control efficiency target. EPA may grant or deny the Permittee's request in whole or in part, subject to the dispute resolution provisions of the CD. If EPA approves the Permittee’s demonstration, such lower control efficiency limit(s) shall be deemed to have replaced the 50% control efficiency limit(s) during the time during which achievement was of the 50% control efficiency limit was infeasible (including any period of time that occurred prior to submittal of the demonstration, during the pendency of EPA’s review of the Permittee’s demonstration, and during the pendency of any dispute resolution under the CD.

[CD CV-15-02206-PHX-DLR 11.c]

2. Monitoring, Recordkeeping and Reporting Requirements

a. <u>*Prior to operation of the Vent Gas Baghouse, the Permittee shall install, certify, calibrate*</u>, maintain, and operate <u>*an SO_2 CEMS both upstream of the lime injection point and at the outlet of the Vent Gas Baghouse in accordance with Condition IX.C of this Attachment.*</u>

[CD CV-15-02206-PHX-DLR 11.b, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

b. After three (3) years of monitoring in accordance with the requirements of Condition a above, the Permittee may submit to EPA a request for an alternative monitoring plan for one or more control efficiency requirements. Such request shall contain a detailed proposal that describes an alternative monitoring plan and demonstrates how such plan: 1) will ensure continuous compliance with the control efficiency requirement(s); 2) identifies the indicator(s) of performance, measurement techniques, monitoring frequency, and the averaging time for the alternative monitoring procedure as referenced in 40 C.F.R. § 63.8(f)(4); and 3) complies with all relevant EPA regulations and guidance. EPA may grant or deny the request in whole or in part.

[CD CV-15-02206-PHX-DLR 11.d]

3. Compliance Requirements

No later than three-hundred-sixty-five (365) days after installation and operation of the Vent Gas Baghouse, the Permittee shall demonstrate compliance, and thereafter continuously comply, with a control efficiency requirement of at least 50 percent, based on a 365-day rolling average, for all SO_2 emissions routed to the Vent Gas Baghouse. Compliance with the 50 percent control efficiency requirement in Condition IV.B.1.a shall be demonstrated by summing the hourly pounds of SO_2 exiting the Vent Gas Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS on the outlet of the Vent Gas Baghouse, and then dividing that value by the sum of the hourly pounds of SO_2 routed to the Vent Gas Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS upstream of the lime injection point. The value obtained shall then be subtracted from one and the difference multiplied by one hundred to calculate the 365-day rolling SO_2 emission control efficiency achieved as a percentage.

[CD CV-15-02206-PHX-DLR 11.b]

4. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with Condition XVI.C.1.b of Permit 60647 and CD CV-15-02206-PHX-DLR 11.b, 11.c and 11.d.

[A.A.C R18-2-325]

V. SLAG SCREENING & TRANSPORT

A. Applicability

This Section shall be applicable to the process of screening and transporting slag to the track hopper for reintroduction into the concentrator and loading slag for offsite shipment.

B. Operating Limitation

<u>The amount of slag processed through the grizzly screen and loaded for offsite shipment shall not collectively exceed 1,063,000 tons per year.</u>

[A.A.C R18-331.A.3.a, and -306.01.A]
[Material Permit Conditions are indicated by underline and italics]

C. Monitoring, Recordkeeping and Reporting Requirements

The Permittee shall maintain a record of the monthly and 12-month rolling totals of the material processed through the grizzly screen and loaded for offsite shipment.

[A.A.C. R18-2-306.A.3.c]

D. Particulate Matter and Opacity

1. Emission Limits and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

a. The Permittee shall screen slag only within an area protected by a wind fence

[CD CV-15-02206-PHX-DLR B.18, A.A.C. R18-2-606]

b. The Permittee shall wet the surface of all slag to be screened or loaded for offsite shipment with sufficient moisture to minimize emissions to the greatest extent practicable.

[CD CV-15-02206-PHX-DLR B.19, B.27, A.A.C. R18-2-606]

c. The Permittee shall comply with the requirements applicable to slag screening and loose material piles as identified in the Fugitive Dust Plan.

[CD CV-15-02206-PHX-DLR B]

3. Monitoring, Recordkeeping and Reporting Requirements

The Permittee shall conduct visible emissions surveys as required by the Fugitive Dust Plan.

[CD CV-15-02206-PHX-DLR B.29, A.A.C. R18-2-306.A.3.c]

E. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715 D, and CD CV-15-02206-PHX-DLR B.18, B.19, B.27, and B.29.

[A.A.C. R18-2-325]

VI. FLASH FURNACE/CONVERTERS/ACID PLANT

A. Operating Limits

1. Blowing on any converter shall not exceed a maximum rate of 32,000 SCFM, averaged over 5 minutes of converter Blowing and rolled each minute.
[CD CV-15-02206-PHX-DLR 8]

2. No later than May 1, 2018, the Permittee shall permanently cease operation of the five (5) existing converters, and shall complete installation of two (2) of the three (3) new converters.

   a. The Permittee shall not have more than one (1) converter Blowing at any given time.
   [CD CV-15-02206-PHX-DLR 8.a]

   b. Total combined Blowing time at all converters shall not exceed twenty-one (21) hours in any 24-hour period, rolled hourly, unless and until the Permittee accepts 100 ppm SO_2 emission limit from the acid plant on a 365-day rolling basis including periods of startup, shutdown, and malfunction, and as measured and recorded by SO_2 CEMS located on the main stack center.
   [CD CV-15-02206-PHX-DLR 8.b]

B. PM and Opacity

1. Emission Limits

   a. For each smelting furnace and converter primary hood, the Permittee shall not cause to be discharged to the atmosphere any process off-gas that contains non-sulfuric acid particulate matter in excess of 6.2 mg/dscm as measured using the test methods specified in 40 CFR §63.1450(b).
   [40 CFR 63.1444(b)(1) & (5) and CD CV-15-02206-PHX-DLR 16]

   b. The Permittee shall not cause to be discharged to the atmosphere from the secondary baghouse any gases that contain total PM in excess of 23 mg per dscm.
   [40 CFR 63.1444(b)(6) and CD CV-15-02206-PHX-DLR 17]

   c. PM Emission Limits Monitored with PM CEMS.

      (1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions VI.B.1.a and VI.B.1.b above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.
      [CD CV-15-02206-PHX-DLR 16.a and 17a]

      (2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

d. *At all times except for periods of startup, shutdown, and malfunction as defined in 40 CFR §60.2, the Permittee shall not cause to be discharged into the atmosphere any visible emissions from the acid plant which exhibit greater than 20 percent opacity*. Opacity readings of portions of plumes, which contain condensed, uncombined water vapor, shall not be used for purposes of determining compliance with the opacity standard.

[40 CFR 60.164 (b), A.A.C. R18-2-331.a.3.f]
[Material permit conditions are indicated by italics and underline]

e. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

2. Air Pollution Control Requirements

a. The Permittee shall route process off-gas from the smelting flash furnace to the acid plant.

[CD CV-15-02206-PHX-DLR 16]

b. All gases captured by a primary hood shall be routed to the acid plant.

[CD CV-15-02206-PHX-DLR 8]

c. *The Permittee shall operate* and maintain *the converter secondary hoods baghouse to minimize particulate emissions from the secondary hoods*.

[A.A.C. R18-2-306.A.3.c, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

d. *The Permittee shall operate the Inter-pass Absorption Tower and Final Absorption tower in the acid plant to control particulate matter emissions from the flash furnace, converters and converter secondary hood during Blowing operations*.

[SPR 60647, A.A.C. R18-2-306.A.3.c and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping and Reporting Requirements

a. Opacity Monitoring Requirements

(1) The Permittee shall operate Continuous Opacity Monitoring System (COMS) installed at the outlet of Acid Plant Tail Gas stream to monitor and record the opacity of gases. The span of this system shall be set at 80 to 100 percent opacity. The COMS shall be installed in accordance with Condition IX.A.

[Permit 60647, Condition II.D.1.b. CD CV-15-02206-PHX-DLR 16]

(2) The Permittee shall evaluate opacity measurements on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[Permit 1000042, A.A.C. R18-2-306.A.3.c]

b. PM Continuous Monitoring System (CEMS) Requirements

(1) *The Permittee shall install, certify*, operate and maintain *PM CEMS on the gas streams exiting the acid plant and the Secondary Hood Baghouse at a location prior to mixing with other gas streams that are routed to the main stack in accordance with Condition IX.B*.

[CD CV-15-02206-PHX-DLR 14.b and c]

(2) *No later than May 1, 2018, The Permittee shall install, certify*, operate and maintain *PM CEMS on the gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the main stack in accordance with Condition IX.B.*

[CD CV-15-02206-PHX-DLR 14.d]

c. For Inter-pass Absorption Tower and Final Absorption tower in the acid plant to control particulate matter emissions,

(1) The Permittee shall select one or more operating parameters, as appropriate for the control device design that can be used as representative and reliable indicators of the control device operation.

[40 CFR 63.1444(h)(1)]

(2) The Permittee shall at all times monitor each of the selected parameters using an appropriate CPMS. *The Permittee shall install,* operate, and maintain *each CPMS according to the equipment manufacturer's specifications and the following requirements.*

[40 CFR 63.1452(d) A.A.C. R18-2-331.A.3.d]

[Material permit conditions are indicated by underline and italics]

(a) Locate the sensor(s) used for monitoring in or as close to a position that provides a representative measurement of the parameter being monitored.

(b) Determine the hourly average of all recorded readings.

(c) Conduct calibration and validation checks any time the sensor exceeds the manufacturer's specifications or install a new sensor.

(d) At least monthly, inspect all components for integrity, all electrical connections for continuity, and all mechanical connections for leakage.

(e) Record the results of each inspection, calibration, and validation check.

(3) The Permittee shall maintain the hourly average value for each of the selected parameters at or above the minimum level or at or below the maximum level, as appropriate for the selected parameter, established during the initial or subsequent performance test.

[40 CFR 63.1444(h)(2)]

4. Compliance Requirements

a. Prior to installation and certification of PM CEMS, compliance with PM Emission Limits shall be determined using the test methods in Condition VI.B.5.

[40 CFR 63.1453, CD CV-15-02206-PHX-DLR 16 and 17]

b. Upon installation and certification of PM CEMS,

[CD CV-15-02206-PHX-DLR 16 and 17]

(1) Compliance shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction; or

(2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

c. Compliance Requirements for Inter-pass Absorption Tower and Final Absorption tower

(1) The Permittee shall demonstrate initial compliance by:

[40 CFR 63.1451(g)]

(a) Selecting one or more operating parameters, as appropriate for the control device design that can be used as representative and reliable indicators of the control device operation.

(b) Establishing site-specific operating limits for each of the selected operating parameters based on values measured during the performance test and preparing written documentation according to the requirements in 40 CFR 63.1450(a)(5)(iv).

(c) Including in the notification of compliance status a copy of the written documentation to demonstrate compliance (2) above and certifying in the notification of compliance status that the Permittee shall operate the control device within the established operating limits.

(d) Submitting a notification of compliance status according to the requirements

(2) The Permittee shall demonstrate continuous compliance by:

[40 CFR 63.1453(e)]

(a) Maintaining the hourly average rate at levels no lower than those established during the initial or subsequent performance test;

(b) Inspecting and maintaining each CPMS operated according to 40 CFR §63.1452(d) and recording all information needed to document conformance with these requirements; and

(c) Collecting and reducing monitoring data for selected parameters according to 40 CFR §63.1452(e) and recording all information needed to document conformance with these requirements.

5. Performance Testing Requirements

a. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test on the secondary hood baghouse for total particulate matter in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[40 CFR 63.1450(a), 1453(a)(1) and CD CV-15-02206-PHX-DLR 17]

b. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test on the acid plant tail gas for the non-sulfuric acid particulate matter emissions in accordance with 40 C.F.R. § 63.1450(b). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[40 CFR 63.1450(b), 1453(b)(1) and CD CV-15-02206-PHX-DLR 16]

c. Performance testing, if required, for the limit in Condition VI.B.1.e shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).

[40 CFR 52.126(b)(5)]

6. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with on Condition Permit II.D.1.b of Permit, 60647, Permit 1000042, 40 CFR 52.126, 40 CFR 63.1444(b)(1),(5) and (6), 1444(h)(1) and (2), 63.1450(a) and (b), 1451(g), 1452(d), 1453(a), (b) and (e), 40 CFR 60.164 (b) and CD CV-15-02206-PHX-DLR 8, 14.b, 14.c, 16, 16.a, 17 and 17.a.

[A.A.C R18-2-325]

C. Sulfur dioxide SO_2

1. Emission Limits

a. The Permittee shall not cause to be discharged into the atmosphere from smelting furnace, or copper converter any gases which contain sulfur dioxide in excess of 0.065 percent by volume. For gases routed to the acid plant, the limit does not apply during periods of startup, shutdown, or malfunction. For gases routed to the Secondary Baghouse and tertiary hood, the limit shall apply at all times, including periods of startup, shutdown, and malfunction.

[40 CFR 60.163(a), CD CV-15-02206-PHX-DLR 10]

b. If the Permittee elects to accept a limit of 100 ppmv SO_2 from the gas exiting the acid plant on a 365-day rolling average basis, including periods of startup, shutdown, and malfunction, the Permittee shall provide EPA with written notice of the effective date of its election to accept the 100 ppmv SO_2 limit in the next quarterly report following such election.

[CD CV-15-02206-PHX-DLR 8.b]

c. No later than May 1, 2018 at all times that SO_2 emissions are routed to the Secondary Baghouse, the Permittee shall inject High-Surface-Area (HSA) Hydrated Lime to reduce SO_2 emissions by at least 50 percent based on a 365-day rolling average, for all SO_2 emissions routed to the Secondary Baghouse. Commencing no later than May 1, 2019, the Permittee shall demonstrate compliance with the SO_2 reduction requirement in accordance with Condition VI.C.4.d.

[Permit 60647, Cond. XVI.C.1.b, CD CV-15-02206-PHX-DLR 11.a]

d. If during the first three (3) years after monitoring control efficiency achieved through injection of High-Surface-Area Hydrated Lime, the Permittee believes that despite design, installation, operation, and maintenance of controls to minimize emissions to the greatest extent practicable, it is technically infeasible to achieve a fifty (50) percent control efficiency through injection of High-Surface-Area Hydrated Lime for gases routed to the vent gas baghouse despite design, installation, operation and maintenance of controls to minimize emissions to the greatest extent practicable, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a lower control efficiency limit, not to be less than forty (40) percent control efficiency. The requirements for this application and procedure for revision are set forth in paragraph 11.c of the CD. The Permittee shall, prior to submission of any such demonstration, employ a third-party consultant with experience in similar dry lime scrubbing applications to recommend equipment and/or operational enhancements to achieve the 50% control efficiency target. EPA may grant or deny the Permittee's request in whole or in part, subject to the dispute resolution provisions of the CD. If EPA approves the Permittee's demonstration, such lower control efficiency limit(s) shall be deemed to have replaced the 50% control efficiency limit(s) during the time during which achievement was of the 50% control efficiency limit was infeasible (including any period of time that occurred prior to submittal of the demonstration, during the pendency of EPA's review of the Permittee's demonstration, and during the pendency of any dispute resolution under the CD.

[CD CV-15-02206-PHX-DLR 11.c]

2. .Air Pollution Control Requirements

The Permittee shall operate the double contact sulfuric acid plant to comply with the flash furnace and converters sulfur dioxide standard of 0.065 percent by volume set forth in Condition VI.C.1. *At all times, including periods of startup, shutdown, and malfunction, Permittee shall, to the extent practicable, continue to operate* and maintain *the flash furnace, converters and the double contact sulfuric acid plant in a manner consistent with good air pollution control practice for minimizing sulfur dioxide emissions.*

[40 CFR 60.11(d) and 60.164(b), A.A.C. R18-2-331.A.3.e]
[Material Permit Conditions are indicated by italics and underline]

3. Monitoring, Recordkeeping and Reporting Requirements

a. *The Permittee shall install, certify*, maintain, and operate *SO_2 CEMS at the acid plant tail gas stream in accordance with requirements in Condition IX.C of this Attachment*.

[40 CFR 60.165(b) and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

b. *Upon installation of the tertiary hooding system, the Permittee shall install, certify, calibrate*, maintain, and operate *SO_2 CEMS on the tertiary hood exhaust stream (prior to mixing with other gas streams in the stack) in accordance with requirements in Condition IX.C of this Attachment*.

[CD CV-15-02206-PHX-DLR 10.c and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

c. *No later than May 1, 2018, the Permittee shall install, certify, calibrate,* maintain, and operate *SO_2 CEMS both upstream of the lime injection point and at the outlet of the Secondary Hood Baghouse in accordance with requirements in Condition IX.C of this Attachment*.

[CD CV-15-02206-PHX-DLR 11.a and A.A.C R18-2-331.A.3.c]
[Material Permit Conditions are indicated by italics and underline]

d. After three (3) years of monitoring in accordance with the requirements of Condition VI.C.3.c above, the Permittee may submit to EPA a request for an alternative monitoring plan for one or more control efficiency requirements. Such request shall contain a detailed proposal that describes an alternative monitoring plan and demonstrates how such plan: 1) will ensure continuous compliance with the control efficiency requirement(s); 2) identifies the indicator(s) of performance, measurement techniques, monitoring frequency, and the averaging time for the alternative monitoring procedure as referenced in 40 C.F.R. § 63.8(f)(4); and 3) complies with all relevant EPA regulations and guidance. EPA may grant or deny the request in whole or in part.

[CD CV-15-02206-PHX-DLR 11.d]

4. Compliance Requirements

a. Compliance with the emission limit in Condition VI.C.1.a

(1) The Permittee shall demonstrate compliance with the emission limit in Condition VI.C.1.a by SO_2 CEMS located on the main stack center to determine the SO_2 concentrations on a dry basis. The sampling time for each run shall be 6 hours. Six-hour average sulfur dioxide concentrations shall be calculated and recorded daily for the four consecutive 6-hour periods of each operating day. Each six-hour average shall be determined as the arithmetic mean of the appropriate six contiguous one-hour average sulfur dioxide concentrations provided by the continuous monitoring system. The monitoring system drift during the run may not exceed 2 percent of the span value.

[CD CV-15-02206-PHX-DLR 10.a, 40 CFR 60.165(c) and 60.166(b)(2)]

(2) For the purpose of reports required under §60.7(c), periods of excess emissions that shall be reported are defined as all six-hour periods during which the average emissions of sulfur dioxide, as measured by the CEMS exceed the level of the standard. The Director will not consider emissions in excess of the level of the standard for less than or equal to 1.5 percent of the six-hour periods during the quarter as indicative of a potential violation of §60.11(d) provided the affected facility, including air pollution control equipment, is maintained and operated in a manner consistent with good air pollution control practice for minimizing emissions during these periods. Emissions in excess of the level of the standard during periods of startup, shutdown, and malfunction are not to be included within the 1.5 percent.

[40 CFR 60.165(d)]

b. For gases routed to the Secondary Hood Baghouse, compliance with this limit shall be demonstrated by a three (3) hour rolling average of data recorded by SO_2 CEMS located at the secondary hood baghouse outlet duct before it mixes with other gas streams in the main stack annulus.

[CD CV-15-02206-PHX-DLR 10.b]

c. Beginning no later than ninety (90) days after installation of the tertiary hooding system, compliance with this limit shall be demonstrated by a three (3) hour rolling average of data recorded by SO_2 CEMS located at the tertiary hood exhaust gas stream before it mixes with other gas streams in the main stack annulus.

[CD CV-15-02206-PHX-DLR 10.c]

d. No later than May 1, 2019, the Permittee shall demonstrate compliance with Condition VI.C.1.c, and thereafter continuously comply, with a control efficiency requirement of at least 50 percent for the secondary hood baghouse HSA lime injection, based on a 365-day rolling average, for all SO_2 emissions routed to the Secondary Hood Baghouse. Compliance shall be demonstrated by summing the hourly pounds of SO_2 exiting the Secondary Hood Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS on the outlet of the Secondary Hood Baghouse, and then dividing that value by the sum of the hourly pounds of SO_2 routed to the Secondary Hood Baghouse for the current calendar day and the preceding three-hundred-sixty-four (364) calendar days, as measured by the SO_2 CEMS upstream of the lime injection point. The value obtained shall then be subtracted from one and the difference multiplied by one hundred to calculate the 365-day rolling SO_2 emission control efficiency achieved as a percentage

[CD CV-15-02206-PHX-DLR 11.a]

e. Upon and after the Permittee's acceptance of 100 ppmv SO_2 emission limit from the gas exiting the acid plant, the Permittee shall demonstrate compliance with this limit on a 365-day rolling average basis, including periods of startup, shutdown, and malfunction, based on the SO_2 CEMS located on the acid plant tail gas stream.

[CD CV-15-02206-PHX-DLR 8.b]

5. Permit Shield

Compliance with the Conditions under this Subsection shall be deemed compliance with 40 CFR 60.163(a), 60.164(b), 60.165(c) and (d), 60.166(b)(2), Condition XVI.C.1.b of Permit 60647, and CD CV-15-02206-PHX-DLR 8.b, 10, 10.a, 10.c, 11.a, 11.c and 11.d .

[A.A.C R18-2-325]

VII. ANODE FURNACES/ANODE CASTING

A. PM and Opacity

1. Operation Limitation

a. The Permittee may operate any of the three anode furnaces under this section, provided only two furnaces can be in operation at a time.

[Permit 1000042]

b. Operate for purposes of Condition VII.A.1.a means holding or processing metal in the furnace, but does not include curing, preheating or sweating of refractory or transferring of metal from one furnace to another.

[Permit 60647, Condition IX.D.2]

2. Emission Limits

a. The Permittee shall not cause to be discharged into the atmosphere from the stack of the baghouse any gases which contain particulate matter in excess of 0.003 grain per standard cubic foot (gr/scf).

[Permit 54251]

b. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from the stack of anode furnaces baghouse, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

[A.A.C. R18-2-715.D]

c. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from the anode launder burners and/or the anode ladle burners, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

[A.A.C. R18-2-702.B.1]

d. The Permittee shall not cause to be discharged to the atmosphere from the anode furnace baghouse any gases that contain total PM in excess of 23 mg per dscm.

[CD CV-15-02206-PHX-DLR 18]

e. PM Emission Limits Monitored with PM CEMS.

(1) Upon installation and certification of PM CEMS, compliance with the emission limits in Conditions VII.A.2.d above shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction.

[CD CV-15-02206-PHX-DLR 18.a]

(2) If during the first three (3) years of operation of any certified PM CEMS, the Permittee believes that, despite proper design and installation of control equipment and best efforts at operation and maintenance, inherent process variability precludes compliance with a PM emission limit on an 8-hour rolling average basis at one or more of the exhaust streams, at any time after the first three (3) years of operation, the Permittee may submit to EPA a demonstration supporting this conclusion and may request a longer averaging period, not to exceed 24 hours.

[CD CV-15-02206-PHX-DLR 21]

f. The Permittee shall not discharge or cause the discharge of particulate matter into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19

120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

3. Air Pollution Control Requirements

a. At all times that any Anode Furnace is operating, its hood shall be engaged and continuously operating so as to collect and convey process off-gases to the Anode Furnaces Baghouse. "Operating" shall mean: holding or processing metal in the furnace, but does not include, curing, preheating or sweating of refractory, or transferring of metal from one furnace to another.

[CD CV-15-02206-PHX-DLR 18]

b. *The Permittee shall install, operate*, and maintain *a capture system for capturing the emissions from the anode furnaces and ducting them to the anode furnace baghouse.*

[Permit 54251, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

c. *At all times when any anode furnace in operation, the Permittee shall operate and maintain a baghouse to minimize particulate emissions*.

[Permit 54251, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

4. Monitoring, Recordkeeping and Reporting Requirements

a. *The Permittee shall install, certify*, operate and maintain *one beta attenuation PM CEMS and one light scatter PM CEMS on the stack exiting the Anode Furnaces Baghouse in accordance with Condition IX.B*.

[CD CV-15-02206-PHX-DLR 14.a]

b. *The Permittee shall calibrate*, maintain, and operate *a bag leak detection system (BLDS) for the anode furnace baghouse in a manner consistent with the manufacturer's written specifications and recommendation, and in accordance with Section X of this Attachment.*

[A.A.C. R18-2-306.A.3.c and -331.A.3.c]
[Material permit conditions are indicated by underline and italics]

c. A certified EPA Reference Method 9 observer shall conduct a bi-weekly survey of visible emissions emanating from the stack of the anode furnace baghouse stack as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

5. Compliance Requirements

a. Prior to installation and certification of PM CEMS, compliance with the Emission Limit shall be determined using the test methods in Condition VII.A.6.

[CD CV-15-02206-PHX-DLR 18]

b. Upon installation and certification of PM CEMS,

[CD CV-15-02206-PHX-DLR 18]

(1) compliance shall be determined on the basis of an eight (8) hour rolling average limit, including periods of startup, shutdown, and malfunction; or

(2) If PM CEMS certification fails for this gas stream, upon EPA approval, the Permittee shall begin complying with an alternative PM monitoring plan.

6. Performance Testing Requirements

a. Prior to installation and certification of PM CEMS, the Permittee shall conduct performance test for total particulate matter in accordance with 40 C.F.R. § 63.1450(a). The performance test shall be performed at least once each three hundred sixty-five (365) days.

[CD CV-15-02206-PHX-DLR 18]

b. Performance testing, if required, for the limit in Condition VII.A.2.f shall be conducted in accordance with the procedures in 40 C.F.R. § 52.126(b)(5).

[40 CFR 52.126(b)(5)]

B. Permit Shield

Compliance with the Conditions under this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-702.B.1, 715 D, Permit 54251, Condition IX.D.2 of Permit 60647, Permit 1000042 and CD CV-15-02206-PHX-DLR 14.a, 18 and 21.

[A.A.C. R18-2-325]

VIII. COMPLIANCE ASSURANCE MONITORING (CAM) REQUIREMENTS

A. Applicability

1. The Compliance Assurance Monitoring requirements under this Section shall be applicable only till the operation and certification of PM CEMS are established.

2. If at any time, the Permittee is permitted to discontinue use of PM CEMS, the Compliance Assurance Monitoring requirements shall again become applicable.

3. These requirements are applicable to following emission units

a. Acid Plant Tail Gas

b. Secondary Hood Baghouse

c. Vent Gas Baghouse

d. Anode Furnace Baghouse

B. Acid Plant Tail Gas

1. Primary Indicators

Circulating acid flow rates of the Interpass Absorption Tower and the Final Absorption Tower.

[SPR 60647, 40 CFR 64.3(a)(1)]

2. Monitoring Approach

[SPR 60647, 40 CFR 64.3(b)(4)(iii)]

a. At the time of annual performance test, the Permittee shall reestablish the average acid flow rates for the Interpass Absorption Tower and the Final Absorption Tower.

b. During flash furnace and converter operation, the Permittee shall maintain hourly average acid flow rates for the Interpass Absorption Tower and the Final Absorption Tower within ± 30% of the average acid flow rates recorded during the most recent performance tests.

c. Excursions of hourly average values beyond the established ranges above shall trigger an alarm. The data acquisition system (DAS) shall maintain record of all alarm events.

3. Quality Assurance/Quality Control (QA/QC)

[40 CFR 64.3(b)(3)]

The Interpass Absorption Tower and Final Absorption Tower acid flow meters will be calibrated, maintained, and operated in accordance with the manufacturer's specifications.

4. Excursion Determination

a. Hourly average acid flow rates outside of the ranges above shall be deemed an excursion. If there is an excursion on an hourly basis, the Permittee shall inspect the system for proper operation, and will make adjustments as necessary. Inspection and adjustments will be recorded in the operating log. At least once each operating day, Asarco personnel will review electronic log to ensure proper recording and alarms addressed.

[40 CFR 64.6(c)(2)]

b. The Permittee shall log in ink or electronic format and maintain a record of installation, calibration, maintenance, and operation of the monitoring systems in accordance with Section XIII, Attachment "A" of this permit. In the case of any excursion incident, the record shall include an identification of the date and time of all excursions, their cause, and an explanation of the corrective actions taken, if any.

[A.A.C. R18-2-306.A.3.c and 40 CFR §64.6]

c. An excursion does not constitute a deviation unless either the Permittee fails to initiate the investigation or take corrective action as required.

[A.A.C. R18-2-306.A.2]

C. Secondary Hood Baghouse, Vent Gas Baghouse and Anode Furnace Baghouse

1. Primary Indicators

[40 CFR 64.3(a)(1)]

The alarm on the bag leak detection system shall be the primary indicator of the baghouse performance.

2. Monitoring Approach

[40 CFR 64.3(b)(4)(iii)]

The bag leak detection system signal shall be monitored continuously. The bag leak detection system shall be equipped with an alarm system that will sound automatically when an increase in relative particulate emissions over a preset level is detected. The alarm shall be located where it is easily heard by plant operating personnel and displayed on the operator's control system's computer screen.

3. Quality Assurance/Quality Control (QA/QC)

[40 CFR 64.3(b)(3)]

The bag leak detection system probes will be inspected once a month for dust buildup.

4. Excursion Determination

a. An excursion is defined as an alarm from the bag leak detection system. If an excursion is detected, then the Permittee shall initiate an investigation within 24 hours of the first discovery of the excursion incident and take corrective action as soon as practicable to adjust or repair to minimize possible exceedances of the particulate matter emissions.

[40 CFR 64.6(c)(2)]

b. The Permittee shall log in ink or electronic format and maintain a record of installation, calibration, maintenance, and operation of the monitoring systems in accordance with Section XIII, Attachment "A" of this permit. In the case of any excursion incident, the record shall include an identification of the date and time of all excursions, their cause, and an explanation of the corrective actions taken, if any.

[A.A.C. R18-2-306.A.3.c and 40 CFR §64.6]

c. An excursion does not constitute a deviation unless either the Permittee fails to initiate the investigation or take corrective action as required

[A.A.C. R18-2-306.A.2]

D. In addition to above, the Permittee shall comply with all the General Compliance Assurance Monitoring Requirements under Section IV of Attachment "B".

[40 CFR 64]

IX. CONTINUOUS MONITORING SYSTEMS REQUIREMENTS

A. Requirements for Continuous Opacity Monitoring System (COMS)

1. The Permittee shall operate COMS installed

a. At the outlet of the Vent Gas Baghouse to monitor and record the opacity of gases discharged into the atmosphere from the dryers. The span of this system shall be set at 80 to 100 percent opacity.

[40 CFR 60.165(b)(1)]

b. At the outlet of the acid plant.

[CD CV-15-02206-PHX-DLR 16]

2. The COMS shall meet the following requirements:

a. The COMS shall comply with 40 CFR 60, Appendix B, "Performance Specification 1 - Specification and Test Procedures for Opacity Continuous Emission Monitoring Systems in Stationary Sources":

[40 CFR 60.13(c)]

b. Quality Assurance Requirements:

[40 CFR 60.13, A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

(1) Calibration checks

<u>The Permittee shall automatically, intrinsic to the opacity monitor, check the zero and upscale (span) calibration drifts at least once daily.</u> For a particular COMS, the acceptable range of zero and upscale calibration materials is as defined in Performance Specification 1 in 40 CFR §60, Appendix B.

(2) Zero and span drift adjustments

(a) The zero and span shall, as a minimum, be adjusted whenever the 24-hr zero drift or 24-hr span drift exceeds 4% opacity.

(b) The system shall allow for the amount of excess zero and span drift measured at the 24-hour interval checks to be recorded and quantified.

(c) The optical surfaces exposed to the effluent gases shall be cleaned prior to performing the zero and span drift adjustments, except for systems using automatic zero adjustments.

(d) For systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds 4% opacity.

(3) System checks

The Permittee shall, as minimum procedures, apply a method for producing a simulated zero opacity condition and an upscale (span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of the light beam. All procedures applied shall provide a system check of the analyzer internal optical surfaces and all electronic circuitry including the lamp and photo detector assembly.

(4) Minimum frequency of operation

Except during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments, the COMS shall be in continuous operation and shall complete a minimum of one cycle of sampling and analyzing for each successive 10-second period and one cycle of data recording for each successive 6-minute period.

(5) Data reduction procedures

(a) The Permittee shall reduce all data from the COMS to 6-minute averages. Six-minute opacity averages shall be calculated from 36 or more data points equally spaced over each 6-minute period.

(b) Data recorded during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages. An arithmetic or integrated average of all data may be used.

c. The Permittee shall evaluate opacity measurements from the COMS on a 24-hour rolling average excluding periods of startup, shutdown, and malfunction. If the 24-hour rolling average opacity exceeds 15 percent, the Permittee shall initiate investigation of the relevant controls or equipment within 24 hours of the first discovery of the high opacity incident and, if necessary, take corrective action as soon as practicable to adjust or repair the controls or equipment to reduce the opacity average to below the 15 percent level.

[A.A.C. R18-2-306.A.3.c]

d. Permittee shall implement and follow the EPA approved plan detailing the corrective action triggers based on COMS readings on the exhaust stream from the acid plant.

[CD CV-15-02206-PHX-DLR 16]

B. Requirements for PM CEMS

1. The Permittee shall install the following PM CEMS as per the schedule below:

a. Acid Plant PM CEMS - The Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS on the gas stream exiting the acid plant at a location prior to mixing with other gas streams that are routed to the main stack.

[CD CV-15-02206-PHX-DLR 14.b]

b. Secondary Hood Baghouse PM CEMS - The Permittee shall install, certify, maintain and operate one light scatter PM CEMS (in situ or extractive) on the gas stream exiting the Secondary Baghouse at a location prior to mixing with other gas streams in the stack.

[CD CV-15-02206-PHX-DLR 14.c]

c. Tertiary Hooding PM CEMS - No later than May 1, 2018, the Permittee shall install, certify, maintain and operate light scatter PM CEMS (in situ or extractive) on the gas stream collected by the tertiary hooding at a

location prior to mixing with other gas streams routed to the main stack.
[CD CV-15-02206-PHX-DLR 14.d]

d. Vent Gas Baghouse PM CEMS -No later than May 1, 2018, the Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS and one light scatter PM CEMS (in situ or extractive) on the gas stream exiting the Vent Gas Baghouse at a location prior to mixing with other gas streams that are routed to the main stack.
[CD CV-15-02206-PHX-DLR 14.e]

e. Anode Furnaces Baghouse PM CEMS - the Permittee shall install, certify, maintain and operate one beta attenuation PM CEMS and one light scatter PM CEMS (in situ or extractive) on the stack exiting the Anode Furnaces Baghouse.
[CD CV-15-02206-PHX-DLR 14.a]

2. *<u>The Permittee shall certify, calibrate,</u>* maintain, and operate *<u>PM CEMS according to EPA Performance Specification 11 in 40 C.F.R. Part 60, Appendix B (PS-11) and the quality assurance requirements of Procedure 2 in 40 C.F.R. Part 60, Appendix F.</u>*
[CD CV-15-02206-PHX-DLR 14 A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

3. Acid Plant, Secondary Baghouse and Tertiary Hooding PM CEMS requirements
[CD CV-15-02206-PHX-DLR 14.b, c and d]

a. Within 90 days from the date of installation, the Permittee shall conduct PS-11 testing in accordance with the Installation, Certification, and QA/QC Protocol to certify the CEMS. The Permittee shall submit the results of the PS-11 testing to EPA.

b. If the PM CEMS fails to certify, the Permittee shall conduct a second round of PS-11 testing in accordance with the revised Installation, Certification, and QA/QC Protocol within ninety (90) days from the date that EPA approves such revised Protocol.

4. Anode Furnaces Baghouse and Vent Gas Baghouse PM CEMS
[CD CV-15-02206-PHX-DLR 14.b, c and d]

a. Within 90 days from the date of installation, the Permittee shall conduct simultaneous PS-11 testing for both PM CEMS in accordance with the Installation, Certification, and QA/QC Protocol in order to certify both of the PM CEMS. The Permittee shall submit the results of the PS-11 testing for both of the PM CEMS to EPA.

b. If one or both of the PM CEMS fails to certify, the Permittee shall conduct a second round of PS-11 testing for such PM CEMS in accordance with the revised Installation, Certification, and QA/QC Protocol within ninety (90) days from the date that EPA approves such revised Protocol.

c. The Permittee shall submit the results of any second round PS-11 testing for both of the PM CEMS to EPA.

d. Following successful certification of both PM CEMS or completion of the second round of PS-11 testing pursuant to the EPA-approved revised Protocol, the Permittee may discontinue operation of and remove one of the PM CEMS.

e. If both PM CEMS are certified, the Permittee may choose which PM CEMS shall be removed. If only one PM CEMS is certified, the Permittee may remove the PM CEMS that did not certify.

f. If neither PM CEMS is certified, the Permittee shall submit a proposal for EPA review and approval as to which PM CEMS should be removed and which shall remain in place as a CPMS, to be based on an analysis of data collected to-date from each PM CEMS and evaluation as to which PM CEMS will provide more useful data. Upon receiving EPA approval of the Permittee's proposal for PM CEMS removal, the Permittee may remove that PM CEMS.

5. Each PM CEMS shall comprise a continuous particle mass monitor to measure and record PM concentration, directly or indirectly, and gas stream flow rates on an hourly average basis. The Permittee shall maintain, in an electronic database, the hourly average emission values of all certified PM CEMS in milligrams per dry standard cubic meter (mg/dscm) and pounds per hour (lbs/hr).

[CD CV-15-02206-PHX-DLR 14]

6. If certification is unsuccessful for any PM CEMS, the Permittee shall consult with the PM CEMS vendor and EPA and then within sixty (60) days of completion of the PS-11 testing (including receipt of the results) that was conducted pursuant to the original Installation, Certification, and QA/QC Protocol for that PM CEMS submit a revised Installation, Certification, and QA/QC Protocol for that PM CEMS to EPA for review and approval.

[CD CV-15-02206-PHX-DLR 14]

7. In the event that no PM CEMS is successfully certified on any of the below-specified gas streams, the Permittee shall within ninety days of completion of the second round of PS-11 testing (including receipt of the results) submit an alternative PM monitoring plan for such gas stream(s) for review and approval by EPA that will propose a methodology for using data from the PM CEMS as continuous parametric monitoring systems (CPMS) and stack performance test data to ensure continuous compliance with the relevant PM emission limits. Upon approval by EPA, the Permittee shall continuously operate the PM CEMS as a CPMS consistent with the final PM monitoring plan.

[CD CV-15-02206-PHX-DLR 14]

8 . The Permittee shall use reasonable efforts to keep each PM CEMS running and producing data whenever any gas at that location is being exhausted to the atmosphere. The Permittee shall operate at least one PM CEMS for at least twelve (12) months on each of the exhaust streams specified in Condition IX.B.1 for monitoring of compliance with applicable emission limits.

[CD CV-15-02206-PHX-DLR 15]

a. After at least twelve (12) months of operation, the Permittee may attempt to demonstrate that it is infeasible to continue operating one or more of the PM CEMS. As part of such demonstration, the Permittee shall submit an alternative PM monitoring plan for review and approval by the EPA. The plan shall explain the basis for stopping operation of each PM CEMS and propose an alternative monitoring plan for each affected exhaust stream.

b. Operation of a PM CEMS shall be considered infeasible if

(1) the PM CEMS cannot be kept in working condition for sufficient periods of time to produce reliable, adequate, or useful data consistent with the QA/QC protocol (including, without limitation, PS-11 and Procedure 2); or

(2) Recurring, chronic, or unusual equipment adjustment, servicing, or replacement needs in relation to other types of continuous emission monitors cannot be resolved through reasonable expenditures of resources.

c. If EPA determines that the PM CEMS operation is infeasible, the Permittee shall be entitled to discontinue operation of and remove that PM CEMS. At that point, the Permittee shall comply with the approved alternative PM monitoring plan.

C. Requirements for SO_2 Continuous Emission Monitoring System (CEMS)

1. The SO_2 CEMS shall meet 40 CFR Part 60, Appendix B, "Performance Specification 6 - Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources." The CMS shall follow a quality assurance procedure equivalent to 40 CFR 60 Appendix F. The SO_2 CEMS installed and operated shall meet the quality assurance requirements of 40 CFR 60, Appendix F.

[A.A.C. R18-2-B1302.E.4.b, 40 CFR 60.13(a)]

2. All the stack gas volumetric flow rate monitoring systems shall meet 40 CFR Part 60, Appendix B, "Performance Specification 6- Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources".

3. For the purpose of the SO_2 CEMS performance evaluation, the reference method for Relative Accuracy Test procedure under 40 CFR Part 60, Appendix B, Performance Specification 2 shall be Method 6. For the performance evaluation, each concentration measurement shall be of one hour duration. The pollutant gas used to prepare the calibration gas mixtures required under Performance Specification 2 of appendix B, and for calibration checks under §60.13 (d), shall be sulfur dioxide. The span of the SO_2 CEMS shall be set at a sulfur dioxide concentration of 0.20 percent by volume.

[40 CFR 60.165(b)(2)(ii)]

4. Continuous monitoring means the taking and recording of at least one measurement of SO_2 concentration and stack gas flow rate reading from the effluent of each affected stack, outlet, or other approved measurement location in each 15-minute period when the associated process units are operating. Fifteen-minute periods start at the beginning of each clock hour, and run consecutively. All CEMS shall complete at least one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

[A.A.C. R18-2-B1302.E.3]

5. The Director shall approve the location of all sampling points for monitoring SO_2 concentration and stack gas volumetric flow rates and the appropriate span values for the monitoring systems. This approval shall be in writing before installation and operation of the measurement instruments.

[A.A.C. R18-2-B1302.E.5.d]

6. The measurement system is subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per operating day unless the manufacturer specifies or recommends calibration at shorter intervals, in which case the Permittee shall follow those specifications or recommendations. The Permittee shall make available a record of these procedures that clearly shows instrument readings before and after zero adjustment and calibration.

[A.A.C. R18-2-B1302.E.5.e]

7. The SO_2 CEMS shall meet the following quality assurance requirements:

   a. Calibration drift checks

      Permittee shall check the zero (or low-level value between 0 and 20% of span value) and span (50 to 100 percent of span value) calibration drifts (CD) at least once daily in accordance with a written procedure prescribed by the manufacturer. The pollutant gas used to prepare the calibration gas mixtures for the calibration drift checks shall be sulfur dioxide.

      [40 CFR 60.13(d)(1) and 165(b)(2)(ii)]

   b. Zero and span drift adjustments

      (1) The zero and span shall, as a minimum, be adjusted whenever the 24-hr zero drift or 24-hr span drift exceeds 100 ppm.

      [40 CFR 60.13(d)(1)]

      (2) The SO_2 CEMS shall allow for the amount of excess zero and span drift measured at the 24-hour interval checks to be recorded and quantified. If the data are automatically adjusted to the corrected calibration values (e.g., microprocessor control), Permittee shall program the SO_2 CEMS to record the unadjusted concentration measured in the calibration drift prior to resetting the calibration, if performed, or record the amount of adjustment.

      [40 CFR 60.13(d)(1)]

   c. The CEMS on the anode furnace baghouse stack and tertiary ventilation system shall complete an initial Relative Accuracy Test Audit (RATA) in accordance with Performance Specification 2. The RATA runs shall be tied to when the anode furnace is in use and, for the tertiary system, when the converters are in operation and/or material is being transferred in the converter aisle. Asarco may petition the Department and EPA Region IX on the criteria for subsequent RATAs for the anode furnace baghouse stack or tertiary ventilation system CEMS. The petition shall include submittal of CEMS data during the year.

      [A.A.C. R18-2-B1302.E.5.a]

   d. The Permittee shall notify the Director in writing at least 30 days in advance of the start of the RATA performed on the CEMS.

[A.A.C. R18-2-B1302.E.5.c]

e. Minimum frequency of operation

[40 CFR 60.13(e)(2)]

Except during periods of system breakdowns, repairs, calibration checks, and zero and span adjustments, the SO_2 CEMS shall be in continuous operation and shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.

f. Data reduction procedures

[40 CFR 60.13(h)]

Permittee shall reduce all data from the SO_2 CEMS to 1-hour averages. The 1-hour averages shall be computed from four or more data points equally spaced over each 1-hour period. Data recorded during periods of continuous system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages. An arithmetic or integrated average of all data may be used. The data may be recorded in reduced or non-reduced form (e.g., ppm pollutant and percent O_2 or ng/J of pollutant).

g. Data Substitution

[A.A.C. R18-2-B1302.F.2]

When no valid hour or hours of data have been recorded by a CEMS and the associated process unit is operating, the Permittee shall calculate substitute data for each such period according to the following procedures:

(1) For a missing data period less than or equal to 24 hours, substitute the average of the hourly SO_2 concentrations recorded by the system for the hour before and the hour after the missing data period.

(2) For a missing data period greater than 24 hours, substitute the greater of:

(a) The 90th percentile hourly SO_2 concentrations recorded by the system during the previous 720 quality-assured monitor operating hours.

(b) The average of the hourly SO_2 concentrations recorded by the system for the hour before and the four hours after the missing data period.

h. Excessive audit inaccuracy

If the SO_2 CEMS is out-of-control in terms of the excessive audit inaccuracy as defined in 40 CFR Part 60, Appendix F.5.2.3, the Permittee shall take necessary corrective action to eliminate the problem. Following corrective action, Permittee shall audit the CEMS with a relative accuracy test audit, cylinder gas audit, or relative accuracy audit, to determine if the

CEMS is operating within the performance specifications.

[40 CFR Part 60, Appendix F.5.2]

i. Repeated excessive inaccuracy

Whenever excessive inaccuracies as defined in 40 CFR Part 60, Appendix F.5.2.3 occur for two consecutive quarters, Permittee shall revise the written procedures, or modify or replace the SO_2 CEMS to correct the deficiency causing the repeated excessive inaccuracy.

[40 CFR Part 60, Appendix F.5.3]

j. The Permittee shall maintain on hand and ready for immediate installation sufficient spare parts or duplicate systems for the CEMS required by this Section to allow for the replacement within six hours of any monitoring equipment part that fails or malfunctions during operation.

[A.A.C. R18-2-1302.E.5.f]

D. Recordkeeping and Reporting Requirements

1. The Permittee shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility under this Condition; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is in operative.

[40 CFR 60.7(b) and A.A.C. R18-2-306.A.3.c]

2. The Permittee shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this Condition recorded in a permanent form suitable for inspection. The file shall be retained for at least five years following the date of such measurements, maintenance, reports and records.

[40 CFR 60.7(f) and A.A.C. R18-2-306.A.4.b]

3. Semiannual SO_2 excess emissions and monitoring systems performance reports

a. The Permittee shall submit an Excess Emissions and Monitoring Systems Performance (EEMSP) report and/or a summary report form to the Department semiannually, unless the total duration of excess emissions for the reporting period is less than 1 percent of the total operating time for the reporting period and the continuous monitoring system downtime for the reporting period is less than 5 percent of the total operating time for the reporting period, in which case only the summary report form shall be submitted and the excess emissions report need not be submitted unless requested by the Department. All semiannual reports shall be postmarked by the 30th day following the end of each six-month period.

[40 CFR 60.7(c) and (d)]

b. The summary report form submission shall be in the format specified in 40 CFR 60.7(d). Each EEMSP report shall include the following information:

[40 CFR 60.7(d)]

(1) The magnitude of excess emissions computed, any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emissions. The process operating time during the reporting period.

(2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.

(3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments.

(4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

X. REQUIREMENTS FOR BAGHOUSES

A. Monitoring Requirements

The Permittee shall install, calibrate, maintain, and continuously operate *a baghouse leak detection system for each baghouse located at the facility to monitor baghouse performance.*

[CD CV-15-02206-PHX-DLR 26.a, 40 CFR 63.1444(f)]

1. Baghouses must be operated such that no bag leak detection system alarms for more than five (5) percent of the total operating time in any six (6) month period. For purposes of determining compliance with this limit, a bag leak detection system shall be deemed to alarm from the time the alarm sounds until such time as all investigation and corrective actions have been completed such that the baghouse has been restored to performance below the alarm set point. A bag leak detection system shall also be deemed to alarm during all periods that the system was not in service or believed to be malfunctioning.

   [CD CV-15-02206-PHX-DLR 26.a.v]

2. Each baghouse leak detection system must include a visual alarm that is displayed in a control room that is permanently staffed, on a twenty-four (24) hour basis.

   [CD CV-15-02206-PHX-DLR 26.a.i]

3. The baghouse leak detection systems shall meet the following specifications and requirements:

   [40 CFR 63.1452(b)(1), CD CV-15-02206-PHX-DLR 26.a.ii]

   a. Each system must be certified by the manufacturer to be capable of detecting PM emissions at concentrations that can effectively discern any dysfunctional leaks of the baghouse and be capable of detecting emissions of particulate matter at concentrations of 10 milligrams per actual cubic meter (0.0044 grains per actual cubic foot) or less;

b. Each system sensor must provide output of relative PM loadings.

c. Each system must be equipped with an alarm system that will sound automatically when an increase in sensor output over a preset level that is protective of the applicable PM emissions limit is detected, and the alarm must be located where it is easily heard by plant operating personnel

d. Each system must be installed downstream of the baghouse; and

e. Each system must be installed, operated, calibrated, and maintained in accordance with the manufacturer's written specifications and recommendations, and the Calibration system must, at a minimum, consist of establishing the relative baseline output level by adjusting the sensitivity of the device and establishing the alarm set points and the alarm delay time.

f. Each system that works based on the triboelectric effect must be installed, operated, and maintained in a manner consistent with the guidance document "Fabric Filter Bag Leak Detection Guidance," EPA 454-R-98-015, September 1997.

g. Following the initial adjustment, the Permittee shall not adjust the sensitivity or range, averaging period, alarm set points, or alarm delay time, except as detailed in operation and maintenance plan. The Permittee shall not increase the sensitivity by more than 100 percent or decrease the sensitivity by more than 50 percent over a 365-day period unless a responsible official certifies, in writing, that the baghouse has been inspected and found to be in good operating condition.

h. Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

4. If a bag leak detection system alarm sounds, the Permittee must initiate investigation of the baghouse within one (1) hour of the first discovery of the alarm and, if necessary, take corrective action, in accordance with the written procedures specified in O&M Plan, as soon as practicable to adjust or repair the baghouse to minimize any increased PM emissions. The corrective actions may include, but not limited to

[40 CFR 63.1447(b)(4), CD CV-15-02206-PHX-DLR 26.a.iii]

a. Inspecting the baghouse for air leaks, torn or broken bags or filter media, or any other condition that may cause an increase in emissions.

b. Sealing off defective bags;

c. Replacing defective bags or otherwise repairing the control device;

d. Sealing off a defective baghouse compartment;

e. Cleaning the bag leak detection system probe, or otherwise repair the bag leak detection system; and

f. Shutting down the process producing the particulate emissions

5. The Permittee shall maintain in spare parts inventory no less than 5% of the total bags used in equipment as backup for timely replacement in case of failure.
[CD CV-15-02206-PHX-DLR 26.a.vi]

B. Inspection of Baghouses

1. The Permittee shall conduct baghouse inspections at their specified frequencies according to the following requirements:
[40 CFR 63.1452(b)(2)]

   a. Monitor the pressure drop across each baghouse cell each day to ensure pressure drop is within the normal operating range identified in the manual.

   b. Confirm that dust is being removed from hoppers through weekly visual inspections or other means of ensuring the proper functioning of removal mechanisms.

   c. Check the compressed air supply for pulse-jet baghouses each day.

   d. Monitor cleaning cycles to ensure proper operation using an appropriate methodology.

   e. Check bag cleaning mechanisms for proper functioning through monthly visual inspection or equivalent means.

   f. Make monthly visual checks of bag tension on reverse air and shaker-type baghouses to ensure that bags are not kinked (kneed or bent) or laying on their sides. The Permittee does not have to make this check for shaker-type baghouses using self-tensioning (spring-loaded) devices.

   g. Confirm the physical integrity of the baghouse through quarterly visual inspections of the baghouse interior for air leaks.

   h. Inspect fans for wear, material buildup, and corrosion through quarterly visual inspections, vibration detectors, or equivalent means.

2. The Permittee shall conduct weekly inspections of baghouses to ensure the equipment is functioning in accordance with the requirements of the Dust Plan.
[CD CV-15-02206-PHX-DLR B28.B.ii]

C. Recordkeeping Requirements

1. The Permittee must log in ink or electronic format and maintain a record of installation, Calibration, maintenance, and operation of the bag leak detection systems.
CD CV-15-02206-PHX-DLR 26.a.iv]

2. If a bag leak detection system alarm sounds, the records must include an identification of the dates, times, and durations of all bag leak detection alarms, their cause, and an explanation of the corrective actions taken, if any and the date on which corrective action was completed.

[CD CV-15-02206-PHX-DLR 26.a.iv, 40 CFR 63.1453(c)(2) and 1456(a)(6)]

3. The Permittee shall also record any dates, times, and durations when the bag leak detection system was not in service or believed to be malfunctioning.
[CD CV-15-02206-PHX-DLR 26.a.iv]

4. The Permittee shall maintain records of each inspection required by Condition X.B, recording all information needed to document conformance with these requirements. If the Permittee increases or decreases the sensitivity of the bag leak detection system beyond the limits specified in Condition X.A.3.g, the Permittee must include a copy of the required written certification by a responsible official in the next semiannual compliance report.
[40 CFR 63.1453(c)(3)]

XI. CONVERTERS ARSENIC CHARGING RATE MONITORING REQUIREMENTS

A. General Provisions

1. The requirements of this section apply to any copper converter under this permit where the total arsenic charging rate for the copper converter department averaged over a 1-year period is less than 75 kg/hr. At such time that the Permittee becomes aware of the 1-year period average total equal to or greater than 75 kg/hr, the Permittee shall submit an application for permit revision in accordance with Section XVI, Attachment "A".
40 CFR 61.172(a)]

2. Arsenic charging rate means the hourly rate at which arsenic is charged to the copper converters based on the arsenic content of the copper matte that is charged to the copper converters.
[40 CFR 61.171]

B. Monitoring Requirements

The Permittee shall determine the converter arsenic charging rate as follows:

1. Collect daily grab samples of copper matte charged to the copper converters.
[40 CFR 61.174(f)(1)]

2. Each calendar month, from the daily grab samples collected under Condition XI.B.1 above, put together a composite copper matte sample. Analyze the composite samples individually using Method 108A, 108B, or 108C to determine the weight percent of inorganic arsenic contained in each sample.

[40 CFR 61.174(f)(2)]

3. Calculate the converter arsenic charging rate once per month using the following equation:
[40 CFR 61.174(f)(3)]

$$Rc = \sum (i=1 \text{ to } n) : \frac{(A_c \cdot W_{ci})}{100\ H_c}$$

R_c= Converter arsenic charging rate (kg/hour or pounds/hour).

A_c= Monthly average weight percent of arsenic in the copper matte charged during the month (%) as determined under Condition IX.B.2 above.

W_{ci}= Total weight of copper matte charged to a copper converter during the month (kg or pound).

H_c= Total number of hours the copper converter department was in operation during the month.

n= Number of copper converters in operation during the month.

4. Determine an annual arsenic charging rate for the copper converter department once per month by computing the arithmetic average of the 12 monthly converter arsenic charging rate values (R_c) for the preceding 12-month period.

[40 CFR 61.174(f)(4)]

C. Recordkeeping and Reporting Requirements

1. The Permittee shall maintain at the source for a period of at least 2 years and make available to the Director upon request the following records:

   a. For all converters, a daily record of the amount of copper matte charged to the converters and total hours of operation.

   [40 CFR 61.176(c)(1)]

   b. For all converters, a monthly record of the weight percent of arsenic contained in the copper matte as determined under Condition IX.B.2.

   [40 CFR 61.176(c)(2)]

   c. For all converters, the monthly calculations of the average annual arsenic charging rate for the preceding 12-month period as determined under Condition XI.B.4.

   [40 CFR 61.176(c)(3)]

2. The Permittee shall submit annually a written report to the Director that includes the monthly computations of the average annual converter arsenic charging rate as calculated under Condition X.B.4. The annual report shall be postmarked by the 30th day following the end of each calendar year.

[40 CFR 61.177(f)]

D. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 CFR 61.171, 40 CFR 61.172(a), 40 CFR 61.174(f), 40 CFR 61.176(c)(1), 40 CFR 61.176(c)(2), 40 CFR 61.176(c)(3), and 40 CFR 61.177(f).

[A.A.C. R18-2-325]

XII. BRICK CRUSHER

A. Applicability

This Section shall be applicable to equipment associated with the Brick Crusher identified in the Equipment List as applicable to this Section.

B. Operating Limitation

1. The amount of material processed in the brick crushing plant shall not exceed 42,000 tons per year.

[Condition 8 of Installation Permit No. 1215]

2. The Permittee shall conduct refractory brick crushing operations only within the current Refractory Crushing Area, the Smithco's revert crusher, or in a fully enclosed building whose emissions are vented through a particulate matter control device, such as a baghouse or a scrubber.

[CD CV-15-02206-PHX-DLR B.5.A]

3. The Permittee shall operate a baghouse with the brick crushing plant subject to the requirements of this section with rated efficiency no lower than 99%.

[Installation Permit 1215, Conditions 2 and 3]

4. Monitoring, Recordkeeping and Reporting Requirements

a. The Permittee shall record the date, hours of operation and process weight rate in tons-mass per hour to the brick crushing system.

.A.A.C. R18-2-306.A.3.c]

b. The Permittee shall maintain a record of monthly and 12-month rolling total of the material processed in the brick crushing plant.

[A.A.C. R18-2-306.A.3.c]

C. Particulate Matter and Opacity

1. Emission Limits and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter from the brick crusher into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

a. Brick crushing plant

(1) *<u>The Permittee shall continue to operate</u>* and maintain *<u>the ventilation system and baghouse associated with the brick crushing plant in accordance with good air pollution control practices for minimizing particulate matter emissions to the greatest extent practicable</u>*.

[Conditions 2 and 3 of Permit 1215, CD CV-15-02206-PHX-DLR B.5.B and A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

(2) Particulates captured in the baghouses shall be handled and disposed in a manner which prevents re-entrainment into the atmosphere.

[Condition 5 of Installation Permit No. 1215]

(3) All conveyor transfer points shall be enclosed.

[Condition 6 of Installation Permit No. 1215]

(4) Spray bars shall be used at every dumping and conveyor transfer point, as necessary to minimize the particulate matter emissions.

[Condition 7 of Installation Permit No. 1215]

(5) The Permittee shall, at all times, comply with the requirements applicable to uncrushed brick handling, brick crushing operations, and storage piles for uncrushed as well as crushed brick as identified in the fugitive dust plan.

[CD CV-15-02206-PHX-DLR B.3 and 4]

3. Monitoring, Recordkeeping and Reporting Requirements

a. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from the baghouse and all other affected facilities associated with the brick crushing plant as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

b. The baseline opacity for the brick crushing plant shall be 5%, established via Method 9 evaluation on March 26, 2003.

[A.A.C. R18-2-306.A.3.c]

(1) If the observer sees visible emissions from the revert crushing plant that on an instantaneous basis appear to exceed the baseline level, then the observer shall if practicable take a six-minute Method 9 observation of the plume.

[A.A.C. R18-2-306.A.3.c]

(2) If the six-minute opacity of the plume exceeds the baseline level but is less than the opacity standard, the Permittee shall initiate corrective action, as necessary, to reduce opacity to or below the baseline level. The Permittee shall make a record of the location, date, and time of the test; the results of the Method 9 observation: and any corrective actions taken.

[A.A.C. R18-2-306.A.3.c]

(3) If the six-minute opacity of the plume exceeds the opacity standard, then the Permittee shall adjust or repair the controls or equipment to reduce opacity to or below the baseline level; and report the event as an excess emission for opacity.

[A.A.C. R18-2-306.A.3.c]

(4) If corrective actions fail to reduce opacity to or below the baseline level, the Permittee shall document all corrective action taken, and re-establish the baseline within 48 hours in accordance with Condition XII.C.3.b(5) below.

[A.A.C. R18-2-306.A.3.c]

(5) If necessitated by the results of the opacity monitoring, the Permittee may reestablish the baseline opacity level. Reestablishment of the baseline shall be performed by conducting 3 certified Method 9 observations, and determining the average of the 3 observations. Within 30 days of reestablishing the baseline opacity, the Permittee shall report the results to the Director. The report shall also contain a description of the need for re-establishing the baseline.

[A.A.C. R18-2-306.A.3.c]

4. Performance Testing Requirements

The Permittee shall determine compliance with the particulate matter standards set forth in Condition XII.C.1.a by conducting performance tests on the baghouse at least once during the permit term using EPA Reference Method 5 or 17 to determine the particulate matter concentration.

[A.A.C. R18-2-312.A]

D. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715 D, Conditions 2, 3, 5, 6 and 7 of Installation Permit No. 1215 and [CD CV-15-02206-PHX-DLR B.3, B.4 and B.5.b

[A.A.C. R18-2-325]

XIII. MATERIAL HANDLING FACILITIES

A. Applicability

1. This Section shall be applicable to the equipment identified in the Equipment list as applicable to this Sections, and material handling operations associated with the following activities:

a. Concentrate storage, handling and unloading operations,

b. Bedding operations

c. Furnace and converter silica flux handling and storage operations

d. Flash furnace feed system

e. Converter dust handling operations

f. Acid plant scrubber blowdown drying system

g. Revert Screens

B. Particulate Matter and Opacity

1. Emission Limits and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter from any equipment into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:

[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25
5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The opacity of emissions from any of the equipment into the atmosphere shall not be greater than 20 percent as measured by EPA Reference Method 9.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

a. *The Permittee shall continue to operate* and maintain *the silo vent baghouses in accordance with good air pollution control practices for minimizing particulate matter emissions*.

[A.A.C. R18-2-306.A.3.c, A.A.C. R18-2-331.A.3.e]
[Material permit conditions are indicated by underline and italics]

b. The Permittee shall, at all times, comply with the requirements applicable to Concentrate Storage, Handling, and Unloading Operations, bedding

operations, furnace/converter silica flux handling and storage operations, converter dust handling operations as identified in the fugitive dust plan.
[CD CV-15-02206-PHX-DLR B.6, 7, 8, 9 and 11]

3. Monitoring, Recordkeeping and Reporting Requirements

a. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from silo vent baghouses as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".
[A.A.C. R18-2-306.A.3.c]

b. The Permittee shall conduct a bi-weekly (once in every 2 weeks) monitoring of visible emissions from all other affected facilities as per the periodic opacity monitoring requirements specified in Condition I.D of Attachment "B".
[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with 40 C.F.R. § 52.126, A.A.C. R18-2-715. D, and CD CV-15-02206-PHX-DLR B.6, 7, 8, 9 and 11.
[A.A.C. R18-2-325]

XIV. WET GAS CLEANING SYSTEM

A. Applicability

The requirements of this Section are applicable to the following equipment:

1. WGC Thickener

2. WGC Filter Press

3. WGC Filter Cake Dryer

4. WGC Filter Cake Packaging System

B. Particulate Matter and Opacity

1. Emissions Limitations and Standards

a. The Permittee shall not discharge or cause the discharge of particulate matter from the wet gas cleaning system into the atmosphere in excess of the hourly rate shown in the following table for the process weight rate identified for such source:
[40 CFR 52.126(b)]

Process Weight Rate	Emission Rate
50	0.36
100	0.55
500	1.53
1,000	2.25

5,000	6.34
10,000	9.73
20,000	14.99
60,000	29.60
80,000	31.19
120,000	33.28
160,000	34.85
200,000	36.11
400,000	40.35
1,000,000	46.72

b. The Permittee shall not cause, allow or permit to be emitted into the atmosphere any plume or effluent from wet gas cleaning system, the opacity of which exceeds 20 percent, as determined by Reference Method 9 in 40 CFR 60, Appendix A.

[A.A.C. R18-2-715.D]

2. Air Pollution Control Requirements

Emissions from the thickener, dryer and packaging system shall be vented through a packed gas cooling tower to minimize particulate emissions.

[A.A.C. R18-2-306.A.3.c and -331.A.3.c]
[Material permit conditions are indicated by underline and italics]

3. Monitoring, Recordkeeping, and Reporting Requirements

A certified EPA Reference Method 9 observer shall conduct a bi-weekly survey of visible emissions from the Wet Gas Cleaning equipment in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c]

C. Permit Shield

Compliance with the terms of this Section shall be deemed compliance with A40 C.F.R. § 52.126, A.C. R18-2- 715.D.

[A.A.C. R18-2-325]

ATTACHMENT "F": SULFUR DIOXIDE MULTI POINT ROLL BACK REQUIREMENTS

I. PROCESS SOURCES GOVERNED BY THE MULTI-POINT ROLLBACK RULE

A. General Provisions

1. Applicability

   a. The requirements of this Attachment are applicable to total of sulfur dioxide emissions from smelter processing units and sulfur dioxide control and removal equipment, but not to uncaptured fugitive emissions or emissions due solely to the use of fuel for space heating or steam generation.

   [A.A.C. R18-2-715.01.A]

   b. This Attachment will remain effective as part of the federally approved SIP until EPA approves A.A.C. R18-2-715.I and A.A.C. R18-2-715.01V.

2. Definitions

   a. An "operating day", for the purpose of this Section, means any day in which sulfur-containing feed is introduced into the smelting process.

   [A.A.C. R18-2-715.01.J]

   b. "Compliance period", for the purposes of this section, means the 365 calendar days immediately preceding the end of each day of the month being reported unless that period includes less than 300 operating days. In such case the number of days preceding the last day of the compliance period shall be increased until the compliance period contains 300 operating days.

   [A.A.C. R18-2-715.01.J]

B. Emission Limitations and Standards

Except as provided in a consent decree or a delayed compliance order, the Permittee shall comply with the following emission limitations:

1. Annual average sulfur dioxide emissions

   Annual average SO_2 emissions, as calculated under Condition I.D.6, shall not exceed 6,882 pounds per hour.

   [A.A.C. R18-2-715.F.1.a]

2. Allowable sulfur dioxide emissions profile

   The number of three-hour average emissions, as calculated under Condition I.D.6 shall not exceed n cumulative occurrences in excess of E, the emission level, shown in the Table 1 below in any compliance period:

   [A.A.C. R18-2-715.F.1.b]

Table 1: Allowable SO_2 emissions profile

Occurrences, n	Emission Level, E (lbs/hr)	Occurrences, n	Emission Level, E (lbs/hr)
0	24,641	180	13,777
1	22,971	245	13,212
2	21,705	330	12,664
4	20,322	435	12,129
7	19,387	560	11,621
12	18,739	710	11,165
20	17,656	890	10,660
32	16,988	1100	10,205
48	16,358	1340	9,748
68	15,808	1610	9,319
94	15,090	1910	8,953
130	14,423	2240	8,556

3. Annual average fugitive sulfur dioxide emissions

   a. Annual average fugitive emissions, as calculated under Condition I.D.7 of this Attachment, shall not exceed 295 pounds per hour.

   [A.A.C. R18-2-715.G]

   b. The above emission limit applies to the total of uncaptured fugitive sulfur dioxide emissions from the smelter processing units and sulfur dioxide control and removal equipment, but not emissions due solely to the use of fuel for space heating or steam generation.

   [A.A.C. R18-2-715.01.T]

C. Air Pollution Control Requirements

The Permittee shall continue to maintain and *operate the following emission control equipment and other relevant facilities with good housekeeping and operational practices to ensure the maximum capture and control of fugitive SO_2 emissions from the converter building, furnace building, and/or anode building*:

[A.A.C. R18-2-306.01.A, -715.02.C, -2-331.A.3.e]
[Material permit conditions are indicated by italics and underline]

1. The vent gas baghouse (after CRP startup)
2. Flue systems;
3. Monsanto sulfuric acid plant;
4. Primary hoods for the converters;
5. Secondary hoods for the converters;
6. Secondary hoods baghouse for the converter building;
7. Furnace ventilation hoods;
8. Furnace wet gas handling system;

9. Tertiary hoods for the converters

D. Monitoring, Recordkeeping and Reporting Requirements

1. Sulfur Balance

As a means of determining total overall emissions, the Permittee shall perform material balances for sulfur in accordance with the procedures prescribed in Section II.

[A.A.C. R18-2-715.01.O]

2. *For purposes of determining compliance with the cumulative occurrence and emission limits contained in Conditions I.B.1 and I.B.2 , the Permittee shall install, calibrate,* maintain, and operate *measurement systems for continuously monitoring sulfur dioxide concentrations and stack gas volumetric flow rates of the following*:

A.A.C. R18-2-715.01.K, K.1 and K.2, A.A.C. R18-2-306.A.3.c, A.A.C. R-18-2-331.A.3.c]
[Material permit conditions are indicated by italics and underline]

a. *Converter secondary hoods and slag return hoods ventilation gas streams reporting to the annulus of the one-thousand-foot stack;*

b. *Flash furnace slag skimming and matte tapping hoods to the annulus of the one-thousand-foot stack;*

c. *Acid plant tail gas stream to the center of the one-thousand-foot stack; and*

d. *Tertiary ventilation system gas stream to the annulus of the one-thousand-foot stack.*

3. For purposes above, continuous monitoring means the taking and recording of at least one measurement of sulfur dioxide concentration and stack gas flow rate reading from the effluent of each affected stack, outlet or other approved measurement location in each 15-minute period. Fifteen-minute periods start at the beginning of each clock hour, and run consecutively. An hour of smelter emissions is continuously monitored if the emissions from all monitored stacks, outlets, or other approved measurement locations are measured for at least 45 minutes of any hour.

[A.A.C. R18-2-715.01.K.4]

4. The Permittee shall measure at least 95 percent of the hours during which emissions occurred in any month.

[A.A.C. R18-2-715.01.L]

5. The Permittee shall demonstrate that the continuous monitoring system meets all of the following requirements:

a. The sulfur dioxide continuous emission monitoring system installed and operated under this Section meets the requirements of 40 CFR §60, Appendix B, Performance Specification 6.

[A.A.C. R18-2-715.01.K.5.a]

b. The sulfur dioxide continuous emission monitoring system installed and operated under this Section meets the quality assurance requirements of

40 CFR 60, Appendix F.

[A.A.C. R18-2-715.01.K.5.b]

c. The Permittee shall notify the Director in writing at least 30 days in advance of the start of relative accuracy test audit (RATA) procedures performed on the continuous monitoring system.

[A.A.C. R18-2-715.01.K.5.c]

d. The Director shall approve the location of all sampling points for monitoring sulfur dioxide concentrations and stack gas volumetric flow rates in writing before installation and operation of measurement instruments.

[A.A.C. R18-2-715.01.K.5.d]

e. The measurement systems in use shall be subject to the manufacturer's recommended zero adjustment and calibration procedures at least once per 24-hour operating period unless the manufacturer specifies or recommends calibration at shorter intervals, in which case specifications or recommendations shall be followed. Records of these procedures shall be made available which clearly show instrument readings before and after zero adjustment and calibration.

[A.A.C. R18-2-715.01.K.5.e]

f. The Permittee shall maintain on hand and ready for immediate installation sufficient spare parts or duplicate systems for the continuous monitoring equipment required by this subsection to allow for the replacement within six hours of any monitoring equipment part which fails or malfunctions during operation.

[A.A.C. R18-2-715.01.N]

6. For purposes of determining compliance with the cumulative occurrence and emission limits contained in Conditions I.B.1 and I.B.2 of this Attachment, the annual average emissions and three-hour emissions shall be determined as follows:

a. The Permittee shall, at the end of each day, calculate annual average SO_2 emissions by averaging the SO_2 emissions for all hours measured during the compliance period, as defined in Condition I.A.2.b, ending on that day.

[A.A.C. R18-2-715.01.C.1]

b. The Permittee shall, at the end of each clock hour, calculate three-hour SO_2 emissions averages by averaging the hourly SO_2 emissions for the preceding three consecutive hours whenever each such hour was measured in accordance with the requirements under Condition I.D.2.

[A.A.C. R18-2-715.01.C.2]

c. The cumulative occurrence and emission level shall be determined using the sum total of sulfur dioxide emissions from the smelter processing units and sulfur dioxide control and removal equipment. The captured fugitive emissions shall be included as part of the total plant emissions, but not the uncaptured fugitive emissions and those emissions due solely to the use of fuel for space heating or steam generation.

[A.A.C. R18-2-715.01.A]

d. Periods of malfunction, startup, shutdown or other upset conditions shall be included in the determination.

[A.A.C. R18-2-715.01.B]

7. For purposes of determining compliance with the annual average fugitive emissions limit contained in Condition I.B.3, the Permittee shall calculate the annual average fugitive emissions at the end of the last day of each month by averaging the monthly emissions for the previous 12-month period ending that day. To determine monthly fugitive emissions, the Permittee shall perform material balances for sulfur in accordance with Section II of this Attachment.

[A.A.C. R18-2-715.01.T.1]

8. Violation Determination

For purposes of this Section, the following scenarios shall be considered violations of the cumulative occurrence and/or emission limits contained in Condition I.B:

a. An annual emissions average in excess of the allowable annual average emission limit in Condition I.B.1 shall be considered a violation if either:

(1) The annual average is greater than the annual average computed for the preceding day; or

[A.A.C. R18-2-715.01.C.1.a]

(2) The annual averages computed for the five preceding days all exceed the allowable annual average emission limit.

[A.A.C. R18-2-715.01.C.1.b]

b. A three-hour emissions average in excess of an emission level (E) will be considered to violate the associated cumulative occurrence limit (n) listed in Condition I.B.2, Table 1 of this Section if:

[A.A.C. R18-2-715.01.E]

(1) The number of all three-hour emissions averages calculated during the compliance period in excess of that emission level exceeds the cumulative occurrence limit associated with the emission level; and

(2) The average was calculated during the last operating day of the compliance period being reported.

c. A three-hour emissions average only violates the cumulative occurrence limit (n) of an emission level (E) on the day containing the last hour in the average.

[A.A.C. R18-2-715.01.F]

d. Multiple violations of a cumulative occurrence limit by different three-hour emissions averages containing any common hour constitute a single violation.

[A.A.C. R18-2-715.01.I]

e. Multiple violations of the same cumulative occurrence limit on the same day and violations of different cumulative occurrence limits on the same day constitutes a single violation.

[A.A.C. R18-2-715.01.G]

f. The violation of any cumulative occurrence limit and an annual average emission limit on the same day constitutes only a single violation.

[A.A.C. R18-2-715.01.H]

g. An annual emissions average in excess of the allowable annual average emission limit for uncaptured fugitives in Condition I.B.3 shall be considered a violation if the fugitive annual average computed at the end of each month exceeds the allowable annual average emission limit.

[A.A.C. R18-2-715.01.T.2]

h. Failure to measure any 12 consecutive hours of emissions in accordance Condition I.D.3 shall constitute a violation.

[A.A.C. R18-2-715.01.M]

9. Recordkeeping and Reporting Requirements

a. The Permittee shall maintain a record of all average hourly emissions measurements and calculated average monthly emissions required by this Section in accordance with the requirements specified in Section XIII of Attachment "A" of this permit.

[A.A.C. R18-2-715.01.P]

b. All of the following measurement results and calculated average monthly emissions shall be expressed as pounds per hour of sulfur dioxide and shall be summarized monthly and submitted to the Director within 20 days after the end of each month:

[A.A.C. R18-2-715.01.P]

(1) For all periods described in Condition I.D.6.a and I.D.6.b, the annual average emissions as calculated at the end of each day of the month;

(2) The total number of hourly periods during the month in which measurements were not taken and the reason for loss of measurement for each period;

(3) The number of three-hour emissions averages that exceeded each of the applicable emissions levels listed in Condition I.B.2 for the compliance periods ending on each day of the month being reported;

(4) The date on which a cumulative occurrence limit listed in Condition I.B.2 was exceeded if the exceedance occurred during the month being reported.

(5) For all periods described in Condition I.D.7, the annual average emissions as calculated at the end of the last day of

each month.

10. Emergency Shutdown Bypass Monitoring and Reporting Requirements

The Permittee shall install instrumentation to monitor each point in the facility where a means exists to bypass the sulfur removal equipment, to detect and record all periods that the bypass is in operation. The Permittee shall report to the Director, not later than the 15th day of each month, the recorded information required by this Section, including an explanation for the necessity of the use of the bypass.

[A.A.C. R18-2-715.01.Q]

E. Permit Shield

Compliance with the conditions of this Section shall be deemed compliance with A.A.C. R18-2-715.F.1, 715.G, 715.I, 715.01.A, 715.01.B, 715.01.C, 715.01.E, 715.01.F, 715.01.G, 715.01.H, 715.01.I, 715.01.J, 715.01.K, 715.01.L, 715.01.M, 715.01.N, 715.01.O, 715.01.P, 715.01.Q, 715.01.T, 715.01.V, 715.02.C and 1302.A.2

[A.A.C. R18-2-325]

II. SULFUR BALANCE PROGRAM

Procedures for Utilizing the Sulfur Balance Method for Determining Sulfur Emissions

A. Determination of sulfur emissions for the smelter as a whole shall be subject to the following conditions:

1. The emissions sum shall apply to all process sulfur emitted into the ambient air from smelter processing units and sulfur control and removal equipment associated with the smelting process. The total monthly amount of sulfur emissions is equal to the weight of the total sulfur introduced into the smelting process in any calendar month minus the weight of all the sulfur removed from the smelting process streams in that month in any physical form. Removed sulfur shall include, but not be limited to, sulfur contained in slag, anodes, sulfuric acid, flue dust, precipitator dust, WPT filter cake, cone settler overflow (CSO), reverts and miscellaneous byproducts. All unaccounted for sulfur, including fugitive sulfur emissions, shall be considered as emissions to the ambient air.

2. Material balances for sulfur described in Condition II.A.1 above shall be obtained in accordance with the procedures listed in this Appendix which are equivalent to Appendix 8 to A.A.C. Title 18, Chapter 2.

3. Average daily emissions shall be determined by dividing the total monthly emissions by the number of operating days in the particular month.

B. Calculating input sulfur

Total sulfur input is the sum of the product of the weight of each sulfur bearing material introduced into the smelting process as calculated in Condition II.B.1 multiplied by the fraction of sulfur contained in that material as calculated in Condition II.B.2 plus the amount of sulfur contained in fuel utilized in the smelting process as calculated in Condition II.B.3.

1. Material weight

All sulfur bearing materials, other than fuels, introduced into the smelting process shall be weighed. Such weighing shall be subject to the following conditions:

a. Weight shall be determined on a belt scale, rail or truck scales, or other weighing device.

b. Weight shall be determined within an accuracy of ±5 percent.

c. All devices or scales used for weighing are to be calibrated to manufacturer's specifications. Scales shall be calibrated at least quarterly.

d. Sulfur bearing materials subject to being weighed shall include, but not be limited to, concentrate, reverts which are not part of the internal circulating load, precipitates and miscellaneous outside products. Materials such as limestone and silica flux which are mixed with a charge of sulfur bearing materials shall be weighed and reported.

2. Sulfur content

The sulfur content of all sulfur bearing materials introduced into the smelting process shall be calculated using the following steps:

a. Sampling – The procedure to be followed in sampling is dependent upon the input vehicles for the sulfur bearing material.

(1) Railcar – The Permittee shall collect a 5 to 15 pound sample from each railcar. Samples are to be taken from one to six points using an auger method, pipe method, or other equivalent method approved by the Director and the EPA Administrator. Samples shall be combined into lots from railcars delivering material from the same source.

(2) Truck – The Permittee shall collect a 5 to 15 pound sample from each truckload. Samples are to be taken from one to six points using an auger method, pipe method, or other equivalent method approved by the Director and the EPA Administrator. Samples shall be combined into lots from trucks delivering material from the same source. For fluxes, one truckload per day shall be sampled.

b. Sample preparation – each total sample shall be prepared for analysis in the following manner:

(1) If necessary, the sample shall be crushed to minus quarter inch particles.

(2) Each sample shall be thoroughly blended in a roto-cone blender or similar device.

(3) A blended composite sample shall be prepared based on individual sample weight and moisture. Material to be used

in the composite sample shall be cut with a sample scoop or knife and used to make a composite sample of a minimum of 1800 grams for each lot.

(4) Each dry composite sample shall be pulverized to a nominal minus 100 mesh using a roto-disc pulverizer or similar equipment and then blended in a roto-cone blender or similar equipment.

(5) A portion that is a minimum of 200 grams shall be cut from the composite sample for analysis.

c. Sample analysis

The sample shall be analyzed to determine sulfur content using LECO Sulfur Analyzer or equivalent method approved by the Director and the EPA Administrator. The accuracy of such an analysis shall be within a range of ±1 percent.

d. Sulfur determination

The sulfur content of all feed material treated per month shall be determined by month and physical inventories in conjunction with certified scales for bed contents. Physical inventory determines beginning and ending bed contents for each month and all bed contents processed during the month, together with inventory changes for secondaries. Based upon individual lot numbers for each material processed (i.e. concentrates, reverts, purchased secondaries, and fluxes) the composite analysis shall be used to determine sulfur input.

3. Fuel sulfur content

Sulfur in fuels used in the process shall be calculated by multiplying the amount of fuel delivered to the process by the fraction of sulfur in the fuel as reported to the Permittee by the fuel's supplier. The sulfur content determination shall be accurate to within ±5 percent.

C. Calculating removed sulfur

Total removed sulfur is the sum of the sulfur removed in each of the following products as determined by each process set forth below.

1. Furnace Slag

a. The weight of the slag shall be determined using a count of furnace slag ladles.

b. A sample shall be collected from each slag ladle during skimming operations and combined into a daily composite sample.

c. The sample shall be prepared and analyzed for sulfur. The sample shall be dried, pulverized using a roto-disc pulverizer or equivalent method approved by the Director, and a sample that is a minimum of 50 grams shall be split out using a Jones Splitter, or equivalent method approved by the Director and the EPA Administrator.

d. The sample will be analyzed as in Condition II.B.2.c above.

2. Scrubber Blowdown

a. Scrubber blowdown shall be collected, thickened, filtered and dried in accordance with the requirements in Section XII of Attachment "D". An average truck payload weight shall be determined for all filter cake recycled onsite. When shipped, all railcars shall be weighed. The filter cake that is recycled onsite shall be stockpiled and sampled. For shipment offsite, all railcars shall be sampled. The sample shall be prepared and analyzed for sulfur and copper using the procedures in Conditions II.B.2.b and II.B.2.c above.

b. If filter cake is managed in a manner other than as set forth in Condition II.C.2.a above, it shall be quantified, sampled and analyzed pursuant to generally acceptable methods.

3. Strong Acids

a. An inventory of strong acids shall be taken daily. The inventory shall be adjusted by the amounts of acid shipped or otherwise transferred during that day.

b. The daily inventory shall be accurate to within ±5 percent.

c. Strong acid analysis both at the acid plant and the laboratory shall be performed with a sonic analyzer or equivalent method approved by the Director and the EPA Administrator. Samples shall be taken a minimum of 6 times per day to compare to the on-stream analyzers.

d. The product sample shall be sent to the laboratory for daily analysis.

4. Weak Acids

a. A weak acid sample that is a minimum of 100 ml shall be collected daily and combined in a sample container to form a composite sample that shall be analyzed monthly for sulfur content using the Barium Sulfate Gravimetric Method or equivalent method approved by the Director and the EPA Administrator.

b. Weak acid railcars shall be loaded to a mark (nominally 20,125 gallons) and the total volume shall be determined by the number of railcars shipped.

5. Sulfur in Copper production

a. The weight of copper produced shall be determined by weight of copper cast to an accuracy of ±5 percent.

b. The weight and number of castings shall be recorded.

c. Three samples per copper anode charge shall be obtained at the beginning, middle and end of each pour. A portion (approximately 1 gram) from each sample shall become part of a monthly composite that is analyzed for sulfur content using a LECO Sulfur Analyzer, or equivalent method approved by the Director and the EPA Administrator, with an induction furnace to volatilize the sulfur and measure the resultant compound using a titration method to an accuracy of within ±50 percent.

6. Materials in process

a. Total tonnage of materials in process shall be determined by physical inventory on the first day of each month.

b. A monthly change of in-process inventory shall be calculated for each material in process by taking the difference between the inventory from each material in process on the first day of the preceding month and multiplying that difference by the monthly composite sulfur assay for that material.

c. The change of monthly in-process inventory shall be accurate to within ±50 percent.

D. General Provisions

1. The processes and procedures specified in this Appendix shall be available for inspection, review and verification by the Department at all reasonable times.

2. The sulfur capture and/or monitoring equipment may be replaced or changed from time to time without a permit revision to the extent such changes comply with A.A.C. R18-2-317 (facility changes allowed without a permit revision).

3. All flow meters, density gauges, sonic sensors, pressure sensors, etc., used in determining the sulfur balance shall be calibrated according to manufacturer's specifications or as needed.

III. ASARCO HAYDEN LABORATORY QA/QC PLAN FOR SULFUR ANALYSES

Sulfuric Acid – Shipments and Production

A. Operation: The Sulfuric Acid Analyzer shall be operated as per manufacturer's instructions.

B. Blank Analyses: A blank analysis consisting of deionized water shall be analyzed daily. This shall be compared to the velocity of sound in water and shall fall within ±5% of the published value.

C. Calibration Verification Sample: A standard sample shall be analyzed with each set of samples. The Calibration Verification Sample shall fall within ±2% of its control value. The results of the analysis shall be plotted on a control chart to indicate that the control value is within three (3) standard deviations.

D. Duplicates: Every twentieth (20^{th}) sample, or one sample from each analytical set, shall be analyzed in duplicate. The relative standard deviation shall be calculated and shall fall within ±20 percent.

E. Quality Control Sample: A quality control sample shall be analyzed quarterly. The analysis shall compare within ±10%. (blind note: JTBaker Sulfuric acid 9681-02)

F. Quality Assurance: When control limits are exceeded, the analysis shall be repeated. If necessary, a supervisory chemist shall be notified and the necessary steps shall be taken to bring the analysis within control. No analyses shall be reported or used as valid data, until the method is found to be under control.

ATTACHMENT "G": REGIONAL HAZE REQUIREMENTS

I. APPLICABILITY

This Attachment is applicable to anode furnaces #1 and #2 at the Hayden Smelter.

[40 CFR 52.145(l)(1)]

II. GENERAL REQUIREMENTS

A. At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate the unit including associated air pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions. Pollution control equipment shall be designed and capable of operating properly to minimize emissions during all expected operating conditions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Regional Administrator which may include, but is not limited to, monitoring results, review of operating and maintenance procedures, and inspection of the unit.

[40 CFR 52.145(l)(12)]

B. Work Practice Standards

Anode furnaces #1 and #2 shall only be charged with blister copper or higher purity copper. This charging limitation does not extend to the use or addition of poling or fluxing agents necessary to achieve final casting chemistry.

[40 CFR 52.145(l)(4)(vi)]

C. Enforcement

Any credible evidence or information relevant as to whether a unit would have been in compliance with requirements under Attachment "G" of this permit if the appropriate performance or compliance test had been performed, can be used to establish whether or not the Permittee has violated or is in violation of any standard or applicable emission limit in Attachment "G" of this permit.

[40 CFR 52.145(l)(13)]

III. NITROGEN OXIDES

A. Emission Limitations and Standards

The Permittee shall not cause total NO_X emissions from anode furnaces #1 and #2 to exceed 40 tons per 12-continuous month period.

[40 CFR 52.145(l)(4)(v)]

B. Compliance determination

1. Compliance with the emission limit for NO_X in Condition III.A shall be demonstrated by monitoring natural gas consumption in anode furnaces #1 and #2 for each calendar day.

[40 CFR 52.145(l)(6)(v)]

2. At the end of each calendar month, the Permittee shall calculate 12-consecutive month NO_X emissions by multiplying the daily natural gas consumption rates for each unit by an approved emission factor and adding the sums for all units over

the previous 12-consecutive month period.

[40 CFR 52.145(l)(6)(v)]

IV. RECORDKEEPING AND REPORTING REQUIREMENTS

A. The Permittee shall maintain the following records for at least five years:

[40 CFR 52.145(l)(9)]

1. Records of all major maintenance activities conducted on emission units, and air pollution control equipment.

2. Records of daily natural gas consumption in anode furnaces #1 and #2, and all calculations performed to demonstrate compliance with the limit in Condition III.A.

ATTACHMENT "H": SMITHCO REVERTS AND FLUX CRUSHING OPERATIONS

I. GENERAL REQUIREMENTS

A. The Conditions in this Attachment are applicable to reverts crushing operations and silica flux crushing operations conducted at the Hayden facility.

B. Section III shall be applicable to

1. Coarse Revert crushing operations, and

2. Fine Crushing Operations, when used for crushing reverts

C. Section IV shall be applicable to

1. Coarse Flux Crushing operations, and

2. Fine Crushing Operations, when used for crushing silica flux

D. The Permittee shall keep records of periods when the fine crushing circuit is utilized for reverts crushing or silica flux crushing.

II. REQUIREMENTS FROM THE CONSENT DECREE

A. The Permittee shall manage uncrushed revert material only in areas protected by a Wind Fence.

[CD CV-15-02206-PHX-DLR B.3.A]

B. The Permittee shall crush revert and store crushed revert only on one or more concrete pads, and within an area protected by a Wind Fence. These pad(s) shall be designed to capture, store and allow pumping of storm water or sprayed water to minimize emissions to the greatest extent practicable, including curbing around the outer edges of the cement pad(s) where feasible.

[CD CV-15-02206-PHX-DLR B.4.A. B and E]

C. The Permittee shall install and continuously operate a sufficient number of sprayers in accordance with the Fugitive Dust Plan to ensure that the surface of all revert material being crushed and crushed revert material is wetted with the objective to minimize emissions to the greatest extent practicable.

[CD CV-15-02206-PHX-DLR B.3.B, 4.C, 26]

D. The Permittee shall perform all storage activities and loading and unloading of furnace silica flux within an area protected by a Wind Fence.

[CD CV-15-02206-PHX-DLR B.8.A]

E. The Permittee shall wet the surface of all furnace silica flux and converter silica flux storage piles with sufficient moisture to minimize emissions to the greatest extent practicable.

[CD CV-15-02206-PHX-DLR B.8.B and 9.A]

III. REVERT CRUSHING OPERATIONS

A. Applicability

This Section is applicable to equipment identified in the Equipment List in Attachment "K" as applicable to this Section.

B. Operating Requirements

At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate any affected facility in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

[40 CFR 60.11(d)]

C. Particulate Matter and Opacity

1. Emission Limitations

The Permittee shall not cause to be discharged into the atmosphere from an affected facility any process fugitive emissions that exhibit greater than 10 percent opacity.

[40 CFR 60.382(b), A.A.C. R18-2-331A.3.f]
[Material Permit Conditions are indicated by underline and italics]

2. Air Pollution Control Requirements

Water spray bars or equivalent control equipment shall be used whenever the equipment is operating or material must be adequately wet to minimize visible emissions to the extent practical.

[A.A.C. R18-2-331.A.3.d & e, and 306.A.2]
[Material permit conditions are indicated by underline and italics]

3. Monitoring and Recordkeeping Requirements

A certified observer shall conduct a weekly visual survey of emissions from all sources covered by this Section while they are in operation and in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c and 306.A.4]

D. Permit Shield

Compliance with the conditions of this Subsection shall be deemed compliance with 40 CFR 60.382(b).

[A.A.C. R18-2-325]

IV. SILICA (FLUX) CRUSHING OPERATIONS

A. OPERATIONS SUBJECT TO NSPS SUBPART OOO

1. Applicability

This Section is applicable to furnace and converter silica flux crushing and storage facilities identified in the Equipment List in Attachment "K" as applicable to this Section.

2. Operating Requirements

   At all times, including periods of startup, shutdown, and malfunction, the Permittee shall, to the extent practicable, maintain and operate any affected facility in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

   [40 CFR 60.11(d)]

3. Particulate Matter and Opacity

   a. Emission Limitations

      (1) *The Permittee shall not allow to be discharged into the atmosphere from any crusher at which a capture system is not used, any fugitive emissions which exhibit visible emissions greater than 15 percent opacity*.

      [40 CFR 60.672(b) Table 3 and A.A.C. R18-2-331.A.3.f]
      [Material permit conditions are indicated by underline and italics]

      (2) *The Permittee shall not allow to be discharged into the atmosphere from any screening operation, transfer point on belt conveyors or any other affected facility which commenced construction, modification, or reconstruction after August 31, 1983, but before April 22, 2008, any fugitive emissions which exhibit visible emissions greater than 10 percent opacity*.

      [40 CFR 60.672(b) Table 3 and A.A.C. R18-2-331.A.3.f]
      [Material permit conditions are indicated by underline and italics]

      (3) *The Permittee shall not allow to be discharged into the atmosphere from any screening operation, transfer point on belt conveyors or any other affected facility which commenced construction, modification, or reconstruction on or after April 22, 2008, any fugitive emissions which exhibit visible emissions greater than 7 percent opacity*.

      [40 CFR 60.672(b) and A.A.C. R18-2-331.A.3.f]
      [Material permit conditions are indicated by underline and italics]

   b. Air Pollution Control Requirements

      Water spray bars or equivalent control equipment shall be used whenever the equipment is operating or material must be adequately wet to minimize visible emissions to the extent practical.

      [A.A.C. R18-2-306.A.2 and -331.A.3.e]
      [Material permit conditions are indicated by underline and italics]

   c. Monitoring, Reporting, and Recordkeeping Requirements

      (1) To demonstrate compliance with the opacity limits in Condition IV.A.3.a, the Permittee shall conduct weekly opacity monitoring of visible emissions on all affected

facilities in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c and 306.A.4]

(2) For any affected facility for which construction, modification, or reconstruction commenced on or after April 22, 2008,

(a) The Permittee shall perform monthly periodic inspections to check that water is flowing to discharge spray nozzles in the wet suppression system. The Permittee shall initiate corrective action within 24 hours and complete corrective action as expediently as practical if it is found that water is not flowing properly during an inspection of the water spray nozzles.

[CFR 60.674(b)]

(b) If an affected facility that routinely uses wet suppression water sprays ceases operation of the water sprays or is using a control mechanism to reduce fugitive emissions other than water sprays during the monthly inspection (for example, water from recent rainfall), the logbook entry required under Condition IV.A.3.c(2)(c) below must specify the control mechanism being used instead of the water sprays.

[40 CFR 60.674(b)(2)]

(c) The Permittee shall maintain record of each periodic inspection including dates and any corrective actions taken, in a logbook (in written or electronic format). The Permittee shall keep the logbook onsite and make hard or electronic copies (whichever is requested) of the logbook available to the Director upon request.

[40 CFR 60.676(b)(1)]

d. Testing Requirements

(1) The Permittee shall demonstrate compliance with the applicable opacity limits for fugitive emissions contained in Condition IV.A.3.a by conducting initial performance tests in accordance with EPA Reference Method 9 and the procedures in 40 CFR 60.11, with the following additions:

[40 CFR 60.675.(c)(1), Table 3 to 40 CFR 60 Subpart OOO]

(a) The minimum distance between the observer and the emission source shall be 4.57 meters (15 feet).

(b) The observer shall, when possible, select a position that minimizes interference from other fugitive emission sources (e.g., road dust). The required observer position relative to the sun (Method 9 of Appendix A–4 of 40 CFR 60, Section 2.1) must be followed.

(c) For affected facilities using wet dust suppression for particulate matter control, a visible mist is sometimes generated by the spray. The water mist must not be confused with particulate matter emissions and is not to be considered a visible emission. When a water mist of this nature is present, the observation of emissions is to be made at a point in the plume where the mist is no longer visible.

(2) For the facility which commenced construction, modification, or reconstruction on or after April 22, 2008, the Permittee shall conduct a repeat performance test according Condition IV.A.3.d(1) above within 5 years from the previous performance test for fugitive emissions from affected facilities without water sprays. Affected facilities controlled by water carryover from upstream water sprays are exempt from this 5-year repeat testing requirement if,

[40 CFR 60.674(b)(1)]

(a) The Permittee conducts periodic inspections of the upstream water spray(s) that are responsible for controlling fugitive emissions from the affected facility. These inspections shall be conducted according to this Condition IV.A.3.c(2)(a) and

[40 CFR 60.674(b)(1)(i)]

(b) The Permittee designates which upstream water spray(s) will be periodically inspected at the time of the initial performance test in Condition IV.A.3.d(1).

[40 CFR 60.674(b)(1)(ii)]

4. Permit Shield

Compliance with the condition of this Section shall be deemed compliance with 40 CFR 60.672(b), 60.674(b)(1) and (2), 60.675.(c)(1) and 60.676(b)(1).

[A.A.C.R18-2-325]

B. SILICA (FLUX) CRUSHING OPERATIONS NOT SUBJECT TO NSPS SUBPART OOO

1. Applicability

This Section is applicable to furnace and converter silica flux crushing and storage facilities in the Equipment List in Attachment "K" as applicable to this Section.

2. Particulate Matter and Opacity

a. Emission Limits/Standards

(1) The Permittee shall not cause, allow or permit the discharge of particulate matter into the atmosphere, except as fugitive emissions, in any one hour from any gravel or crushed stone processing plant in total quantities in excess of the amounts calculated by one of the following equations:

[A.A.C. R9-3-522]

(a) For process sources having a process weight rate of 60,000 pounds per hour (30 tons per hour) or less, the maximum allowable emissions shall be determined by the following equation:

$E = 3.59P^{0.62}$

Where:

E = the maximum allowable particulate emissions rate in pounds-mass per hour.

P = the process weight rate in tons-mass per hour.

[AZ SIP R9-3-522.A.2.a]

(b) For process sources having a process weight rate greater than 60,000 pounds per hour (30 tons per hour), the maximum allowable emissions shall be determined by the following equation:

$E = 17.31P^{0.16}$

Where E and P are defined above.

[AZ SIP R9-3-522.A.2.b]

(2) Opacity

The Permittee shall not cause to be discharged into the atmosphere from any silica crushing processes any emissions greater than 20 percent.

[A.A.C. R18-2-702.B.3]

b. Air Pollution Control Requirements

(1) *<u>Water spray bars or equivalent control equipment shall be used whenever the equipment is operating or material must be adequately wet to minimize visible emissions to the extent practical</u>*.

[A.A.C. R18-2-331.A.3.d & e, and 306.A.2]
[Material permit conditions are indicated by underline and italics]

(2) Spray bar pollution control shall be utilized in accordance with "EPA Control of Air Emissions From Process Operations in the Rock Crushing Industry" (EPA 340/1-79-002), and "Wet Suppression System" (pages 15-34, amended as of January, 1979 (and no future amendments or editions)), as incorporated herein by reference and on file with the Office of the Secretary of State, with placement of spray bars and nozzles as required by the Director to minimize air pollution.

[A.A.C. R18-2-722.D]

c. Monitoring and Recordkeeping Requirements

(1) A certified observer shall conduct a weekly visual survey of emissions from all sources covered by this Section while they are in operation and in accordance with Condition I.D of Attachment "B".

[A.A.C. R18-2-306.A.3.c and 306.A.4]

(2) *The Permittee shall install, calibrate*, maintain, and operate *monitoring devices which can be used to determine daily the process weight of sand, gravel or crushed stone produced. The weighing devices shall have an accuracy of plus or minus 5 percent over their operating range*.

[A.A.C. R18-2-722.F, and A.A.C. R18-2-331.A.3.c]
[Material permit conditions are indicated by underline and italics]

(3) The Permittee shall maintain records of the daily production rate of crushed silica produced.

[A.A.C. R18-2-722.G]

3. Permit Shield

Compliance with Conditions of this Subsection shall be deemed compliance with AZ SIP R9-3-522.A.2.a and b, A.A.C. R18-2-702.B, 722.D, 722.E, 722.F and 722.G.

[A.A.C. R18-2-325]

ATTACHMENT "I": HAYDEN SMELTER SITE-SPECIFIC SIP REQUIREMENTS

I. GENERAL REQUIREMENTS

A. The operational controls and limitations in Condition II shall be implemented at the time specified in Condition II, or upon smelter restart where no time is listed in Condition II. The requirements of Condition II are federally enforceable as a permit condition upon restart and as part of the state implementation plan upon the Administrator's action approving them in the Hayden sulfur dioxide or lead nonattainment area plan, as applicable.

B. The requirements in Condition III (Sulfur Dioxide (SO_2) Emissions Limitations) shall become effective 60 days after the Hayden smelter achieves maximum production after smelter restart or 180 days after smelter restart. The requirements of Condition III are state-only enforceable until the effective date of the Administrator's action approve them as part of the state implementation plan for sulfur dioxide control.

C. The requirements in Condition IV (Particulate Limits and Lead Work Practice Standards) shall become effective 60 days after the Hayden Smelter achieves maximum production or 180 days after restart, whichever occurs first. The requirements of Condition IV are state-only enforceable until the effective date the EPA Administrator approves them as part of the state implementation plan for lead control.

D. The Tables in Appendix 1 of this Attachment are required to be maintained in accordance with the provisions of this Attachment as an aid to the administration of this Attachment, but the Tables and information contained therein shall not constitute part of the state implementation plan. The Tables and the information contained therein are federally enforceable when the condition referring to them is federally enforceable.

E. Definitions for Purposes of this Attachment:

1. "Fuming ladle" shall mean a ladle emitting an abnormal amount of fume after discharge of material.

2. "Maintenance downturn" shall mean a scheduled maintenance period lasting at least eight (8) working hours.

3. "Smelter restart" shall mean the first day after permit issuance that concentrate is processed through the INCO flash furnace to produce matte.

II. OPERATIONAL LIMITATIONS

A. Flash Furnace Area Capture Improvements

1. The Permittee shall install additional hooding and interceptor walls (the "Uptake Improvement System") to improve the capture of fugitive emissions from the flash furnace area, matte tapping and slag skimming areas, route them to the existing converter secondary hood baghouse for fabric filter and high surface area lime injection control, and then to the annulus of the main stack.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

2. The Uptake Improvement System shall have a design evacuation rate of 50,000 to 60,000 cfm hourly average and shall operate when the flash furnace is in operation

except for brief periods when slag is being returned to the flash furnace using the slag launder return. At those times, the ventilation for this system shall be switched to the slag return capture system and then switched back automatically to the Uptake Improvement System at the conclusion of the slag return cycle.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

3. Establishment of Operational Ranges

a. The Permittee shall establish a range of damper positions based upon the secondary hood baghouse flow monitor that provides reasonable assurance that the Uptake Improvement System exhaust flow is within the design range specified in Condition II.A.2. These ranges shall be established and verified by a stack test no later than 180 days after smelter restart and may be revised thereafter in the same fashion. The proposed ranges, stack test verifying evacuation rates compliant with Condition II.A.2, and proposed revision to Table 1 of Appendix 1 shall be submitted to the department within 45 days of the stack test. If the Director concurs that the proposed damper position ranges assure an exhaust flow compliant with Condition II.A.2, the director shall issue a revised Table 1 of Appendix 1 reflecting the new damper position range. Thereafter, the Permittee shall comply with the approved Table 1 range. Until the first submittal is approved, the Permittee shall use ranges specified by the air pollution control designer. The current ranges are specified in Table 1 of Appendix 1 of this Attachment.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

b. The Permittee shall establish a timed interlock on the slag return launder such that when slag is returned to the flash furnace the ventilation air from the Uptake Improvement System is switched to the slag return capture system for a defined period of not less than 5 minutes nor more than 10 minutes and then returns to the Uptake Improvement System automatically. The Permittee shall optimize the period within the 5 to 10-minute range during the initial 60-day optimization period by observation and analysis and thereafter as necessary. The first analysis, proposed time period, and proposed revisions to Table 2 shall be submitted no later than 75 days after smelter restart. The Director shall approve any period that falls within both the 5 to 10-minute range and a range between the mean and mean plus one standard deviation of observed slag return durations. If the director concurs that the proposed range meets these requirements, the director shall issue a revised Table 2. All analyses shall be submitted and approved by the Director. Until the first report is approved, the Permittee shall use ranges specified by the air pollution control designer. The current ranges are specified in Table 2 of Appendix 1 of this Attachment.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

4. Operational Requirements

The Permittee shall:

a. Operate the Uptake Improvement/Launder Return combined damper in accordance with the approved Table 1 range(s) at all times the flash furnace is operating and at all times matte tapping, slag skimming or slag return is occurring.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

b. Operate the timed interlock in accordance with the approved Table 2 value. Operators shall trigger the interlock prior to starting slag return and may trigger the timed interlock again if slag is still returning at the end of the interlock cycle to minimize emissions.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

5. The Permittee shall inspect the Uptake Improvement System during each scheduled maintenance downturn to ensure that the hooding and walls are in proper position and that there are no visible accretions of material in the mouth of the hooding that would preclude efficient operation. The Permittee shall quarterly, evaluate the damper controlling air between the Uptake Improvement System and the slag return capture system to ensure it is operating properly. Records of these inspections shall be maintained for five (5) years.

[A.A.C. R18-2-306.A.2, -306.A.4.b, and ARS 49-426.E]
[State Enforceable Only]

B. Converter and Material Transfer Area Capture Improvements

1. The Permittee shall install a hood and interceptor walls (the "Fuming Ladle Capture System") to provide a system for the capture of fugitive emissions from fuming ladles in the converter aisle and material transfer areas, route them to the existing converter secondary hood baghouse for fabric filter and high surface area lime injection control, and then to the annulus of the main stack each day.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

2. The Permittee shall, whenever a fuming ladle is detected, promptly move the fuming ladle into the Fuming Ladle Capture System.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

a. The Permittee shall develop training for its employees responsible for ladle movement on identification of fuming ladles. The training shall be developed within 60 days of restart. Existing employees shall be trained within 90 days of restart and any new employees shall be trained before working ladle operations unsupervised by a trained operator. Employees shall be retrained once every five (5) years.

[A.A.C. R18-2-306.A.3.d and ARS 49-426.E]
[State Enforceable Only]

b. Training Program

The training program curriculum required for Condition 0 shall include:

(1) Identification of fuming ladles, including oral description from experienced operators, written descriptions and, after smelter restart, photographs and video of fuming and non-fuming ladles;

(2) Procedures on observing ladles to determine when they are fuming;

(3) Instruction on when marginal ladles may be moved to the matte tunnels for control and when they should be moved to the Fuming Ladle Capture System (FLCS);

(4) Prompt movement of ladles to, placement in, and operation of the FLCS;

(5) When and how ladles may be removed from the FLCS;

(6) Steps to take if a ladle remains fuming after initial time out of the FLCS; and

(7) Procedures for additional scrutiny of first slag and shell out ladles.

[A.A.C. R18-2-306.A.3.d and ARS 49-426.E]
[State Enforceable Only]

c. The Permittee shall submit the curriculum required for Condition 0 and any written and photographic/video training materials to the Department within 10 days of development of the curriculum and thereafter shall be provide training the curriculum and materials to inspectors upon request.

[A.A.C. R18-2-306.A.3.d and ARS 49-426.E]
[State Enforceable Only]

d. The Permittee shall keep a log of the occurrences of fuming ladle events. The log shall include the date of the event, duration of the event, severity of the fuming ladle, and the time elapsed between identification of the fuming ladle the operator moving the fuming ladle into the Fuming Ladle Capture System.

e. Training records for the operators shall be kept for (5) five years. The training and records shall be available for inspection.

[A.A.C. R18-2-306.A.4.b and ARS 49-426.E]
[State Enforceable Only]

3. The Fuming Ladle Capture System shall have a design evacuation rate of 40,000- to 50,000 cfm when a ladle is present within the hooded area. The capture system shall run until the ladle is removed or for at least 20 minutes after the ladle is placed in the containment. Fuming ladles shall not be removed from the Fuming Ladle Capture System containment unless transported directly to the tunnel or within the capture area of a secondary hood.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

4. The Permittee shall conduct an initial flow test within 180 days of smelter restart to verify that the system achieves the design flow. The results of this flow test shall be reported to the Department within 45 days of completion of the test.

[A.A.C. R18-2-306.A.3.d, -306.5.a, and ARS 49-426.E]
[State Enforceable Only]

5. The Permittee shall inspect the Fuming Ladle Capture System during each

scheduled maintenance downturn to ensure that it is actuating properly, that the hoods and walls are in proper position, and there are no visible accretions of material in the mouth of the hood that would preclude efficient operation. Records of these inspections shall be maintained for five (5) years.

[A.A.C. R18-2-306.A.2, -306.A.4.b, and ARS 49-426.E]
[State Enforceable Only]

C. Anode Furnace Secondary Hood Capture and Control System

1. The Permittee shall install secondary hoods around each of the anode furnaces to improve the capture of fugitive emissions from the anode furnaces during charging, holding and processing, route the emissions to a new anode secondary hood baghouse for fabric filter control, and then to the annulus of the main stack. This is the Anode Secondary Hood System.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

2. The Anode Secondary Hood System

   a. The Anode Secondary Hood System shall have an overall design evacuation rate for the total system of 150,000 cfm hourly average.

   [A.A.C. R18-2-306.A.2 and ARS 49-426.E]
   [State Enforceable Only]

   b. The anode secondary hood baghouse shall have a maximum design emission rate of 0.002 gr/scf.

   [A.A.C. R18-2-306.A.2 and ARS 49-426.E]
   [State Enforceable Only]

   c. Each secondary hood shall be equipped with dampers that can close completely and operate with a range from 20 to 100% to modulate flows to the individual anode furnace.

   [A.A.C. R18-2-306.A.2 and ARS 49-426.E]
   [State Enforceable Only]

   d. The Anode Secondary Hood System shall be operated to achieve balanced flows (± 15%) on the two operating anode furnaces when neither are charging. When one anode furnace is charging, the Anode Secondary Hood System shall be balanced so that the charging furnace achieves a minimum of 100,000 cfm and the other operating furnace gets the balance.

   [A.A.C. R18-2-306.A.2 and ARS 49-426.E]
   [State Enforceable Only]

3. The Permittee shall establish a range of damper positions and total flow conditions based upon the anode secondary hood baghouse flow monitor that provides reasonable assurance that the Anode Secondary Hood System exhaust flow is within the design range. These ranges and flow conditions shall be verified during a performance test within 180 days of smelter restart may be revised thereafter in the same fashion. The proposed ranges and flow conditions, stack test verifying evacuation rates compliant with Condition II.C.2.a and 0, and proposed revision to Table 3 of Appendix 1 shall be submitted to the department within 45 days of the stack test. If the director concurs that the proposed damper position and flow ranges assure an exhaust flow compliant with Condition II.C.2.a and 0, the Director shall issue a revised Table 3 of Appendix 1 reflecting the new damper position and flow ranges. Thereafter, the Permittee shall comply with the approved

Table 3. Until the first performance test, the Permittee shall use ranges specified by the air pollution control designer. The current flows shall be specified in Table 3 of Appendix 1 of this Attachment. Damper positions shall be logged and the logs kept for five (5) years.

[A.A.C. R18-2-306.A.2 and ARS 49-426.E]
[State Enforceable Only]

4. Operational Requirements

The Permittee shall Operate the Anode Secondary Hoods in accordance with the approved Table 3 range(s) at all times the anode furnaces are operating.

5. The Permittee shall inspect the Anode Secondary Hood System during each scheduled maintenance down turn to ensure that the dampers are working properly, the hoods and walls are in proper position and that there are no visible accretions of material in the mouth of the hoods that would preclude efficient operation. Records of these inspections shall be maintained for five (5) years.

[A.A.C. R18-2-306.A.2, -306.A.4.b, and ARS 49-426.E]
[State Enforceable Only]

III. SULFUR DIOXIDE (SO_2) EMISSION LIMITS

The requirements of Condition III are state-only enforceable until the effective date of the Administrator's action approving them as part of the state implementation plan for sulfur dioxide control.

A. Main Stack Limit

Sulfur dioxide emissions from the Main Stack shall not exceed 1069.1 lb/hr, 14-day operating average.

[A.A.C. R18-2-306.01 and ARS 49-426.E]
[State Enforceable Only]

B. Fugitive Emissions Limits

Effective 60 days after the Hayden smelter achieves maximum production after smelter restart, or 180 days after smelter restart, whichever occurs first.

1. Fugitive emissions of SO_2 from the INCO flash furnace, matte tapping and slag skimming areas shall not exceed 38.5 pounds/hour, as measured by the flash furnace roofline monitoring system.

[A.A.C. R18-2-B1302 and ARS 49-426.E]
[State Enforceable Only]

2. Fugitive emissions of SO_2 from the converter aisle area shall not exceed 10.0 pounds/hour, as measured by the converter aisle roofline monitoring system.

[A.A.C. R18-2-B1302 and ARS 49-426.E]
[State Enforceable Only]

3. Fugitive emissions of SO_2 from the anode furnaces shall not exceed 9.0 pounds/hour, as measured by the anode furnace roofline monitoring system.

[A.A.C. R18-2-B1302 and ARS 49-426.E]
[State Enforceable Only]

These limits shall apply when the underlying processes are in operation, including periods of startup, shutdown and malfunction.

[A.A.C. R18-2-B1302 and ARS 49-426.E]
[State Enforceable Only]

C. Monitoring

1. Main Stack Monitoring

Monitoring for the main stack emission limits in Condition III.A of this permit and A.A.C. R18-2-B1302, Subdivision C shall be as set forth in A.A.C. R18-2-B1302 Subdivision E with the following additional requirements:

a. *The Permittee shall install, calibrate,* maintain and operate *a CEMS for continuously monitoring and recording SO_2 emissions and stack gas volumetric flows at the exit of the Anode Secondary Hood Baghouse. This system shall be installed and a RATA successfully completed within 180 days of the effective date of this Section under Condition I.B.*

[A.A.C. R18-2-306.A.3.c, -306.A.3.d -331.A.3.c, -B1302.E, and ARS 49-426.E]
[Material Permit Conditions are defined by underline and italics]

b. The CEMS shall meet the requirements of A.A.C. R18-2-B1302(E)(2), (3), and (5), except that everywhere those provisions reference "subsection (E)(1)" it shall mean "subsection (E)(1) and Condition III.C.1.a of permit number 96410."

[A.A.C. R18-2-306.A.3.c, -B1302.E, and ARS 49-426.E]
[State Enforceable Only]

2. Fugitive Monitoring

Monitoring for the fugitive emission limits in Condition III.B of this permit shall be as follows:

a. *The Permittee shall install, calibrate,* maintain and operate *a CEMS for continuously monitoring and recording SO_2 emissions and volumetric flows at the roofline of the following areas when the underlying process units are operating:*

[A.A.C. R18-2-306.A.3.c, -306.A.3.d -331.A.3.c, -B1302.E, and ARS 49-426.E]
[State Enforceable Only]
[Material Permit Conditions are defined by underline and italics]

(1) Flash furnace roofline system, located on the penthouse and roof of the flash furnace building;

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

(2) Converter aisle roofline system, located at the north and south ends of the converter aisle, and

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

(3) Anode aisle roofline system, located over the anode furnaces.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

b. These systems shall be installed and certified successfully completed within 180 days of the effective date of this section under Condition I.B. The Permittee shall notify the Director in writing at least 30 days in advance of the initial certification testing performed on the CEMS.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

c. The CEMS shall meet the requirements of A.A.C. R18-2-B1302(E)(2), (3), and (5), except that everywhere those provisions reference "subsection (E)(1)" it shall mean "Condition III.C.2.a of Permit No. 96410" and everywhere those provisions specify a relative accuracy test audit (RATA) a cylinder gas audit (CGA) shall be used instead.

[A.A.C. R18-2-306.A.3.c, -B1302.E, and ARS 49-426.E]
[State Enforceable Only]

d. The Permittee shall develop a roofline monitoring system operations and maintenance plan (Roofline Plan) that addresses the roofline monitoring system required by Condition III.C.2.a. The Roofline Plan shall include the following elements:

(1) a diagram showing the location of each intake point and which intake points are directed to which CEMS;

(2) a protocol for how the intake points will be sampled by the CEMS;

(3) a description of each CEMS, its required QA/QC procedures and span;

(4) manufacturer's or installer's recommended zero adjustment and calibration procedures, which must provide for instrument readings before and after zero adjustments and calibrations, to be implemented at least once per operating day on the CEMS and at a frequency set forth in the protocol for flow meters;

(5) a list of replacement parts that shall be maintained on hand and ready for immediate installation on the CEMS within 6 hours and to allow fabrication of new sample runs and installation within 10 days;

(6) and equations showing how mass emission rates will be calculated.

[A.A.C. R18-2-B1302.D.2.a, e and ARS 49-426.E]
[State Enforceable Only]

e. The Permittee shall submit the Roofline Plan to the Department and EPA Region IX at least 90 days prior to smelter restart. The Permittee may submit other revisions at any time when necessary. All revisions shall be designed to achieve data collection at the roofline monitoring system consistent with the attainment demonstration in the Hayden 2010 Sulfur Dioxide National Ambient Air Quality Standards Nonattainment Area SIP. Plans and plan revisions may be implemented upon submittal and shall remain in effect until superseded or until disapproved by the Department or EPA Region IX. Disapprovals are appealable agency action.

[A.A.C. R18-2-B1302.D.2.a, e and ARS 49-426.E]
[State Enforceable Only]

3. Emergency Shutdown Ventilation Flue Monitoring

The Permittee shall install instrumentation on the Emergency Shutdown Ventilation Flue to detect and record all periods that the bypass is in operation. The Permittee shall keep a log of all times of both damper positions and, when both dampers are open, whether the period is a planned or unplanned maintenance period. The Permittee shall log any periods when one damper is open and the other damper is closed stating when the malfunctioning damper was repaired. For purposes of this Attachment, "planned maintenance" means any period where the Permittee has shut down the associated emissions units and run the evacuation system until the inlet meter at the acid plant registers the equivalent of 53.5 lb/hr or less before opening the Emergency Shutdown Ventilation Flue. The inlet concentration shall be documented in the operating log.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

D. Compliance Demonstration

1. Main Stack Compliance Demonstration.

a. Compliance with the main stack limit in Condition III.A shall be demonstrated using the procedures in A.A.C. R18-2-B1302(F)(1), (2), (4) and (5) except as follows:

(1) "subsection (E)(1) and Condition III.C.1 of permit no. 96410 shall be substituted for "subsection (E)(1)" throughout;

(2) the provisions of subsection (F)(1)(c) shall not be used; and

(3) Notwithstanding subsections (F)(2)(a) and (F)(2)(b), the owner or operator may present any credible evidence as to the quantity or concentration of emissions during any period of missing data.

[A.A.C. R18-2-B1302 and ARS 49-426.E]
[State Enforceable Only]

b. For purposes of demonstrating compliance with the main stack limit in Condition III.A and A.A.C. R18-2-B1302(F)(1)(a), the pounds of SO_2 in the emergency shutdown vent shall be calculated for unplanned use of the emergency shutdown ventilation system as the total volume of the emergency shutdown system at the maximum expected SO_2 concentrations in each segment and 10 percent of that amount for planned shutdowns when the evacuation system is run until SO_2 emissions shown on the combined CEMS system are less than 53.5 lb/hr. Future changes to the design volume of the emergency shutdown system or to the maximum SO_2 concentrations used in the calculation shall be submitted to the Department with a written justification for the change and revised calculations showing the newly calculated planned and unplanned shutdown emissions. This justification may be included as part of a required permit or permit revision. The change shall not be made until approved by the Director. A copy of the current calculations and planned and unplanned shutdown emissions values shall be included in Table 4 of Appendix 1 of this Attachment.

[A.A.C. R18-2-306.A.3.c, -B1302 and ARS 49-426.E]
[State Enforceable Only]

2. Fugitive Limit Compliance Demonstration

Compliance with the fugitive emission limits in Condition III.B shall be demonstrated as follows:

a. Each valid hour of calculated emissions from the flash furnace roofline system in Condition III.C.2.a(1) shall be compared to the limit in Condition III.B.1 to demonstrate compliance.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

b. Each valid hour of calculated emissions from the converter aisle roofline system in Condition III.C.2.a(2) shall be compared to the limit in Condition III.B.2 to demonstrate compliance.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

c. Each valid hour of calculated emissions from the anode aisle roofline system in Condition III.C.2.a(3) shall be compared to the limit in Condition III.B.3 to demonstrate compliance.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

d. Data substitution under Section R18-2-B1302(F)(2) shall not be used. Instead, the Permittee shall maintain 95% or more valid hours for each system listed in Condition III.C.2.a.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

e. The Permittee shall include periods of startup, shutdown, malfunction, or other upset condition when determining compliance with the limits in Condition III.B.

[A.A.C. R18-2-B1302.F.4 and ARS 49-426.E]
[State Enforceable Only]

3. For purposes of demonstrating compliance with the limits in A.A.C. R18-2-B1302(C) and Conditions III.A and III.B of Permit No. 96410, all CEMS listed in A.A.C. R18-2-B1302(C)(1) and Conditions III.C.1 and 2 of Permit No. 96410 shall use the following data validity requirements:

a. Except as provided under Condition III.D.3.c for a full operating hour (any clock hour with 60 minutes of unit operation), at least four valid data points are required to calculate the hourly average, i.e., one data point in each of the 15-minute quadrants of the hour.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

b. Except as provided under Condition III.D.3.c for a partial operating hour (any clock hour with less than 60 minutes of unit operation), at least one valid data point in each 15-minute quadrant of the hour in which the unit operates is required to calculate the hourly average.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

c. For any operating hour in which required maintenance or quality-assurance activities are performed:

(1) If the unit operates in two or more quadrants of the hour, a minimum of two valid data points, separated by at least 15 minutes, is required to calculate the hourly average; or

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

(2) If the unit operates in only one quadrant of the hour, at least one valid data point is required to calculate the hourly average.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

d. If a daily calibration error check is failed during any operating hour, all data for that hour shall be invalidated, unless a subsequent calibration error test is passed in the same hour and the requirements of Condition III.D.3.c are met, based solely on valid data recorded after the successful calibration.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

e. For each full or partial operating hour, all valid data points shall be used to calculate the hourly average.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

f. Data recorded during periods of continuous monitoring system breakdown, repair, maintenance, out of control periods, calibration checks, and zero and span adjustments shall not be included in the data averages computed under Condition III.D.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

g. Either arithmetic or integrated averaging of all data may be used to calculate the hourly average. The data may be recorded in reduced or non-reduced form.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

E. Recordkeeping

1. The Permittee shall maintain the operational and training records specified in Condition II.A.3, II.A.4, II.B.2, II.B.4, II.B.5, II.C.3,and II.C.4 for five (5) years.

[A.A.C. R18-2-306.A.4.b and ARS 49-426.E]
[State Enforceable Only]

2. The Permittee shall maintain the following records for at least five (5) years:

a. All measurements from the continuous monitoring systems required by

Condition III.C.1 and 2 including the date, place, and time of sampling or measurement, parameters sampled or measured, and results.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

b. All records of all compliance calculations required by Condition III.D.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

c. All records of quality assurance and quality control activities conducted on the continuous monitoring systems required by Conditions III.C.1 and 2.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

d. All records of continuous monitoring system breakdowns, repairs, maintenance, out of control periods, calibration checks, and zero and span adjustments for the continuous monitoring systems required by Condition III.D.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

e. All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of Smelter processes; any malfunction of the associated air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device required by Condition III.C.1 or 2.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

f. All records of all major maintenance activities conducted on emission units, capture system, air pollution control equipment, and continuous monitoring systems.

[A.A.C. R18-2-306.A.4.a and ARS 49-426.E]
[State Enforceable Only]

g. All records of reports and notifications required by Condition III.F.

[A.A.C. R18-2-306.A.4.b and ARS 49-426.E]
[State Enforceable Only]

F. Reporting

1. Within 30 days after the end of each calendar quarter, the Permittee shall submit a data assessment report to the Director in accordance with 40 CFR Part 60, Appendix F, Procedure 1 for the continuous monitoring systems required by Condition III.C.

[A.A.C. R18-2-306.A.5.a and ARS 49-426.E]
[State Enforceable Only]

2. The Permittee shall submit an excess emissions and monitoring systems performance report and/or summary report form in accordance with 40 CFR § 60.7(c) to the Director semiannually for the continuous monitoring systems required by Condition III.C.1 and 2. All reports shall be postmarked by the 30th day following the end of each six-month period.

[A.A.C. R18-2-306.A.5.b and ARS 49-426.E]
[State Enforceable Only]

3. The Permittee shall provide the following to the Director:

   a. Notification of commencement of construction of the project improvements and equipment authorized by Significant Permit Revision No. 96410 to comply with the operational or emission limits permit no later than 30 days after such date.

      [A.A.C. R18-2-306.A.5.a and ARS 49-426.E]
      [State Enforceable Only]

   b. Semiannual progress reports on construction of any such improvements and equipment on January 1 and July 1 of each calendar year until construction is complete.

      [A.A.C. R18-2-306.A.5.a and ARS 49-426.E]
      [State Enforceable Only]

   c. Notification of initial startup of any such improvements and equipment within 15 days after such date.

      [A.A.C. R18-2-306.A.5.a and ARS 49-426.E]
      [State Enforceable Only]

IV. PARTICULATE MATTER AND LEAD REQUIREMENTS

A. Lead Emission Limits

1. Notwithstanding the addition of emissions from the anode secondary hood baghouse, total lead emissions from the main stack shall not exceed 0.683 pounds of lead per hour.

   [A.A.C. R18-2-B1301.C and ARS 49-426.E]
   [State Enforceable Only]

2. Total process fugitive lead emissions from the Hayden Smelter furnaces and converters shall not exceed 0.326 lb/hr calculated as a 3-month rolling average in accordance with Condition IV.E.3.c.

   [A.A.C. R18-2-B1301.C and ARS 49-426.E]
   [State Enforceable Only]

B. Operational Limits

1. The anode secondary hood baghouse and anode secondary hood capture system shall comply with the requirements of A.A.C. R18-2-B1301(D). Minimum specifications for the uptake improvement system, the fuming ladle control system, and the anode secondary hood system operations are set forth in Condition II of this Attachment. These shall be incorporated into the control system operations and maintenance plan required by A.A.C. R18-2-B1301(D)(2). Revisions to the plan shall be submitted for approval within 180 days of the effective date of this Section under Condition I.C.

   [A.A.C. R18-2-B1301.D and ARS 49-426.E]
   [State Enforceable Only]

2. At all times that any anode furnace is operating, its secondary hood shall be engaged and continuously operating so as to collect and convey process off-gases to the anode secondary hood baghouse. For the purposes of this Condition, “operating” shall include holding or processing metal in the furnace or transferring metal to or from the furnace but does not include curing, preheating or sweating of refractory.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

3. The Permittee shall increase the paved road cleaning frequency specified in A.A.C. R18-2-B1301.01.D.9 to twice per day.

[A.A.C. R18-2-B1301.01.E.1]

C. Testing Requirements

1. Performance testing of the main stack for lead shall be conducted annually as follows:

   a. The gas stream exiting the anode furnaces baghouse prior to mixing with other gas streams routed to the Main Stack.

   b. The gas stream exiting the acid plant at a location prior to mixing with other gas streams routed to the Main Stack.

   c. The gas stream exiting the converter secondary baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

   d. The gas stream collected by the tertiary hooding at a location prior to mixing with other gas streams routed to the Main Stack.

   e. The gas stream exiting the vent gas baghouse at a location prior to mixing with other gas streams routed to the Main Stack.

   f. The gas stream exiting the anode secondary hood baghouse at a location prior to mixing with the other gas streams routed to the Main Stack.

[A.A.C. R18-2-B1301.E and ARS 49-426.E]
[State Enforceable Only]

2. The performance tests at the main stack shall test particulate matter using Method 5 and lead using Method 29.

[A.A.C. R18-2-312, -B1301.E.3, and ARS 49-426.E]
[State Enforceable Only]

3. The Permittee shall also evaluate opacity at the time of each performance test. The opacity evaluation shall evaluate both the opacity at the roofline monitor and note the opacity exiting from the walls or other openings but shall not include dust entrained from vehicles passing through an entryway. The opacity evaluation of the flash furnace building and anode aisle shall be conducted in accordance with 40 CFR 60.13 and the opacity evaluation of the converter aisle shall be conducted in accordance with 40 CFR 63.1450(c). If complying with 40 CFR Part 63, Subpart QQQ, then testing to demonstrate compliance with that standard shall satisfy this requirement for the converter aisle.

[A.A.C. R18-2-312, -B1301.E, and ARS 49-426.E]
[State Enforceable Only]

D. Monitoring Requirements

1. *The Permittee shall install, calibrate,* maintain and operate *a monitoring device that continuously records the volumetric flow rate, or other parameter that has a direct relationship to volumetric flow rate such as pressure drop (delta P) if*

<u>approved by the Department at a representative point in the anode secondary hood system, fuming ladle control system and uptake improvement hood</u>. If the Permittee seeks an alternative to a volumetric flow monitor, the permittee shall submit a detailed proposal to the Department that includes the following:

[A.A.C. R18-2-306.A.3.c, -306.A.3.d, -331.A.3.c, and ARS 49-426.E]
[Material Permit Conditions are defined by underline and italics]
[State Enforceable Only]

a. Identification of the parameter(s) to be monitored in lieu of volumetric flow rate;

b. Identification of where in the hooding system such monitors would be placed and how such location will give appropriate and representative measurements in accordance with good engineering practices;

c. A detailed explanation, including sample calculations, of how such parameter(s) has a direct relationship to volumetric flow rate in the hooding system and how such parameter(s) will ensure proper operation in accordance with design at all times, including detecting any degraded performance over time; and

d. Proposed limit(s), including sample calculations, for the selected parameters that would be the enforceable demonstration of acceptable performance. Upon the Department's approval within 180 days of the effective date of this Section under Condition I.C , this limit shall take effect and be enforceable thereafter until changed in accordance with this paragraph.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

2. The Permittee shall monitor the pressure drop across the anode secondary hood baghouse.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

3. The Permittee shall monitor the damper positions for the Uptake Improvement System and Fuming Ladle Control System at all times.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

4. *<u>The Permittee shall install, certify, calibrate</u>*, maintain, and operate *<u>PM continuous emission monitoring systems (CEMS) at the locations specified in Condition IV.D.1 according to EPA Performance Specification 11 in 40 CFR Part 60, Appendix B (PS-11) and the quality assurance requirements of Procedure 2 in 40 CFR Part 60, Appendix F and in accordance with the requirements of the following subparagraphs</u>*.

[A.A.C. R18-2-306.A.3.c, -306.A.3.d, -331.A.3.c, and ARS 49-426.E]
[Material Permit Conditions are defined by underline and italics]
[State Enforceable Only]

a. No later than 180 days after the effective date of this Condition, the Permittee shall submit to the Department for review and approval a proposed Installation, Certification, and Quality Assurance/Quality Control (Installation, Certification, and QA/QC) Protocol, developed in consultation with the PM CEMS vendor(s), for the PM CEMS required on the anode secondary hood baghouse

[A.A.C. R18-2-306.A.3.c, -1301B.D.2.a, and ARS 49-426.E]
[State Enforceable Only]

b. The Installation, Certification, and QA/QC Protocol shall include a schedule and specifically describe a proposed testing plan that is designed to maximize the likelihood of successful certification of the PM CEMS. If certification is not approved, then the Permittee shall consult with the PM CEMS vendor and the Department. Then, within sixty (60) days of completion of the PS-11 testing (including receipt of the results) that was conducted pursuant to the original Installation, Certification, and QA/QC Protocol for that PM CEMS, the Permittee shall submit a revised Installation, Certification, and QA/QC Protocol for that PM CEMS to the Department and the EPA Administrator for review and approval.

[A.A.C. R18-2-306.A.3.c, -1301B.D.2.a, and ARS 49-426.E]
[State Enforceable Only]

c. Each PM CEMS shall comprise a continuous particle mass monitor to measure and record PM concentration, directly or indirectly, and gas stream flow rates on an hourly average basis.

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

d. The Permittee shall maintain, in an electronic database, the hourly average emission values of all PM CEMS in milligrams per dry standard cubic meter (mg/dscm) and pounds per hour (lbs/hr).

[A.A.C. R18-2-306.A.3.c and ARS 49-426.E]
[State Enforceable Only]

e. In the event that no PM CEMS is successfully certified after the first round of testing, the Permittee shall within ninety (90) days of certification failure submit an updated Installation, Certification and QA/QC Protocol to EPA and the Department for review and approval. If, upon completion of the second round of PS-11 testing (including receipt of the results), the PM CEMS fail to certify, the permittee shall submit an alternative PM monitoring plan for such gas stream(s) for review and approval by the EPA and the Department that will propose a methodology for using data from the PM CEMS as a continuous parametric monitoring system (CPMS) and stack performance test data to ensure continuous compliance with the relevant PM emission standard in Condition 0 of this Attachment. Upon approval by the EPA and the Department, the Permittee shall continuously operate the PM CEMS as a CPMS.

[A.A.C. R18-2-306.A.3.c, -1301B.D.2.a, and ARS 49-426.E]
[State Enforceable Only]

f. The Permittee shall use reasonable efforts to keep each PM CEMS running and producing data whenever any gas at that location is being exhausted to the atmosphere. After at least twelve months of operation, the Permittee may attempt to demonstrate that it is infeasible to continue operating the PM CEMS. As part of such demonstration, the Permittee shall submit an alternative PM monitoring plan for review and approval by the Department and the EPA Administrator. The plan shall explain the basis for stopping operation of the PM CEMS and propose an alternative monitoring plan. Operation of the PM CEMS shall be considered infeasible if:

(1) The PM CEMS cannot be kept in working condition for sufficient periods of time to produce reliable, adequate, or useful data consistent with the QA/QC protocol (including, without limitation, PS-11 and Procedure 2); or

(2) Recurring, chronic, or unusual equipment adjustment, servicing, or replacement needs in relation to other types of continuous emission monitors cannot be resolved through reasonable expenditures of resources.

If the Department and the EPA Administrator approves the Permittee's demonstration that it is infeasible to continue operating a PM CEMS, the Permittee shall be entitled to discontinue operation of and remove the PM CEMS. At that point, the Permittee shall comply with the approved alternative PM monitoring plan. The Department's and the EPA Administrator's disapproval of the Permittee's demonstration or alternative monitoring plan shall constitute an appealable agency action.

[A.A.C. R18-2-306.A.3.c, -1301B.D.2.a, and ARS 49-426.E]
[State Enforceable Only]

5. The Permittee shall complete two fugitive emissions studies required by Paragraph 22 of the Consent Decree that was filed on December 30, 2015 in United States v. ASARCO LLC, No. CV-15- 02206-PHX-DLR (D. Ariz.).

a. The studies shall be completed according to the updated Fugitive Emissions Study Protocol submitted to the EPA Administrator on January 20, 2017 and approved by the EPA Administrator on May 31, 2017. The Permittee shall submit modifications to the protocol six months prior to each study for EPA approval and Department comment. Upon EPA approval, the modified protocol shall take effect.

[CD CV-15- 02206-PHX-DLR and ARS 49-426.E]
[State Enforceable Only]

b. The first fugitive study shall be commenced no later than six months after smelter restart or three months after EPA approval of a modified protocol,. The Permittee shall complete 12 months of monitoring and submit a report to the Department and EPA no later than three months after the conclusion of the study. The study shall evaluate the effectiveness of MiniVol samplers in providing high quality, replicable data; compare the MiniVol sampler data to estimates derived from lb/ton emission factors or other process parameters or surrogates; evaluate the accuracy and cost effectiveness of various monitoring approaches; and recommend either a new lb/ton concentrate emission factor or a SIP revision to incorporate an improved monitoring methodology. If the study concludes that the lb/ton concentrate emission factor should be retained, permittee shall submit a justification for why an improved monitoring methodology (e.g., MiniVols) is not feasible and a justification for the selected lb/ton concentrate factor and how it may be revised to maintain accuracy and representativeness. If the study concludes that a new methodology should be proposed, the Permittee shall submit a petition to the Department to revise the SIP within 90 days after submitting the report unless either EPA or the Department provides comments upon the report, in which case the deadline is 60 days after receipt of the final comments but no earlier than 90 days after report submittal.

[CD CV-15- 02206-PHX-DLR and ARS 49-426.E]
[State Enforceable Only]

c. The second fugitive study shall be commenced at the start of the fourth year after smelter restart or three months after EPA approval, and shall run for 12 months. The second fugitive study shall evaluate whether the monitoring methodology remains appropriate. The Permittee shall submit a report to EPA and the Department on the adequacy of the monitoring methodology within 90 days after completion of the fugitive monitoring. Based upon the study results, the Permittee may petition the Department for a SIP revision. The Department or EPA may require the Permittee to submit a revised monitoring methodology if, based upon the second fugitive study or other credible evidence, the then-current methodology underestimates emissions by 15 percent or more or overestimates emissions by 20 percent or more.

[CD CV-15- 02206-PHX-DLR and ARS 49-426.E]
[State Enforceable Only]

E. Compliance Demonstration

1. Compliance with the main stack limit in Condition IV.A.1 shall be demonstrated using the procedures in A.A.C. R18-2-B1301(F)(1) except that "Subsection (E)(1) and Condition IV.C.1 of Permit No. 97168" shall be substituted for "Subsection (E)(1)" throughout. Continuous compliance with the limit in Condition IV.A.1 is demonstrated if the most recent performance test under Condition IV.E.1 was 0.683 pounds lead/hour or less.

[A.A.C R18-2-B1301.F.1 and ARS 49-426.E]
[State Enforceable Only]

2. Proper operation of the control and capture system shall be verified follows:

a. For each outlet identified in Condition IV.C.1 that is equipped with a certified PM CEMS, a 30-day average of PM CEMS mg/dscm shall be calculated based on the average of all valid hour data during the prior 30 operating days for each outlet and then across all outlets on a flow-weighted basis using the following equation:

$$E = \frac{(\sum_{i=1}^{n} C_i \times VF_i)}{\sum_{i=1}^{n} VF_i}$$

Where:

E = Main stack concentration PM, mg/dscm.

i = ith certified PM CEMS identified in Condition IV.E.1.

n = number of certified PM CEMS covered by Condition IV.E.1.

C_i = 30-day average of PM CEMS i, mg/dscm.

VF_i = 30-day average of volumetric flow measured at PM CEMS i, dscm.
[A.A.C. R18-2-306.A.3.c, -B1301, and ARS 49-426.E]
[State Enforceable Only]

b. For each outlet identified in Condition IV.C.1 that is not equipped with a certified PM CEMS, a 30-day average of the continuous parametric data shall be calculated based on the approved alternative monitoring plan.
[A.A.C. R18-2-306.A.3.c, -B1301, and ARS 49-426.E]
[State Enforceable Only]

c. Proper operation of the control and capture system is verified if “E” in Condition IV.E.2.a is 23 mg/dscm or less, and any outlet subject to an approved alternative monitoring plan is in compliance.
[A.A.C. R18-2-306.A.3.c, -B1301, and ARS 49-426.E]
[State Enforceable Only]

3. The Permittee shall demonstrate compliance with the process fugitive limit in Condition IV.B.2:

a. By demonstrating that all work practice standards set forth in Conditions IV.B, D.1, 2, and 3 are being met with no more than a 3-hour consecutive period out of manufacturer’s specification before the underlying process unit was shut down or idled; and
[A.A.C. R18-2-B1301.F, and ARS 49-426.E]
[State Enforceable Only]

b. Until the fugitive study required under Condition IV.D.5 is completed, by the fifth working day of each month, the Permittee shall calculate rates of process fugitive lead emissions by multiplying the tons of concentrate processed through the flash furnace during the three prior calendar months by 0.0018 lb lead/ton of concentrate and then dividing that value by the number of operating hours during the same three calendar months, where an operating hour is defined as 24 hours for each operating day as defined in A.A.C. R18-2-B1302(B)(2) less any maintenance downturn hours during an operating day in that month, with compliance demonstrated if the calculated value is 0.326 lb/hr or less. The lb/ton concentrate factor provisions in Condition IV.E.3 shall remain in effect until a SIP revision replacing them is approved.
[A.A.C. R18-2-B1301.F, and ARS 49-426.E]
[State Enforceable Only]

c. After the fugitive emissions studies described in Condition IV.D.5 are completed, by the fifth working day of each month, the Permittee shall calculate rates of process fugitive lead emissions by multiplying the tons of concentrate processed during the three prior calendar month by the factor for lead that is developed in the most recent fugitive study and then dividing that value by the number of operating hours, as defined in Condition IV.E.3.b, in the same three calendar months to calculate an average pound/hour with compliance demonstrated if the calculated value is 0.326 lb/hr or less.
[A.A.C. R18-2-B1301.F, and ARS 49-426.E]
[State Enforceable Only]

F. Recordkeeping Requirements

The Permittee shall maintain the following records for at least five years and keep on-site for at least two years:

1. All records of major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment, including those set forth in the operations and maintenance plan required by A.A.C. R18-2-B1301(D)(1)-(3).

   [A.A.C. R18-2-B1301.G.2 and ARS 49-426.E]
   [State Enforceable Only]

2. All records of performance tests, test plans, and audits required by Condition IV.C and operational parameters required pursuant to Condition IV.D.1 through 4.

   [A.A.C. R18-2-B1301.G.3 and ARS 49-426.E]
   [State Enforceable Only]

3. The output of the PM CEMS and 30-day flow weighted average value required in Condition IV.D.3.

   [A.A.C. R18-2-306.A.4, -B1301.G and ARS 49-426.E]
   [State Enforceable Only]

4. All records of compliance calculations required by Condition IV.E.

   [A.A.C. R18-2-B1301.G.4 and ARS 49-426.E]
   [State Enforceable Only]

5. All records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of concentrate drying, smelting, converting, anode refining, and casting emission units; and any malfunction of the associated air pollution control equipment that is inoperative or not operating correctly.

   [A.A.C. R18-2-B1301.G.6 and ARS 49-426.E]
   [State Enforceable Only]

6. All records of reports and notifications required by Condition IV.G.

   [A.A.C. R18-2-B1301.G.7 and ARS 49-426.E]
   [State Enforceable Only]

7. Records of the fugitive studies and their supporting data required under Condition IV.D.5.

   [A.A.C. R18-2-B1301.G.5 and ARS 49-426.E]
   [State Enforceable Only]

8. Records of daily concentrate processed and operating hours and the corresponding calculation of 90-day average fugitive lead emissions required by Condition IV.E.3

   [A.A.C. R18-2-306.A.4, -B1301.G and ARS 49-426.E]
   [State Enforceable Only]

G. Reporting Requirements

The Permittee shall provide the following to the Department:

1. Notification of commencement of construction of any equipment necessary to comply with the operational or emission limits.

   [A.A.C. R18-2-B1301.H.1 and ARS 49-426.E]
   [State Enforceable Only]

2. Semiannual compliance reports on construction of any such equipment postmarked by July 30 for the preceding January-June period and January 30 for

the preceding July-December period.

[A.A.C. R18-2-B1301.H.2 and ARS 49-426.E]
[State Enforceable Only]

3. Notification of initial startup of any such equipment within 15 business days of such startup.

[A.A.C. R18-2-B1301.H.3 and ARS 49-426.E]
[State Enforceable Only]

4. Whenever the Permittee becomes aware of any exceedance of the emission limit set forth in Condition IV.A the Permittee shall notify the Department orally or by electronic or facsimile transmission as soon as practicable, but no later than two business days after the Permittee learns about the exceedance.

[A.A.C. R18-2-B1301.H.4 and ARS 49-426.E]
[State Enforceable Only]

5. Within 30 days after the end of each calendar-year quarter, the Permitee shall submit a quarterly report to the Department for the preceding quarter that shall include dates, times, and descriptions of deviations when the owner or operator operated smelting processes and related control equipment in a manner inconsistent with this permit.

[A.A.C. R18-2-B1301.H.5 and ARS 49-426.E]
[State Enforceable Only]

6. Reports from performance testing conducted pursuant to Condition IV.C shall be submitted to the Department within 60 calendar days of completion of the performance test. The reports shall be submitted in accordance with A.A.C. R18-2-312(A).

[A.A.C. R18-2-B1301.H.6 and ARS 49-426.E]
[State Enforceable Only]

7. The Permittee shall submit reports to the Department providing the results of the fugitive studies required in Condition IV.D.5 within six (6) months of completion of each study.

[A.A.C. R18-2-306.A.5, CD CV-15- 02206-PHX-DLR and ARS 49-426.E]
[State Enforceable Only]

8. The Permittee shall submit quarterly, 30 days after the end of each calendar quarter, a summary report showing the date, time and magnitude of any exceedance of the PM CEMS (or approved alternative monitoring system) calculated in accordance with Condition IV.E.2 - (3) and any exceedance of the fugitive parameters calculation in accordance with Condition IV.E.3.

[A.A.C. R18-2-306.A.5 and ARS 49-426.E]
[State Enforceable Only]

9. The permittee shall submit a report to the Department showing that the contingency measures required in Condition IV.H were implemented within 90 days of receipt of notice from the Department or EPA Region 9 that the requirement for implementing the contingency measures is triggered.

[A.A.C. R18-2-306.A.5 and ARS 49-426.E]
[State Enforceable Only]

H. Contingency Measures

The Permittee shall implement contingency measures as set forth in this condition.

1. Contingency Measures

a. The Permittee shall install a wind fence starting west of the filter plant and proceeding around its northern perimeter for an approximate length of 790 feet. The fence shall be at least 20 feet high or greater than or equal to the material pile height at the filter plant, whichever is greater. The allowed material pile height shall be posted in a readily visible location at the wind fence. Wind fence porosity shall not exceed 50 percent.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

b. The Permittee shall install a wind fence along the south perimeter road starting at the east end of the former SmithCo processing area and extending for an approximate length of 655 feet. The fence shall be at least 20 feet high or greater than or equal to the material pile height, whichever is greater. The allowed material pile height shall be posted in a readily visible location at the wind fence. Wind fence porosity shall not exceed 50 percent.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

c. The Permittee shall install a new perimeter fence on the southwest corner of the property extending from the south entry gateway area toward the chlorinator area and then reconnecting to the existing perimeter at the former SmithCo area. The fence shall be at least 6 feet high and shall be posted for no trespassing.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

d. The fencing shall approximate that shown in Figure 4-3 of the 2023 Hayden Pb NAA SIP.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

2. Triggers

The Permittee shall implement the contingency measures set forth in Attachment "I", Condition IV.H.1, no later than 60 days after receiving notice from the Department or EPA Region 9 that any of the following have occurred:

a. Failure to attain the 2008 Pb NAAQS by the January 31, 2027, attainment date.

[A.A.C. R18-2-B1301.D.1 and ARS 49-426.E]
[State Enforceable Only]

APPENDIX 1 OF ATTACHMENT "I"

Table 1: Uptake Improvement System Flow Conditions and Damper Positions

Converter Secondary Hood Baghouse Flow Cfm	Uptake Improvement/Slag Return Combined System Damper
>170,000	100% open

Table 2: Uptake Improvement System Interlock Timing

System Condition	Requirement
Normal Operation	Uptake Improvement Damper 100% open Slag Return N and S Dampers 0% open
Slag in Slag Return	Uptake Improvement Damper 0% open Slag Return w/Slag 100% open Other Slag Return 0% open
Slag Return Damper Timing	Upon initiating slag return Damper remains open for 10 minutes

Table 3: Anode Secondary Hood System Flow Conditions and Damper Positions

Condition	Requirement
Furnace Offline	AF SH Damper Closed
1 Furnace Processing Only	AF SH Damper 100% Open
2 Furnaces Processing	Each AF Damper 45-55% Open
1 Furnace Charging, 1 Processing	Charging AF SH Damper 75-100% Open Processing AF SH Damper 25-50% Open

Table 4: Emergency Shutdown Ventilation Flue Emissions

Event Type	SO_2 Emissions (lbs)
Unplanned Event[1]	1081
Planned Event[2]	108

1 Based upon highest SO2 percentages and volumes

2 Based upon running ventilation system until SO2 clears and accepting 10% as a conservative number

ATTACHMENT "J": EQUIPMENT LIST- CONCENTRATOR

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
ORE RECEIVING						
Track Hopper	1,625 tph	National Iron Co.	N/A	T11	1959	Att. "C" Section I
Reciprocating Plate Feeders (6 total)	1,625 tph	National Iron Co.	Hydrastroke Feeders	PF1-PF6	1959	Att. "C" Section I
Scrubber #7	15,000 acfm	Ducon	IV	C99-0808-Item 2/WS7	1988	Att. "C" Section I
CONVEYORS						
#1 A, B ,C Conveyor Belts – 48 inch (Plate Feeders to Secondary Screens)	1,625 tph (total)	N/A	N/A	BF1-BF3	Pre-1982	Att. "C" Section II.A
#2 Conveyor Belt- 60 inch (Secondary Crushers to #3 Conveyor Belt)	3,470 tph	N/A	N/A	#2C	Pre-1982	Att. "C" Section II.A
#3 Conveyor Belt- 60 inch (#2 Conveyor Belt to #4 Conveyor Belt)	3,470 tph	N/A	N/A	#3C	Pre-1982	Att. "C" Section II.A
#4 Conveyor Belt – 60 inch (#3 Conveyor Belt to #5 Conveyor Belt)	3,470 tph	N/A	N/A	#4C	Pre-1982	Att. "C" Section II.A

#5 Conveyor Belt – 60 inch (#4 Conveyor Belt to Surge Bin)	3,470 tph	N/A	N/A	#5C	Pre-1982	Att. "C" Section II.A
#6 Conveyor Belt – 42 inch (Secondary Screens to #8 Conveyor Belt)	490 tph	N/A	N/A	#6C	Pre-1982	Att. "C" Section II.A
#8 Conveyor Belt – 42 inch (#6 and #7 Conveyor Belts to #9 Conveyor Belt)	1,625 tph	N/A	N/A	#8C	Pre-1982	Att. "C" Section II.A
#7 Conveyor Belt- 48 inch (Tertiary Screens to #8 Conveyor Belt)	1,135 tph	N/A	N/A	#7C	Pre-1982	Att. "C" Section II.A
#9 Conveyor Belt- 42 inch (#8 Conveyor Belt to #10 Conveyor Belt)	1,625 tph	N/A	N/A	#9C	Pre-1982	Att. "C" Section II.A
#10 Conveyor Belt – 48 inch (#9 Conveyor Belt to Fine Ore Bins)	1,875 tph	N/A	N/A	#10C	Pre-1982	Att. "C" Section II.A
Scrubber #3	36,000 cfm	Clean Gas Systems	Dynascrub II	J95531/WS3	1995	Att. "C" Section II.A
SECONDARY CRUSHING CIRCUIT						
Vibrating Screens (3), 8'x 16' double deck	1,625 tph (total)	Svedala	Low-head	SS1-SS3	1995	Att. "C" Section II.B
Cone Crushers (3)	1,625 tph (total)	Symons by Nordberg	N/A	SC1-SC3	1958	Att. "C" Section II.A
Scrubber #4	36,000 acfm	Clean Gas Systems	Dynascrub II	J9531/WS4	1995	Att. "C" Section II.B

TERTIARY CRUSHING CIRCUIT						
Variable Speed Feeders (6)	750 tph each	60 inch	N/A	TBF1-TBF6	Pre 1982	Att. “C” Section II.A
Tertiary Feed Bin	3,000 ton live	N/A	N/A	TFB	1961/1989	Att. “C” Section II.B
Vibrating Screens (6), 8’x 16’	700 tph each	Svedala	Low-head	K09531, K09532, K09533, K09534, TS1-TS6	1997	Att. “C” Section II.B
Cone Crushers (6)	189 tph each	Symons by Nordberg	Shorthead	TC1-TC6	1958	Att. “C” Section II.A
Scrubber #1	36,000 acfm	Ducon Dynamic Scrubber	IV	DC88-808-Z Item 3/WS1	1988	Att. “C” Section II.B
Scrubber #2	36,000 acfm	Ducon Dynamic Scrubber	IV	DC88-808-Z Item 4/WS2	1988	Att. “C” Section II.B
Scrubber #5	36,000 acfm	Ducon Dynamic Scrubber	IV	WS5	1988	Att. “C” Section II.B
TRANSFER HOUSE						
Transfer House	N/A	N/A	N/A	TFRII	Pre-1982	Att. “C” Section II.A
Scrubber #6	15,000 acfm	Ducon Dynamic Scrubber	IV	C88-0808-Item 1/WS6	1988	Att. “C” Section II.A
FINE ORE STORAGE						
Fine Ore Bin	30,500 ton dead	N/A	N/A	FOB	1961/1989	Att. “C” Section II.B

	5,000 ton live					
Variable Speed Feeders- 11-42 inch belts & 1-60 inch belt	218 tph each	N/A	N/A	N/A	Pre-1982	Att. "C" Section II.A
Fine Ore Bin Scrubber #8 (NW)	15,000 acfm	Ducon Dynamic Scrubber	IV	DS89-939-Z/WS8	1988	Att. "C" Section II.B
Fine Ore Bin Scrubber #9 (SE)	34,700 cfm	Ducon Dynamic Scrubber	IV	C04-3863/WS9	2005	Att. "C" Section II.A
Fine Ore Bin Scrubber #10 (SW)	15,200 cfm	Ducon Dynamic Scrubber	IV	C04-386X3/WS10	2005	Att. "C" Section II.A
LIME STORAGE AND HANDLING						
Lime Storage Bins (2)	250 tons each	N/A	N/A	N/A	1959	Att. "C" Section IV
Lime Slaker	9 tph	Eimco	N/A	N/A	1959	Att. "C" Section IV
Lime Dust Collector (Baghouse)	5,100 cfm shaker	Wheelabrator Dustube	N/A	126-D/LSB	1960	Att. "C" Section IV
Feedoweight Conveyor	2.5 to 15 tph	Merrick	WS Feedoweight	WS-3969/70	1959	Att. "C" Section IV
Conveyor Belt to Bucket Elevator	15 tph	N/A	N/A	N/A	Pre 1982	Att. "C" Section IV
Bucket Elevator	12.75 tph	Hewitt Robins	N/A	N/A	1959	Att. "C" Section IV
BOILERS/HEATERS						
Boiler (Change House)	85,000 Btu/Hr	Coroaire	85S-HB	A	1990	Att. "B" Section V
Boiler (Admin. Basement)	1,500,000 Btu/Hr	Rite Engg.	150	24696	1995	Att. "B" Section V

Gas Fired Heater (HCTTS)	300,000 Btu/Hr	Dayton	3E376B	Q9162368	N/A	Att. "B" Section V
Gas Fired Heater (HCTES)	300,000 Btu/Hr	Dayton	3E376B	Q9162369	N/A	Att. "B" Section V
Gas Fired Heater (Hagemeyer)	50,000 Btu/Hr	Modine	PA50AB	3001101127 9	N/A	Att. "B" Section V
Gas Fired Heater (Hagemeyer)	120,000 Btu/Hr	TRANE	TUD120C96 0B0	J28537397	N/A	Att. "B" Section V
Gas Fired Heater (Hagemeyer)	120,000 Btu/Hr	TRANE	TUD120C96 0B0	J11529944	N/A	Att. "B" Section V
Water Heater (Change House)	199,000 Btu/Hr	AMERICAN STANDARD	D100-199 AS	B13-0463	N/A	Att. "B" Section V
Water Heater (Change House)	199,000 Btu/Hr	AMERICAN STANDARD	D100-199 AS	B13-0473	N/A	Att. "B" Section V
EMERGENCY GENERATORS						
Concentrator Generator #1	190 HP	N/A	N/A	N/A	N/A	Att. "B" Section VI.A
Concentrator Generator #2	100 KW	N/A	N/A	N/A	N/A	Att. "B" Section VI.A
Concentrator Generator #3	33 KW	N/A	N/A	N/A	N/A	Att. "B" Section VI.A
Concentrator Generator #4	167 HP	TBD	TBD	TBD	TBD	Att. "B" Section VI.B
FUEL TANKS						
Gasoline Storage Tank #9	2000 gallons	N/A	N/A	N/A	N/A	Att. "B" Section VII and VIII

ATTACHMENT "K": EQUIPMENT LIST- SMELTER

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Sampling and Unloading Operations						
Dump Hopper (12'x28.6')	175 tph, 1,533,000 tpy	Linkbelt	N/A	N/A	1983	Section XIII of Att. D and E
Unloading conveyors (60"x17'8") (3)	175 tph, 1,533,000 tpy	Linkbelt	N/A	N/A	N/A	Section XIII of Att. D and E
Tripper car & belt separator (2)	175 tph, 1,533,000 tpy	Linkbelt	51M	N/A	1964/1968	Section XIII of Att. D and E
Bedding area - 4 storage bins (Concrete)	30,000 wet tons, 26,000 dry tons	N/A	N/A	N/A	1964/1968	Section XIII of Att. D and E
Bedding area – Vibrating screen/ grizzly (4' x 8')	N/A	Ty-rock	I-surface/F300	7308	1967	Section XIII of Att. D and E
Reclaim hopper & feeder	150 tph, 1,533,000 tpy	Feeder Belt, Rex Chainbelt Inc.	N/A	N/A	1968	Section XIII of Att. D and E
No. 2 main inclined conveyor (24" X 625')	300 tph, 2,628,000 tpy	N/A	N/A	N/A	1982	Section XIII of Att. D and E
No. 3 inclined conveyor (30" X 439')	300 tph, 2,628,000 tpy	Boston Dulon 600	600	N/A	1982	Section XIII of Att. D and E
No. 4 Horizontal Conveyor (42" X 139')	300 tph, 2,628,000 tpy	Boston Dulon 600	600	N/A	1982	Section XIII of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Flash Furnace Building Operations						
Wet bin conveyors, dryer feed & weigh belts	85 tph, 744,600 tpy	ASARCO design	N/A	N/A	1983	Section XIII of Att. D and E
Vibrating Screen	6tph, 52,560 tpy	N/A	N/A	N/A	1998	Section XIII of Att. D and E
Nos. 1 & 2 Fluid Bed Dryers with Burners Burners (gas): 38,000 CFH x 2	64 wet ton/hr, 560,640 tpy Maximum dryer usage: 6,915 hours per year	Fuller	11-81-20337-106 Farrier	N/A	1983	Section IV of Att. D and E
Dryer Oversize System #1 Bucket Conveyor #2 Bucket Conveyor Double Deck Screen	 10 tph 10 tph 10 tph	 Nerak Nerak FMC	 WB300A315 PB350 CS-238	 3032/08 3033/08 T102994	 2008 2008 2010	Section XIII of Att. D and E
Fluid Bed Dryer Product Baghouse Nos. 1 & 2	55,000 ACFM	Peabody Process Systems, Inc.	PMTR-10-1692 TW	N/A	1982	Section IV of Att. D and E
Dry Screw Conveyors #1-8	56.9 tph, 498,444 tpy	FMC	N/A	N/A	1983	Section XIII of Att. D and E
Feed Screw Conveyors #10-16	N/A	FMC	N/A	N/A	1983	Section XIII of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
West Wet Bins Nos. 1 & 2	200 tons	N/A	N/A	N/A	1983	Section XIII of Att. D and E
200-ton dry bins nos. 1 through 4, each served by one silo ventilation baghouse	1050 acfm	Nederman	SiloSafe 66	N/A	2013	Section XIII of Att. D and E
30-ton dust bin no. 1 served by a ventilation baghouse	1200 acfm	BHA	N/A	N/A	1998	Section XIII of Att. D and E
30-ton dust bin no. 2 served by a ventilation baghouse	1200 acfm	Fuller	N/A	N/A	1983	Section XIII of Att. D and E
Oxygen Flash Furnace with oxygen concentrate burners 4 Natural Gas Burners used only when furnace is on stand-by	2,400 tpd concentrates Maximum gas usage is 91,113 CFH.	Inco	N/A	N/A	1983	Section VI of Att. D and E
WGHS Venturi Scrubber	62,913 acfm	Swemco Inc.	SW-A-138696	14520	August, 1997	Section VI of Att. D and E
WGHS Disengagement vessel	62,913 acfm	Swemco Inc.	SW-A-138696	14525-100	August, 1997	Section VI of Att. D and E
WGHS Condensing Heat Exchanger	80 MBtu/hr	High Country Fabrications	N/A	3196	2009	Section VI of Att. D and E
WGHS Saturation Tower 25' high x 8' dia.	125,168 acfm	Structural Steel and Fabrication Company	N/A	N/A	fourth quarter 1997	Section VI of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
WGHS Clarifier	77,153 total gallons	Westech Engineering	Elevated tank-35’	N/A	1997	Section VI of Att. D and E
WGHS Stripping Tower 34' high x 3' dia	1,032 acfm	Structural Steel and Fabrication Company	N/A	N/A	fourth quarter 1997	Section VI of Att. D and E
Brick Crushing System						
Feeder	200 tph, 42,000 tpy	Kue-Ken	Hydro stroke feeder	270	1980	Section XII of Att. D and E
Jaw Crusher	200 tph, 42,000 tpy	Kue-Ken	N/A	11011781	1980	Section XII of Att. D and E
Vibrating Screen	200 tph, 42,000 tpy	Tyler Industry	R1204X	502626	1980	Section XII of Att. D and E
Cone Crusher	200 tph, 42,000 tpy	Kue-Ken	N/A	3095132	1980	Section XII of Att. D and E
Belt Conveyors (2)	200 tph, 42,000 tpy	Kue-Ken	BC-203 and BC-206	N/A	1980	Section XII of Att. D and E
Brick Crusher Baghouse	32,000 acfm	Peabody Process Systems, Inc.	PMTR-10-592W pulse	01-5011-01	1989	Section XII of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Converter Building						
Converters (3)	6185 cubic feet each	FSmidth	Pierce Smith	TBD	2017	Section VI of Att. D and E
Converter Burners (6) (2 for each converter)	12 MMBtu/hr each	Fives North American Construction Services, Ltd.	4570-12-ETF-X13839	TBD	2017	Section VI of Att. D and E
Converters silica conveying system	3 Tons per minute	McCord Conveyor Systems LLC	N/A	N/A	2017	Section VI of Att. D and E
Converter Primary Hooding	Blowing: 32,000 scfm	Drummond-GCT	N/A	N/A	2017	Section VI of Att. D and E
Converter Secondary Hooding	Charging/skimming : 133,000 scfm	Drummond-GCT	N/A	N/A	2017	Section VI of Att. D and E
Converter ESP	177,600 acfm	Hamon Research–Cottrell, Inc	N/A	N/A	2017	Section VI of Att. D and E
Secondary hood and Furnace Vent lime injection system and silo	100 Ton	Clyde Bergemann Power Group Americas	TBD	TBD	TBD	Section VI of Att. D and E
Secondary hood baghouse	300,000 scfm	Hosakawa Mikroupul	100 J-10-30-TRH Pulse type	950281 H1-Hy	1996	Section VI of Att. D and E
Anode Secondary Hood Baghouse	150,000 dscf	TBD	TBD	TBD	TBD	Section II of Att. I
Tertiary hooding	402,000 acfm	N/A	N/A	N/A	2017	Section VI of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Tertiary ventilation SO_2 CEM	TBD	SICK	GM32-1	TBD	TBD	Section VI of Att. D and E
Secondary Hood Baghouse Outlet SO_2 CEM	TBD	SICK	GM32-1	TBD	TBD	Section VI of Att. D and E
Gas Cleaning Plant						
WGC Venturi Scrubber	240,728 acfm	Mikropul	N/A	215051S1	2016	Section VI of Att. D and E
WGC Packed Cooling Tower	146,000 scfm	GEA	CT01	37-0329-01	2016	Section VI of Att. D and E
WGC Thickener	1,950 TPY	Westech Engineering	N/A	22691B TKE51	2016	Section XIV of Att. D and E
WGC Filter Press	1,950 TPY	Ascension Industries, Inc	DURCO Filters EPMM1200/32-48	14238-1-1	2016	Section XIV of Att. D and E
WGC Dryer	1,950 TPY	Metchem	N/A	N/A	2016	Section XIV of Att. D and E
WGC Filter Cake Packaging System	1,950 TPY	Best Process Solutions, Inc.	N/A	1603-10225	2016	Section XIV of Att. D and E
Mist precipitators (8)	N/A	ASARCO design	N/A	N/A	1983	Section XIV of Att. D and E
Acid Plant						
Acid plant -Double contact type	2,820 STPD (100% acid basis) as 93% H_2SO_4	Monsanto	N/A	N/A	1983	Section VI of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Acid Plant Preheater - Natural gas fired	200 MMBTu/hr	NORAM	TBD	TBD	2018	Att. B Section V
Anode Plant						
Anode Furnaces (3)	330 ton each	Fuller Co.	N/A	N/A	1971	Section VII of Att. D and E
Anode Furnace Burners (3)	30 MMBTU/hour each	Bloom Engineering	1020-160-16	B011321	2013	Section VII of Att. D and E
Anode Furnace Pilot Burners (3)	0.1 MMBTU/hour each	Bloom Engineering	?\3001-150-03	N/A	2013	Section VII of Att. D and E
Anode Baghouse	69,500 scfm	MikroPul	323(6.25)-16-30TRH	TBD	2012	Section VII of Att. D and E
Anode Steam Boiler- Natural gas fired (1)	3,780,000 Btu/hr	Parker	N/A	N/A	2010	Att. B Section V
Anode Casting Wheels (2)	16 molds each	Stearns-Rodgers Corporation	N/A	N/A	1972	Section VII of Att. D and E
Anode Launder Burners (6) - Natural gas fired	N/A	North American/ASARCO	4-1518	N/A	2011	Section VII of Att. D and E
Anode Ladle Burners (3) - Natural gas fired	N/A	North American/ASARCO	4-1518	N/A	2011	Section VII of Att. D and E

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Anode Mold Burners (2) - Natural gas fired	N/A	N/A	N/A	N/A	N/A	Section VII of Att. D and E
Oxygen Plant						
Oxygen Plant Boiler- Natural gas fired	8,740,000 Btu/hr	General Electric	CB Packaged Boiler 700X	L-75227	1982	Att. B Section V
Oxygen Plant (Consists of main air compressor, oxygen compressor, direct contact after cooler, liquid oxygen storage tank and cooling tower)	650 tpd gaseous oxygen	Air Products	N/A	N/A	1983	-
Furnace Ventilation Gas Control (PRE-CRP)						
R & R Electrostatic Precipitator	43,350 dscfm	ASARCO Inc.	Plate wire	N/A	1961/1968	Att. D Section IV
R & R ESP Screw Conveyors #1-15, 17, 18	Conveyors #1-15: 12 tph, Conveyor #17:105 tph, Conveyor #18:120 tpy	Screw Conveyor Corporation	N/A	N/A	1968	Att. D Section IV
R & R ESP Bucket Elevator	35 tph, 306,600 tpy	Automation Supply	3-SA	N/A	1975	Att. D Section IV

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
R & R ESP Pugmill	15 ton	Automation Supply & Engineering	Double shaft	N/A	1968	Att. D Section IV
Furnace Ventilation Gas Control (POST – CRP)						
Vent gas baghouse	275,000 scfm	AMEC Foster Wheeler	10 Compartment, Size 1917, Model 192 TA-SB	TBD	2017	Section IV of Att. D and E
Vent Gas Baghouse Outlet SO_2 CEM	TBD	SICK	GM32-1	TBD	TBD	Section IV of Att. D and E
Other Processes						
Reverts Screen #2	200 tph, 40,000 tpy	N/A	N/A	N/A	1994	Section XIII of Att. D and E
Reverts Screen #3	100 tph	Chieftain	Std/Chief	50 07 895	1995	Section XIII of Att. D and E
Storage Tanks						
Gasoline Tanks (1)	2000 gallons	N/A	N/A	N/A	N/A	Att. B Sections XII and XIII
Sulfuric Acid Tanks	1,221,045 gallons	N/A	N/A	N/A	N/A	Att. B Section IX
Sulfuric Acid Tanks	790,565 gallons	N/A	N/A	N/A	N/A	Att. B Section IX
Emergency Generators						
Generator – Cooling Towers	760 HP	Onan	500 DFED	J9706511679	pre-2000	Att. B Section VI.A

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Power House East	760 HP	Cummins	VTA-28	N/A	1987	Att. B Section VI.A
Power House West	755 HP	Cummins	VTA-28	N/A	1989	Att. B Section VI.A
(2) Natural gas generators (South end of converter aisle)	536 HP	DOOSAN	GG12VK183A1N	TBD	TBD	Att. B Section VI.C
Cooling Towers						
Acid Plant Cooling Tower	21,000 GPM	Evaptech	EX212-636T32	15001463	2017	Att. B Section XII
Marley Cooling Tower	12,000 GPM	Marley	596-88-3	596-12-524-81	1981	Att. B Section XII
Flash Cooling Tower	8,300 GPM	Marley	1232	110968	1997	Att. B Section XII
Anode Cooling Tower	2,273 GPM	Ecodyne	153-1-347	N/A	1972	Att. B Section XII
Oxygen Plant Cooling Tower	4,400 GPM	Marley	NC 8305H-2GG	NC801950-A	2005	Att. B Section XII
Portable Oxygen Plant Cooling Tower	900 GPM	Marley	NC 8614	N/A	1969	Att. B Section XII
Powerhouse Cooling Tower	5,300 GPM	Fluor	FW60A	N/A	1982	Att. B Section XII
Converter Cooling Tower	3,000 GPM	Evaptech	EX110-324J18	17002047	2018	Att. B Section XII
Non-emergency Generator						
Engine for Power Screen	76 HP	Cummins	4B3.9-F	21186967	1995	Att. B Section VI.A
Miscellaneous Heaters						
(2) Gas Fired Heaters (HSES)	175,000 Btu/Hr	Dayton electric mfg. co.	4LX58	K1101099701003 002	N/A	Att. B Section V
(3) Gas fired dryer (Vallens)	165,000 – 300,000 Btu/Hr	Alliance laundry systems, LLC	JT75CG	Varies	N/A	Att. B Section V

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Gas fired water heater (Vallens)	600,000 Btu/Hr	Hamilton engineering, INC.	HDD 00600	101675082	N/A	Att. B Section V
20 ton gas package unit (Change house)	250,000 Btu/Hr	American standard	YCH240E3L0BB	101210385D	N/A	Att. B Section V
(3) Gas fired ovens (Sampling)	100,000 Btu/Hr	Wisconsin oven CORP	SWN 34-56	Varies	N/A	Att. B Section V
Hot water boiler (Lab)	511,000 Btu/Hr	Natl. bd	H3-0514	1006311171	N/A	Att. B Section V
(4) Gas fired griddle ranges (Lab)	30,000 Btu/Hr	American range	ARHP-24-2	Varies	N/A	Att. B Section V
(2) Gas fired ovens (Lab)	2,420,000 Btu/Hr	North American mfg. co.	4659-7-C/BO	Varies	N/A	Att. B Section V
(4) Gas fired heaters (Truck shop)	75,000 – 175,000 Btu/Hr	Dayton Electric mfg co.	4LX58	Varies	N/A	Att. B Section V
(2) Gas fired heaters (Area 3 shop)	30,000 Btu/Hr	Reznor	XL30	Varies	N/A	Att. B Section V
Gas fired heater (Carpenter shop)	100,000 Btu/Hr	American Standard	AUD1C100A9481 AB	10353JF51G	N/A	Att. B Section V
(9) Gas fired heaters (engineering)	80,000 – 120,000 Btu/Hr	American Standard	Varies	Varies	N/A	Att. B Section V
(2) Gas fired water heaters (Change house)	199,000 Btu/Hr	Varies	Varies	Varies	N/A	Att. B Section V

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Gas fired water heater (Sampling)	30,000 Btu/Hr	American Water Heater Company	BFG6130T303NOH	1233T465724	N/A	Att. B Section V
Gas fired water heater (R&r cottrell)	40,000 Btu/Hr	American Water Heater Company	BFG12240T403NO	1008T419530	N/A	Att. B Section V
Gas fired water heater (Lab)	30,000 Btu/Hr	American Water Heater Company	BFG6130T303NOH	1022T409496	N/A	Att. B Section V
Gas fired water heater (Respirator rm)	35,500 Btu/Hr	Reliance	640YORT4	E07J019315	N/A	Att. B Section V
Gas fired water heater (Area 4)	40,000 Btu/Hr	American Water Heater Company	G62 40T40 400	1.6211E+12	N/A	Att. B Section V
Gas fired water heater (Engineering build.)	40,000 Btu/Hr	American Water Heater Company	BFG6140T403NO	1426T467159	N/A	Att. B Section V
(2) Gas fired water heaters (Boilershop)	35,000 Btu/Hr	Reliance	630YORT	Varies	N/A	Att. B Section V
Gas fired water heater (Hses)	40,000 Btu/Hr	American Water Heater Company	BFG6140T403NO	1217T463653	N/A	Att. B Section V
SO_2 CEMS for Anode B/H	TBD	SICK	GM32-1	TBD	TBD	Att. E Section IX

ATTACHMENT "L": EQUIPMENT LIST- SMITHCO

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
SMITHCO – Coarse Flux Crushing Circuit						
Hopper Pan Feeder	N/A	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Crusher	200 TPH	Eagle	623-C1-105	10665	1973	Att. "H" Section IV.B
Under jaw conveyor	27 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Screen feed conveyor	38 feet	N/A	N/A	9-30-6838-AA	Pre-2008	Att. "H" Section IV.A
Screen	200 TPH	El Jay	FSG-5163-26	34D0487	1987	Att. "H" Section IV.A
Crusher	200 TPH	El Jay	548	N/A	1970	Att. "H" Section IV.B
Under cone conveyor	33 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Short return conveyor	25 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Little rock conveyor	22 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Converter rock stacker conveyor	65 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Surge stacker conveyor	86 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Under screen conveyor	25 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Cross over conveyor	40 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
Primary fines stacker	78 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section IV.A
SMITHCO – Coarse Revert Crushing Circuit						

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Hopper pan feeder	N/A	Hewitt-Robins	LP-89	N/A	Pre-2008	Att. "H" Section III
Picking conveyor	60 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III
Electromagnet	N/A	Dings	55-CR	N/A	N/A	Att. "H" Section III
Screen feed conveyor	60 feet	Superior	36x60	U8037 07	Pre-2008	Att. "H" Section III
Double deck screen	85 TPH	Tyler	5x16 Incline	N/A	1993	Att. "H" Section III
HSI Feed conveyor	60 feet	Superior	36x60	6360 05	Pre-2008	Att. "H" Section III
Horizontal shaft impact crusher	400 TPH	Bear Claw	300-502	N/A	1995	Att. "H" Section III
Under HSI conveyor	27 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III
Under screen conveyor	21 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III
Revert stacker conveyor	60 feet	Superior	36x60	6363 05	Pre-2008	Att. "H" Section III
SMITHCO – Fine Crushing Circuit						
Hopper feeder conveyor	N/A	N/A	N/A	N/A	Pre-2008	Att. "H" Section III or IV.A
VSI discharge conveyor	45 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III or IV.A
Screen feed conveyor	60 feet	Superior	36x60	N/A	Pre-2008	Att. "H" Section III or IV.A
Double deck screen	200 TPH	TCl	Kimball EO 6' X 18' DD	17092557	2017	Att. "H" Section III or IV.A
VSI feed conveyor	60 feet	Superior	36x60	UN297	2008	Att. "H" Section III or IV.A

EQUIPMENT TYPE	MAX. CAPACITY	MAKE	MODEL	SERIAL NUMBER	DATE OF MFG.	APPLICABLE PERMIT SECTION
Vertical shaft impact crusher	120 TPH	Remco	9000	9000-896	1996	Att. "H" Section III or IV.A
Under screen conveyor	22 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III or IV.A
Stacker conveyor	60 feet	N/A	N/A	N/A	Pre-2008	Att. "H" Section III or IV.A

TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT No. 97168

I. INTRODUCTION

This Class I Significant Permit Revision (SPR) is for the continued operation of ASARCO LLC's ("ASARCO") Hayden Operations. SPR No. 97168 to Operating Permit No. 39948 incorporates the Uptake Improvement Project, Fuming Ladle Control Project and the Anode Furnaces Secondary Hood Project. In addition, it includes lead emissions limitations at the Hayden Smelter under Attachment "I": Hayden Smelter Site-Specific SIP Requirements as part of the state implementation plan (SIP) for the Hayden Lead Nonattainment Area (NAA).

A. Company Information

Facility Name: ASARCO LLC Hayden Operations

Mailing Address: P.O. Box 8, Hayden, AZ 85135

Facility Location: 100 N Hayden Ave, Hayden, AZ 85135

B. Attainment Classification

The facility is located in Gila County. The area is designated as a non-attainment area for particulate matter with a diameter less than 10 microns (PM_{10}), sulfur dioxide (SO_2) and lead (Pb) for the National Ambient Air Quality Standards (NAAQS). For all other criteria pollutants, the area is designated as attainment or unclassified.

II. BACKGROUND

ASARCO operates copper concentrator and smelter facilities in Hayden, Arizona. The facility emits a significant amount of lead emissions in the Hayden Nonattainment Area (NAA). The purpose of this SPR is to address lead emissions from the facility:

- **January 12, 2009** – The United States Environmental Protection Agency (EPA) revised the lead NAAQS (the "2008 Lead NAAQS") to establish a revised primary standard of 0.15 $\mu g/m^3$ based on the highest quarterly average during a three-year period.

- **October 3, 2014** – The EPA designated the Hayden area of Gila County as nonattainment for the 2008 Lead NAAQS.

- **March 2, 2017** – The Arizona Department of Environmental Quality (ADEQ) submitted the "Arizona State Implementation Plan Revision: Hayden Lead Nonattainment Area for the 2008 Lead NAAQS" (2017 Hayden Lead SIP) to the EPA.

    - The proposed SIP included the Converter Retrofit Project (CRP) to implement additional emissions capture and control technologies to reduce lead emissions at the Hayden smelter.

  - In 2017-2018, ASARCO undertook the CRP to attain the 2008 Lead NAAQS as set forth in the 2017 Hayden Lead SIP.

- **November 14, 2018** – The EPA published its approval of the 2017 Hayden Lead SIP.

- **January 31, 2022** – The EPA issued a Finding of Failure to Attain (FFTA) triggering additional requirements to submit a revised SIP.

- **March 31, 2022 –** ASARCO filed a petition for judicial review of the FFTA in the Ninth Circuit Court of Appeals (case I.D. 22-70058). By court order, that action is temporarily suspended pending the outcome of the two SIP revision proceedings (lead and SO_2).

ASARCO has developed the following three projects to address the elevated SO_2 levels and demonstrate attainment of the 1-hour SO_2 NAAQS (SPR No. 96410). These projects also will reduce particulate and lead emissions. ASARCO proposes to revise the Hayden Lead NAA SIP to include these additional controls: The Uptake Improvement Project, the Fuming Ladle Control Project and the Anode Furnaces Secondary Hood Project.

III. REVISION DESCRIPTION

The three projects described below are designed to reduce peak emissions and to assure that the 2008 Lead NAAQS is attained in the Hayden Lead NAA.

A. Uptake Improvement Project

The objective of the Uptake Improvement Project is to improve the capture of fugitive emissions from the flash furnace and emissions generated during matte tapping and slag skimming activities. ASARCO proposes to install a partial enclosure around the INCO flash furnace uptake shaft. The captured emissions will be ducted to the converter secondary hood baghouse, then vented to the annulus of the main stack. The uptake enclosure will be ventilated at all times except during periods where slag is returned to the furnace. Based on data from the fugitive emissions studies required by Consent Decree CV-15-02206-PHX-DLR, it is estimated that the project will improve capture in the flash furnace area to reduce peak emissions at the flash furnace roofline and converter roofline.

B. Fuming Ladle Control Project

The objective of the Fuming Ladle Control Project is to capture emissions from fuming ladles. Fuming ladles refer to ladles emitting an abnormal amount of fume after discharge of material. This can occur sometimes after a ladle is poured.

ASARCO proposes to construct a hood and retaining walls to capture fuming-ladle emissions from the converter aisle and material transfer area. The captured emissions will be ducted to the converter secondary hood baghouse where they will be treated to remove particulate matter including lead. The Fuming Ladle Capture System will operate when a fuming ladle is present in the enclosure.

C. Anode Furnaces Secondary Hood Project

The objective of the Anode Furnaces Secondary Hood Project is to improve the capture of fugitive emissions from the anode furnaces during operations. ASARCO proposes to install secondary hoods around each of the anode furnaces and a new anode furnaces secondary hood baghouse. The captured emissions will be directed to the anode furnaces secondary hood baghouse where they will be treated to remove particulate matter and then released to the annulus of the main stack.

In addition to the proposed projects, the facility also proposed an emission limit of 0.326 lb/hr (3-month rolling average) for process fugitive lead emissions from the Hayden smelter furnaces and converter. This limit was determined using the results from a 2019 fugitive emissions study and the emission reductions expected from the proposed projects.

IV. EMISSIONS

Emissions were calculated using maximum process rates for the facility, applicable control efficiencies, and corresponding emission factors. The emission factors used were from the Compilation of Air Pollutant Emission Factors (AP-42) and an analysis conducted by Gas Cleaning Technologies LLC. The facility has a maximum throughput limit of 693,500 tons of concentrate per year. ASARCO proposes to maintain the current limit of 0.683 pound per hour lead from the main stack.

Lead emissions were calculated by dividing actual lead emissions by actual PM emissions to derive a lead fraction from the years 2004 to 2015. The maximum value plus a 5% margin was used as a conservative value. This lead fraction was then multiplied by the particulate matter emissions to obtain the lead emissions.

The facility's PTE based on the proposed changes is provided in Table 1 below:

Table 1: Potential to Emit (tpy)

Pollutant	PTE
PM	446.47
PM_{10}	1626.35
$PM_{2.5}$	1364.75
Pb	3.69

V. MINOR NEW SOURCE REVIEW (NSR)

Minor new source review is required if the emissions of any physical change or change in the method of an operation of an emission unit or stationary source increase in emissions of any regulated minor NSR pollutant by an amount equal to or greater than the permitting exemption threshold. The proposed projects result in a decrease of lead emissions and thus, minor NSR does not apply.

VI. MAJOR NEW SOURCE REVIEW

Major new source review is required if there is a major modification to the facility. A major modification is a physical change, or change in the operation of a major stationary source that would result in a significant increase in emissions of any regulated NSR pollutant and a significant net increase of that pollutant from the stationary source. The proposed significant permit revision establishes additional operating and emissions limitations to demonstrate attainment with the 2008 Lead NAAQS. The proposed projects do not add or modify any production equipment. Thus, major new source review does not apply.

VII. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 2 contains an inclusive but not an exhaustive list of the monitoring, recordkeeping and reporting requirements prescribed by the air quality permit. The table below is intended to provide insight to the public for how the facility is required to demonstrate compliance with the emission limits in the permit.

Table 2: Permit No. 97168

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Main Stack	Pb	0.683 lbs/hr	Monitor the pressure drop across the anode secondary hood baghouse.	Record major maintenance activities and inspections conducted on emission units, capture systems, monitoring devices, and air pollution control equipment.	Submit semiannual compliance reports on construction of any such equipment.
			Monitor the damper positions for the Uptake Improvement System and Fuming Ladle Control System at all times.	Record required performance tests, test plans, and audits.	Submit quarterly summary reports that include dates, times, and descriptions of deviations when the facility operated smelting processes and related control equipment.
			Monitor PM Continuous Emissions Monitoring System (CEMS) - exit of the Anode Secondary Hood Baghouse.	Record output of the PM CEMS.	Submit quarterly summary report showing the date, time and magnitude of any exceedance of the PM CEMS (or approved alternative monitoring system and any exceedance of the fugitive parameters calculation).
				Record required compliance calculations.	Submit reports of exceedances within two days

Table 2: Permit No. 97168

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Process Fugitives	Pb	0.326 lb/hr, 3 month-rolling average	Monitor work practice standards for capture system performance	Record work practice standard outputs	Submit reports of exceedances within two day
			Monitor concentrate feed rates	Record concentrate feed rates and required compliance calculations	Submit quarterly summary reports that include dates, times, and descriptions of deviations when work practices not followed

VIII. ENVIRONMENTAL JUSTICE ANALYSIS

The Environmental Protection Agency (EPA) defines Environmental Justice (EJ) to include the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and polices. The goal of completing an EJ assessment in permitting is to provide an opportunity for overburdened populations or communities to allow for meaningful participation in the permitting process. Overburdened is used to describe the minority, low-income, tribal and indigenous populations or communities that potentially experience disproportionate environmental harms and risks due to exposures or cumulative impacts or greater vulnerability to environmental hazards. The significant permit revision does not allow or permit any increases in emissions and thus, will not result in any additional impacts.

The EPA developed EJSCREEN, a publicly available tool that uses nationally consistent data, to produce maps and reports detailing environmental and demographic indicators that can be used to evaluate EJ concerns. The EPA selected an 90th percentile threshold for this action to evaluate the potential for EJ concerns in a community, meaning that if the area of interest exceeds the 90th percentile for one or more of the EJ indexes, the EPA considers that area to have a high potential for EJ concerns. The ADEQ mapped the location of the Hayden Smelter and reviewed a 5-mile radius around the facility for potential environmental justice concerns (see Figure 1 below).

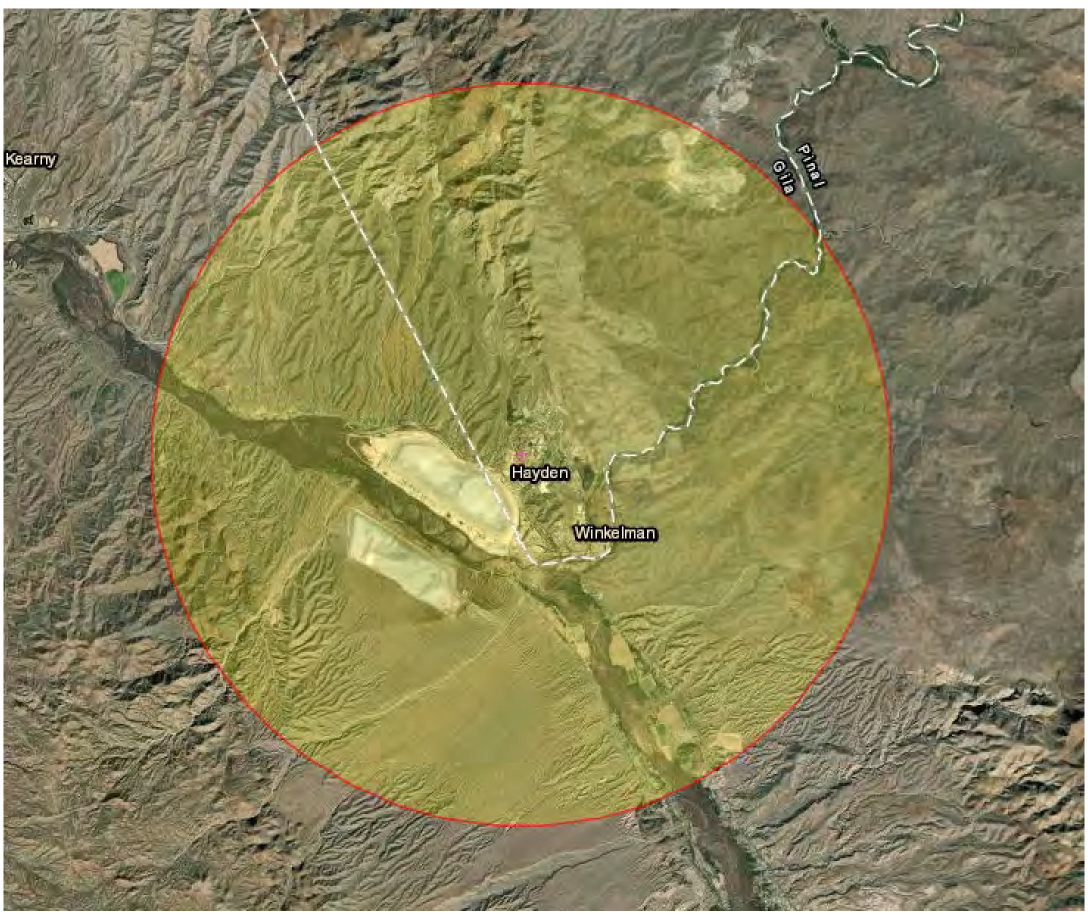

Figure 1: Hayden Smelter – EJSCREEN – 5-Mile Radius

A. Demographics

The ADEQ relied on data from the EPA EJ Screen tool to assess the demographics of the communities near the initial location for this proposed facility. The EJSCREEN report shows that the Limited English-Speaking Households, People Under Age 5, and People Over Age 64 are all below the 80th percentile threshold compared to Arizona and the USA average. The Demographic Indicator for Demographic Index, People of Color, Low Income, Unemployment Rate, and People with Less Than High School Education were all above the 80th percentile compared to Arizona and the USA average, but did not exceed the 90th percentile.

B. Summary of Air Quality

All air quality related environmental indicators within a 5-miles radius of the facility were below the 90^{th} percentile for both Arizona and the USA averages. Additionally, ASARCO submitted an ambient air impact analysis to demonstrate that the implementation of the proposed projects will result in ambient Pb levels in the Hayden Nonattainment Area below the 2008 Lead NAAQS. A complete review of the air quality analysis can be found in Section X below. In addition, the submitted air quality analysis demonstrated that the levels of Pb decreased rapidly as the distance from the facility increased.

C. Conclusion

The proposed projects in this significant permit revision will result in a reduction Pb emissions and will not result in any significant emission increases of other criteria pollutants. The ADEQ concludes that the protections afforded by the Arizona Revised Statutes (A.R.S.) § 49-426, which is imposed through the permit, ensure that the public health and environment in Arizona are protected and that the public notice and comment opportunities afforded to the community on this new permit application satisfy the public participation component of the EPA EJ Guidance. The dispersion modeling ADEQ conducted further concludes that ASARCO will demonstrate compliance with the 2008 Lead NAAQS and that the emissions from the facility will not result in any significant environmental or public health impacts.

IX. LEARNING SITE EVALUATION

In accordance with ADEQ's Environmental Permits and Approvals near Learning Sites Policy, the Department is required to conduct an evaluation to determine if any nearby learning sites would be adversely impacted by the facility. Learning sites consist of all existing public schools, charter schools and private schools the K-12 level, and all planned sites for schools approved by the Arizona School Facilities Board. The learning sites policy was established to ensure that the protection of children at learning sites is considered before a permit approval is issued by ADEQ.

This significant permit revision will not result in any increase in emissions as there are no changes to any equipment. Hence, a learning site evaluation was not conducted.

X. AMBIENT AIR IMPACT ANALYSIS

ASARCO submitted an air quality dispersion model in their application for this permit revision to Operating Permit No. 39948 and to support the Hayden Lead NAA SIP. The modeling was performed in accordance with the EPA's Guideline on Air Quality Models (GAQM). In addition, the "2008 Lead (Pb) National Ambient Air Quality Standards (NAAQS) Implementation Questions and Answers" (U.S. EPA, 2011) was used for clarification.

A. Model Selection

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) is the preferred model for EPA when estimating impacts at receptors located in simple terrain and complex terrain (within 50 km of a source) due to emissions from industrial sources. ASARCO used the regulatory default option of AERMOD for this ambient impact air analysis. Version 22112 of AERMOD was used in this analysis. In addition to this, AERMET (version 22112) was used to process the meteorological data and AERMAP (version 18081) was used to process terrain data and develop elevations for receptors. AERSURFACE (Version 20060), and BPIPPRIM were also used in this analysis.

B. Source Inputs

The ADEQ determined that the Hayden Smelter releases lead emissions from the following sources: the main smelter stack, the anode furnace roof monitors, the converter aisle roof monitors, the flash furnace building roof monitors, outdoor slag pouring, miscellaneous material handling activities, and fugitive dust from roadways.

Point sources were used to model the emissions from the main stack and slag pouring. Volume sources were used to model the fugitive emissions from the anode furnace, converter aisle, flash furnace building, other material handling sources, and roads. Fugitive emissions storage areas and storage piles were represented as AreaPoly sources.

C. Meteorological Data

For AERMOD, the EPA recommends 5 years of National Weather Service (NWS) station meteorological data, or one-year of site-specific meteorological data. For this model, ASARCO used meteorological data from the most recent complete year of data available, the 2020 calendar year.

The data used consists of on-site hourly surface observations the Camera Hill station and ADEQ's HOJ station. The data from the Camera Hill station was used to model emissions from the main stack and fugitive rooflines. The data from the HOJ station was used to model the emissions from lower elevation sources (e.g. material storage and handling sources, paved roads, unpaved roads).

D. Background Air Quality Concentration

The EPA requires that modeling results include background air quality estimates for comparison to the NAAQS. The background concentrations should be representative of regional air quality in the vicinity of a facility.

To determine this background concentration, ASARCO used ambient air monitoring data located in the Hayden area. Since the Smelter has been temporarily shut down since October 2019, the data from November 2019 through September 2022 was used. The data was generated from two air monitoring stations, the Globe Highway station and the Hillcrest station. Since the Hillcrest monitor resulted in higher concentrations of lead, it was used as the background concentration as a conservative estimate. Per 8.3.2(c)(i) of Appendix W of 40 CFR Part 51, "the monitoring data used to calculate the background concentration of Pb employed in the modeling analysis excluded data generated when wind was blowing from a 90-degree arc relative to the monitor"[1]. After the relevant data points were excluded, the resulting background concentration was 0.013 μg/m^3.

E. Modeling Results for 2008 Lead NAAQS

The results of the model demonstrated that the proposed controls will result in attainment of the 2008 Lead NAAQS in the Hayden NAA. Table 3 below summarizes the results of the modeling analysis, in addition to applicable background concentrations for comparison to the NAAQS.

Table 3: Modeling Results, Pb NAAQS

Highest 3-Month Concentration (μg/m^3)*	**Total Concentration (μg/m^3)***	**NAAQS (μg/m^3)**	**Background Concentration (μg/m^3)**
0.134	0.147	0.15	0.013

* Highest 3-month concentration predicted to occur at (521358.8 m, 3651137.8 m).

AERMOD was run for each year for the Camera Hill and for the Hayden Jail Data sets to determine the design concentration. The results for the two runs were combined then post-processed using LEADPOST. The analysis demonstrates that the proposed projects will result in attainment of the 3-month rolling average Pb NAAQS. In addition, the results showed that the modeled Pb concentrations decrease very rapidly with distance from the facility.

XI. LIST OF ABBREVIATIONS

ADEQ .... Arizona Department of Environmental Quality
AERMAP .... Terrain data preprocessor for AERMOD
AERMET .... AERMOD Meteorological Preprocessor
AERMOD .... AMS/EPA Regulatory Model
AERSURFACE .... Surface characteristics preprocessor for AERMOD
AMS .... American Meteorological Society
A.R.S. .... Arizona Revised Statutes

1 Modeling Report for the Hayden Lead Nonattainment Area (December 20, 2022) by Blue Sky Modeling, LLC.

CEMS....Continuous Emissions Monitoring System
CFR....Code of Federal Regulations
CMS....Continuous Monitoring System
CRP....Converter Retrofit Project
EJ....Environmental Justice
EPA....Environmental Protection Agency
NAA....Nonattainment Area
NAAQS....National Ambient Air Quality Standard
NWS....National Weather Service
Pb....Lead
PM....Particulate Matter
PM_{10}....Particulate Matter less than 10 μm nominal aerodynamic diameter
PTE....Potential to Emit
SIP....State Implementation Plan
SO_2....Sulfur Dioxide
SPR....Significant Permit Revision
TPY....Tons per Year

Arizona Department of Environmental Quality

Appendix D: EJ Screen Analysis

Air Quality Division
October 3, 2023 Final Version

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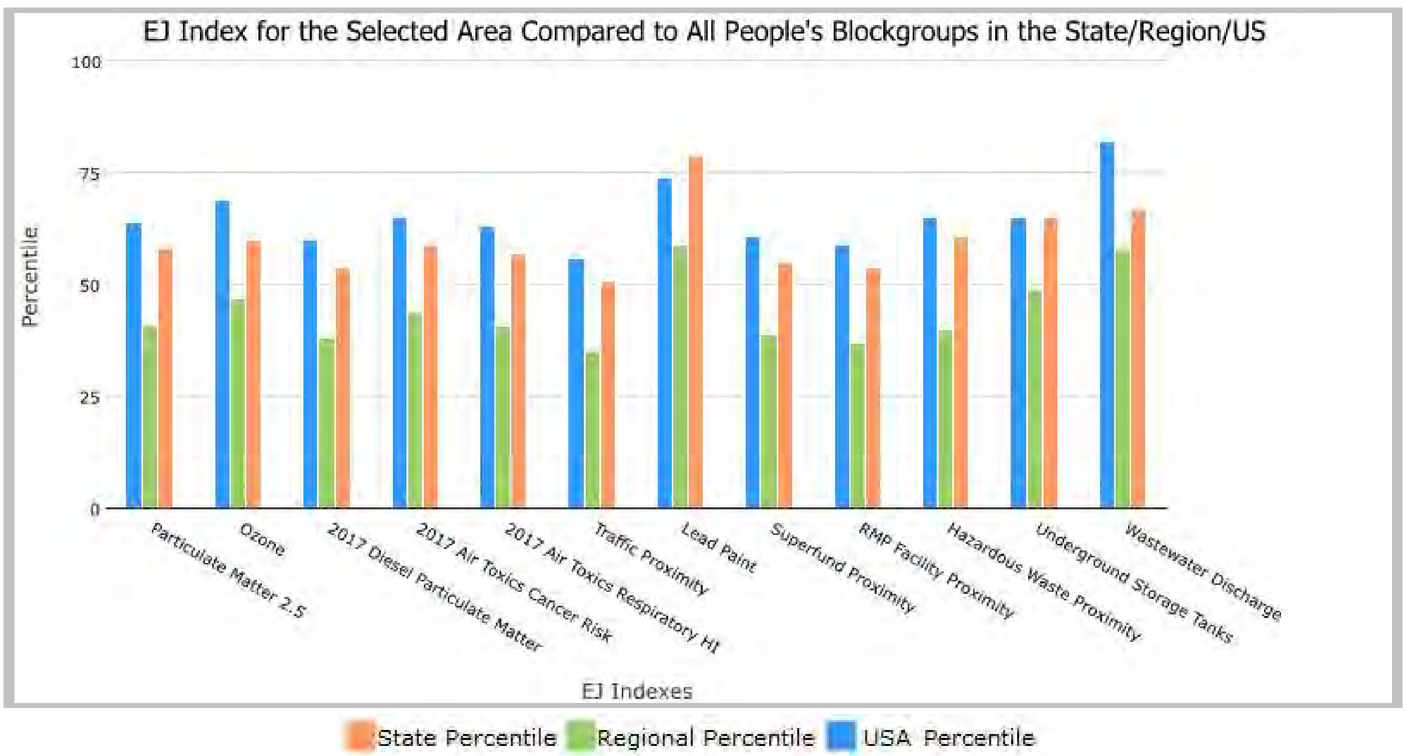
EJScreen Report (Version 2.0)

10 miles Ring Centered at 33.012259,-110.776544, ARIZONA, EPA Region 9

Approximate Population: 4,508

Input Area (sq. miles): 314.03

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	58	41	64
EJ Index for Ozone	60	47	69
EJ Index for 2017 Diesel Particulate Matter*	54	38	60
EJ Index for 2017 Air Toxics Cancer Risk*	59	44	65
EJ Index for 2017 Air Toxics Respiratory HI*	57	41	63
EJ Index for Traffic Proximity	51	35	56
EJ Index for Lead Paint	79	59	74
EJ Index for Superfund Proximity	55	39	61
EJ Index for RMP Facility Proximity	54	37	59
EJ Index for Hazardous Waste Proximity	61	40	65
EJ Index for Underground Storage Tanks	65	49	65
EJ Index for Wastewater Discharge	67	58	82



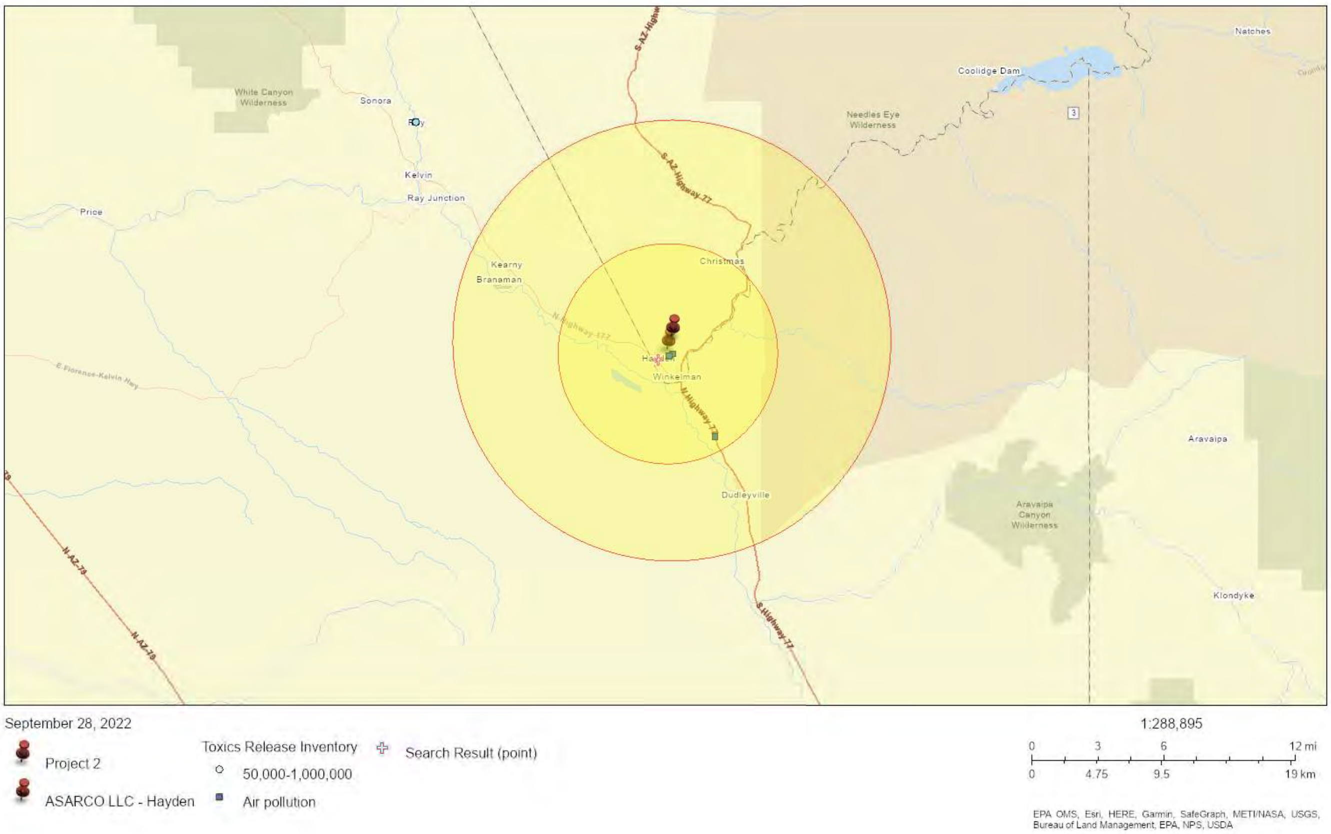
This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJScreen Report (Version 2.0)

10 miles Ring Centered at 33.012259,-110.776544, ARIZONA, EPA Region 9

Approximate Population: 4,508

Input Area (sq. miles): 314.03



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	1

EJScreen Report (Version 2.0)

10 miles Ring Centered at 33.012259,-110.776544, ARIZONA, EPA Region 9

Approximate Population: 4,508

Input Area (sq. miles): 314.03

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 ($\mu g/m^3$)	5.35	7.35	9	10.8	1	8.74	1
Ozone (ppb)	54.5	54.3	48	49.6	63	42.6	91
2017 Diesel Particulate Matter* ($\mu g/m^3$)	0.0449	0.327	5	0.33	<50th	0.295	<50th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	22	32	33	30	<50th	29	<50th
2017 Air Toxics Respiratory HI*	0.2	0.37	18	0.41	<50th	0.36	<50th
Traffic Proximity (daily traffic count/distance to road)	0.85	550	1	1300	0	710	1
Lead Paint (% Pre-1960 Housing)	0.26	0.084	88	0.23	63	0.28	60
Superfund Proximity (site count/km distance)	0.013	0.08	9	0.15	8	0.13	8
RMP Facility Proximity (facility count/km distance)	0.03	0.65	7	1	1	0.75	1
Hazardous Waste Proximity (facility count/km distance)	0.24	1.5	24	4.4	10	2.2	33
Underground Storage Tanks (count/km^2)	0.27	1.7	37	3.3	28	3.9	30
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.01	6.1	36	59	44	12	69
Socioeconomic Indicators							
Demographic Index	51%	40%	70	46%	60	36%	75
People of Color	60%	45%	70	60%	48	40%	72
Low Income	42%	35%	66	31%	71	31%	72
Unemployment Rate	10%	6%	81	6%	81	5%	84
Linguistically Isolated	1%	4%	48	8%	26	5%	52
Less Than High School Education	17%	13%	70	16%	62	12%	73
Under Age 5	4%	6%	32	6%	29	6%	31
Over Age 64	23%	17%	78	15%	85	16%	83

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

Appendix E: Public Process Documentation

Air Quality Division
May 20, 2024

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To be added once public review process is complete.