TECHNICAL REVIEW AND EVALUATION OF APPLICATION FOR AIR QUALITY SIGNIFICANT PERMIT REVISION NO. 96410 TO OPERATING PERMIT NO. 39948

I. INTRODUCTION

This Class I Significant Permit Revision (SPR) is for the continued operation of ASARCO LLC's ("ASARCO") Hayden Operations. SPR No. 96410 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 sulfur dioxide (SO_2) 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 SO_2 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 the Hayden area of 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 SO_2 emissions in the Hayden non-attainment area (NAA). The purpose of this SPR is to address the SO_2 emissions from the facility and to demonstrate attainment of the 1-hour SO_2 NAAQS. Here is a timeline from the promulgation of the 1-hr SO_2 NAAQS to the submissions of this application.

- **August 23, 2010** - The United States Environmental Protection Agency (EPA) promulgated a the new 1-hour SO_2 NAAQS.
- **August 5, 2013** - The EPA designated the Hayden area of Gila County as a non-attainment area for the new 1-hr SO_2 NAAQS.
- **January 19, 2016** – The Arizona Department of Environmental Quality (ADEQ) issued SPR No. 60647 to Operating Permit No. 1000042 for the implementation of the converter retrofit project (CRP) at the Hayden smelter.
- **March 8, 2017** – The ADEQ submitted the "Arizona State Implementation Plan Revision: Hayden Sulfur Dioxide Nonattainment Area for the 2010 SO_2 NAAQS" (2017 Hayden SO_2 SIP) to the EPA.

  - In 2017-2018, ASARCO undertook the CRP to attain the 2010 SO_2 NAAQS as set forth in the 2017 Hayden SO_2 SIP.

  - In addition, SPR No. 66329 to Operating Permit No. 1000042 was issued for the for installation and operation of a new acid plant preheater.

- **November 5, 2020** – The EPA issued a limited approval/disapproval of the 2017 Hayden SO_2 SIP regulatory language.

- **November 10, 2020** – The EPA issued a partial approval/disapproval of the 2017 Hayden SO_2 SIP

- **January 31, 2022** - The EPA issued a Finding of Failure to Attain, triggering additional requirements to submit a revised SIP.

While the CRP significantly reduced SO_2 emissions at the Hayden smelter, the surrounding ambient monitors still detected elevated levels of SO_2. Thus, ASARCO conducted an investigation to determine the reason for the elevated levels.

On July 18, 2022, ASARCO submitted the results of that investigation, the "ASARCO Preheater-Ambient Monitor Data Correlation Analysis". The report concluded that there was "strong evidence that the emissions from the damaged Acid Plant Preheater were responsible for the vast majority" of the observed exceedances. However, since not all events of elevated SO_2 levels were concluded to be a result of the damaged preheater, ASARCO evaluated additional sources of fugitive SO_2 emissions.

As a result, ASARCO has developed the following three projects to address the elevated SO_2 levels and demonstrate attainment of the 1-hour SO_2 NAAQS: The Uptake Improvement Project, the Fuming Ladle Control Project and the Anode Furnaces Secondary Hood Project.

III. REVISION DESCRIPTION

A. Uptake Improvement Project

The objective of the Uptake Improvement Project is to improve the capture of fugitive SO_2 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 where they will be treated with lime injection, 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.

B. Fuming Ladle Control Project

The objective of the Fuming Ladle Control Project is to capture SO_2 emissions from fuming ladles in the converter aisle and material transfer area. 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 with lime injection, and then vented to the annulus of the main stack. 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 SO_2 emissions from the anode furnaces during charging, holding and processing. 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 and then released to the annulus of the main stack.

D. Proposed Process Fugitive SO_2 Limits

In the 2017 SIP submittal that was partially approved and partially disapproved, ADEQ had included a main stack limit of 1069.1 lb/hr, 14-operating day average with a provision that no violation would occur if the 1069.1 lb/hr limit was exceeded but no hour in the 336 hour period exceeded 1518 lb/hr, which reflected the modeling value shown not to cause an exceedance in the Hayden NAA. EPA has expressed concern about the approvability of this limit. ASARCO has consented to voluntarily relinquish, under R18-2-306.01, the secondary part of the limit. As a result, upon issuance of this permit, the main stack SO_2 limit will be 1069.1 lb/hr, 14-operating day average.

ASARCO has proposed the following fugitive SO_2 limits. These limits will apply when the underlying processes are in operation, including periods of startup, shutdown and malfunction.

1. Flash Furnace area: 38.5 lb/hr

2. Converter aisle area: 10.0 lb/hr

3. Anode aisle area: 9.0 lb/hr

It should be noted that ASARCO's proposal of these limits is contingent upon their being monitored in accordance with the existing fugitive study roofline monitoring system installed pursuant to the Consent Decree.

IV. EMISSIONS

The emission rates were calculated using the maximum process rates for the facility, applicable control efficiencies, and the 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.

A. Flash Furnace (and Associated Fugitives)

1. Uptake Improvement Project

The emission reduction from the Uptake Improvement Project was calculated by determining the total available fugitive SO_2 emissions from the Flash Furnace and taking account the loss due to slag pouring. The emissions were then reduced post capture system by 96% (based on the 2019 Fugitive Study for the roofline). The emissions are then directed to the Vent Gas Baghouse (VGBH) and the Converter Secondary Hood Baghouse. The VGBH results in a 50% reduction from lime injection treatment.

B. Converters, Anode Furnaces and Fugitives

1. Anode Furnaces Secondary Hood

The emission reduction from the Anode Furnaces Secondary Hood Project was calculated by determining the total available fugitive SO_2 emissions from the Converters and Anode Furnaces. Then, the anode furnace SO_2 emissions were determined using the anode tons per day (there is also an existing baghouse with 85% capture). Then, an additional 80% reduction from the Anode Secondary Hood Baghouse. In addition, the SO_2 emission from the Anode Furnace Burners were considered, but were not significant

2. Fuming Ladle Control

The emission reduction from the Fuming Ladle Control Project was calculated by determining the total available fugitive SO_2 emission from the Converter Secondary Operations. Then, an existing baghouse with 90% capture results in further reductions. The Fuming Ladle Control System captures 90% of the emissions that occur due to a fuming ladle and directs them through the Converter Secondary Hood Baghouse and its lime injection system.

The facility's PTE based on the proposed changes is provided in Table 1 below:

Table 1: Potential to Emit (tpy)

Emission Source	**Emissions (tpy SO_2)**
Main Stack Center (Acid Plant)	1189.33
Main Stack Annulus	1691.64
Fugitives	124.08
Misc. Sources	1.80
Total Emissions	3006.84

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 that results in an 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 SO2 emissions and do not result in the increase of any regulated minor NSR pollutant. As a result, 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 emission increase of a 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 2010 1-hr SO_2 NAAQS. The proposed projects do not add or modify any production equipment. Thus, major new source review does not apply to this action.

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 Permittee is required to demonstrate compliance with the emission limits in the permit.

Table 2: Permit No. 96410

<table>
<tr><th>Emission Unit</th><th>Pollutant</th><th>Emission Limit</th><th>Monitoring Requirements</th><th>Recordkeeping Requirements</th><th>Reporting Requirements</th></tr>
<tr><td>Main Stack</td><td>SO_2</td><td>1069.1 lbs/hr, 14-operating day rolling average</td><td>SO_2 Continuous Emissions Monitoring System (CEMS) - exit of the Anode Secondary Hood Baghouse</td><td rowspan="4">Maintain all measurements from the continuous monitoring systems (CMS) including the date, place, and time of sampling or measurement, parameters sampled or measured, and results
Records of all compliance calculations
Records of quality assurance and quality control activities conducted on the CMS
Records of CMS breakdowns, repairs, maintenance, out of control periods, calibration checks, and zero and span adjustments
Records of all major maintenance activities conducted on emission units, capture system, air pollution control equipment, and CMS</td><td rowspan="4">Quarterly data assessment report in accordance with 40 CFR Part 60, Appendix F, Procedure 1
Semiannual excess emissions and monitoring systems performance report for the CMS</td></tr>
<tr><td>INCO Flash Furnace, Matte Tapping and Slag Skimming Areas</td><td>SO_2</td><td>38.5 lbs/hr</td><td rowspan="3">SO_2 CEMS – corresponding roofline areas</td></tr>
<tr><td>Converter Aisle</td><td>SO_2</td><td>10.0 lbs/hr</td></tr>
<tr><td>Anode Furnaces</td><td>SO_2</td><td>9.0 lbs/hr</td></tr>
</table>

VIII. ENVIRONMENTAL JUSTICE ANALYSIS

The 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 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 Hayden Smelter and reviewed a 5-mile radius around the facility for potential environmental justice concerns (see

Figure 1 below).

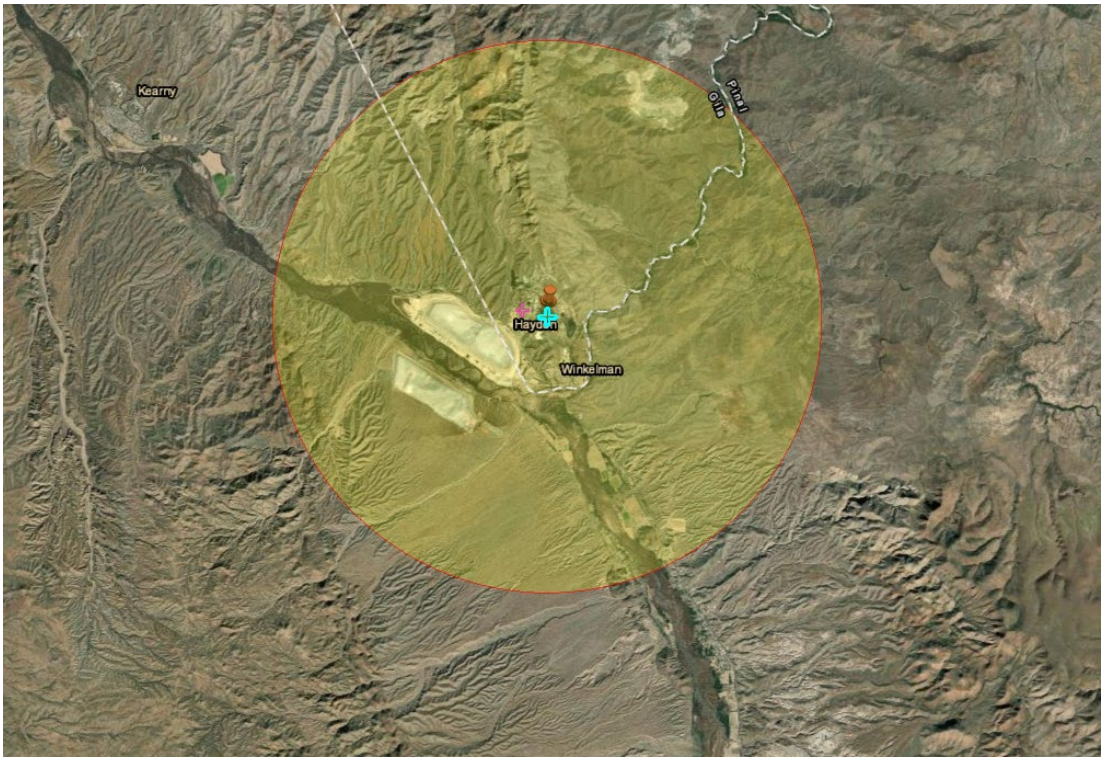

Figure 1: Hayden Smelter – EJSCREEN – 5-Mile Radius

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 90th 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 ambient SO_2 levels in the Hayden Nonattainment Area below the 1-hr SO_2 NAAQS. A complete review of the air quality analysis can be found in Section IX below. In addition, the submitted air quality analysis demonstrated that the levels of SO_2 decreased rapidly as the distance from the facility increased.

C. Conclusion

The proposed projects in this significant permit revision will result in a reduction SO_2 emissions and will not result in any significant emission increases of other criteria pollutants. The ADEQ concludes that the protections afforded by 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 permit revision application satisfy the public participation component of the EPA EJ Guidance. The modeling conducted further concludes that ASARCO will demonstrate compliance with the 1-hr SO_2 NAAQS and that the emissions from the facility will not result in any significant environmental or public health impacts.

IX. 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 SO_2 NAA SIP. The modeling was performed in accordance with the EPA's Guideline on Air Quality Models (GAQM) and Guidance for 1-Hour SO_2 Nonattainment Area SIP Submissions - Appendix A Modeling Guidance for Nonattainment Areas.

A. Model Selection

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) is-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 was used to process terrain data and develop elevations for receptors. AERSURFACE (Version 20060), and BPIPPRIM (version 04274) were also used in this analysis.

B. Source Inputs

Hayden Smelter releases SO_2 emissions from five sources: the main smelter stack, the anode furnace roof monitors, the converter aisle roof monitors, the flash furnace building roof monitors, and outdoor slag pouring. Point sources were used to model the emissions from the main stack, slag pouring, acid plant preheater, anode boiler, and the oxygen plant boiler. Volume sources were used to model the fugitive emissions from the anode furnace, converter aisle, and flash furnace.

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 2015-2016 and 2018-2020, totaling the five years required. The data from 2017 and 2021 could not be used due to not meeting the minimum 90% data completeness requirement for regulatory modeling. The data used consists of on-site hourly surface observations collected by ASARCO from the Camera Hill monitoring station.

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. The monitoring data used was measured during 2020 and 2021, while the smelter was temporarily shut down.

For each of the two years under review (2020 and 2021), Seasonal Hour-Of-Day is determined by organizing all of the SO_2 concentrations by hour of day (1AM, 2AM, 3AM, etc.) for each season of the year in descending order and selecting the 2nd highest SO2 concentrations for each hour of the day. The background concentrations are then determined as the two-year average of the 2nd highest-concentrations for each hour of the day and season.

E. Modeling Results for 1-hr SO_2 NAAQS

The results of the model demonstrated that the proposed controls and SO_2 limits in Section III.D above will result in attainment of the 1-hour SO_2 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, 1-hr SO_2 NAAQS

Highest 99th Percentile of Controlling 1-hr Concentrations (µg/m³)*	NAAQS (µg/m³)	Background Concentration (µg/m³)
195.97	196.0	Varies by season & hour

* Includes background through the application of SEASHR in AERMOD

AERMOD was run for each year to determine the design concentration. The representative background concentration was added via AERMOD's SEASHR functionality and the total concentration was then compared to the NAAQS. The resulting concentration of 195.97 µg/m³ was below the 1-hr SO_2 NAAQS of 196 µg/m³. Since the worst-case scenario was modeled and the background concentration was considered in the results, the analysis demonstrates that the proposed projects and limits will result in attainment of the 1-hr SO_2 NAAQS. In addition, the results showed that the modeled 1-hr SO_2 concentrations decrease very rapidly with distance from the facility.

X. 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
BPIPPRIM ..... Building Profile Input Program for PRIME
CEMS ..... Continuous Emissions Monitoring System
CFR ..... Code of Federal Regulations
EJ ..... Environmental Justice
EPA ..... Environmental Protection Agency
NAA ..... Nonattainment Area
NAAQS ..... National Ambient Air Quality Standard
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
TPY ..... Tons per Year