Aurubis Richmond LLC

SIP Permit Application

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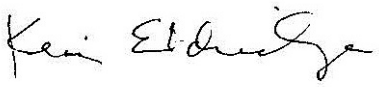
Aurubis Richmond LLC

SIP Permit Application



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List of Acronyms

ACF(M)	Actual cubic feet per (minute)
CCU	Copper Casting Unit
CFR	Code of Federal Regulations
CI	Compression ignition
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
dscf(m)	dry standard cubic feet per (minute)
D/F	dioxins furans
EPA	United States Environmental Protection Agency
EPD	Environmental Protection Division
gr	grains
GRAQC	Georgia's Rule for Air Quality Control
h	hour
HAP	Hazardous Air Pollutant
HBr	hydrogen bromide
HCl	hydrogen chloride
HF	hydrogen fluoride
kW-hr	kilo watt - hour
L	liter(s)
lb(s)	pound(s)
ICE	Internal combustion engine
ICW	Insulated copper wire
kg	kilogram
LTAF	lead tin alloy furnace
LTS	ladle treatment stand
m^3	cubic meter
MACT	Maximum Achievable Control Technology
MER	Maximum Emission Rate
$MMft^3$	Million cubic feet
$\mu g/m^3$	Micrograms per square meter
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOx	Nitrogen oxides
NNSR	Non-attainment New Source Review
NSPS	New Source Performance Standards
PCC	dioxins (polychlorinated dibenzo-p-dioxins
PCDD	furans (polychlorinated dibenzofurans
PCDF	Post combustor chamber
PFD	process flow diagram
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than 2.5 microns
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RICE	Reciprocating Internal Combustion Engine
SHF	Slag Holding Furnace
SIP	State Implementation Plan
SNCR	Selective non-catalytic reduction
SO_2	sulphur dioxide
TAP	Toxic Air Pollutant
TBRC	top blown rotary converter
TCDD	2, 3, 7, 8-tetrachlorodibenzo-p-dixoin
tpy	tons per year

List of Acronyms

VOC	volatile organic compound
WEEE	Waste Electrical and Electronic Equipment
yr	Year

1. INTRODUCTION

Aurubis Richmond LLC (Aurubis) is planning to construct a plant to recycle copper containing scrap in Augusta, Georgia. The facility will process low-grade copper bearing scrap materials, Waste Electrical and Electronic Equipment (WEEE) and general copper metal bearing materials which are available on the US market today. The generated valuable materials will be directly available for the market as well as further treated in the existing Aurubis production network. Alongside the core element copper multiple metals such as tin, lead, nickel, zinc and further precious metals will be recovered. This document constitutes Aurubis' State Implementation Plan (SIP) construction permit application. The facility will be a synthetic minor source.

1.1 Application Content

This Permit Application (prepared as a Georgia SIP Air Permit Application) is organized as follows:

- Section 2.0 includes a description of processes at the facility.
- Section 3.0 includes a description of facility-wide emissions and the emission calculation methodologies.
- Section 4.0 includes an air regulatory applicability analysis for the facility.
- Section 5.0 includes a discussion of air toxics evaluation for the facility.
- Supporting documentation for this application is provided in the following:
- Appendix A contains a Site Diagram and Process Flow Diagrams (PFD).
- Appendix B contains emissions source and facility-wide potential to emit (PTE) calculations.
- Appendix C contains the required Georgia State Implementation Plan (SIP) Air Permit Application Forms.

2. PROCESS DESCRIPTION

2.1 General Description

The Aurubis - Augusta Plant will produce copper ingots primarily from printed circuit boards, shredded metals, metal fractions, and copper cables using the top blown rotary converter (TBRC) process. Raw material is delivered to the site. The material is analyzed for chemical composition and quality control. Material is then shredded to the desired fraction size for melting. In the smelting, converting and refining process valuable metal is separated from the waste and organic material. After casting, the copper ingots are conveyed to storage for off-site transfer. The dry slag formed in the TBRCs is granulated and sent to storage for off-site shipment. The following provides a listing of the emission sources at the facility:

- Raw materials handling and processing including storage, blending, pre-treatment, sampling and analyzing and a feed mix charging system;
- Three Shredders (these will be electrically operated);
- Four Top Blown Rotary Converters (TBRCs 1, 2, 3 and 4) each with a Preheater venting to baghouses BH01 and BH05;
- One Lead Tin Alloy Furnace (LTAF) with a Heater and Ladle Treatment Stand (LTS) venting to BH02;
- Smelting and Sampling Building including Charging Hood TBRC 1, Charging Hood TBRC2, Tapping Hood TBRC 1, Taping Hood TBRC 2, Material Handling and Roof Extraction venting to BH03;
- Charging Hood TBRC 3, Charging Hood TBRC 4, Tapping Hood TBRC 3, Taping Hood TBRC 4, and Roof Extraction venting to BH06;
- Slag Holding Furnace (SHF) off gas, SHF Tapping Hood, Dry Slag Granulation (DSG), Copper Casting Unit (CCU) – Tilting Chair, CCU – Launder, CCU Mould Filling venting to BH04;
- Small Sampling Furnaces (these will be electrically operated);
- Two Carbon Silos;
- Two Flue Dust Silos;
- A Cooling Tower;
- Three Diesel Fueled Emergency Generators;
- Six Roof Vents; and
- Slag Storage and Processing including Wind Erosion.

Table 2-1 shows the controls that will be utilized at the facility. A site map and facility flow diagram are included in Appendix A.

Table 2-1: Air Pollution Controls

Emission Units	Emission Point ID	Control Device(s)	Description
TBRCs 1 & 2	EP1A	Baghouse 01, Scrubber 01, Post Combustor 01	Scrubber is used to remove acids. Combustor includes SNCR controls and conversion of CO to CO_2
TBRCs 3 & 4	EP1B	Baghouse 05, Scrubber 02, Post Combustor 02	Scrubber is used to remove acids. Combustor includes SNCR controls and conversion of CO to CO_2
LTAF and LTS	EP1A	Baghouse 02	Includes LTAF, LTS and LTAF Hood
Slag Holding Furnace, CCU and SG	EP3	Baghouse 04	Includes SHF off gas, SHF Tapping hood, DSG, CCU-Tilting Chair, CCU Launder and CCU Mould Filling
Secondary - Smelting and Sampling Building 01	EP2A	Baghouse 03	
Secondary - Smelting Building 02	EP2B	Baghouse 06	
Carbon Silo 01	BV01	Bin Vent 01	
Carbon Silo 02	BV04	Bin Vent 04	
Flue Dust Silo 01	BV02	Bin Vent 02	
Flue Dust Silo 02	BV05	Bin Vent 05	

Table 2-2 provides a listing of the fuel combustion sources.

Table 2-2: Natural Gas Fuel Combustion Sources

Source	Heat Rating		Fuel Consumption	
	MMBtu/hr	MMBtu/yr	$MMft^3/hr$	$MMft^3/yr$
Preheaters for TBRCs 1&2	81.89	277,246	0.080	222.79
Preheaters for TBRCs 3&4	81.89	277,346	0.080	222.79
LTAF	13.65	48,111	0.013	47.17
Ladle Heater	17.06	62,373	0.017	61.15
Post Combustor 1	6.82	682	0.0067	0.67
Post Combustor 2	6.82	682	0.0067	0.67
Slag Holding Furnace	14.33	45,654	0.014	44.76
Launders	3.75	3,378	0.0037	3.31

Table 2-3 Diesel Fired Emergency Generators

ID	Rating (hp)	Hours
EG01	2,720	500
EG02	2,720	500
EG03	1,360	500

2.2 Detailed Description

2.2.1 Material Reception, Transport and Storage

All materials are delivered by truck and enter the plant at an entrance facility. The trucks enter an uncovered or a covered lot pile area where the raw material is unloaded. Vehicles such as forklifts, front loaders and excavators are operated in these areas. The empty trucks leave the area by passing an automatic tire cleaning unit to prevent dragging material onto public roads. Inside of the lot piles, as well as inside the sampling area, excavators and front loaders will be operated to move raw material. Packaging will be removed from the material and an initial sample for moisture will be taken. Samples are also taken to the laboratory facilities for further treatment and analysis. Three (electric) shredder lines are operated in the laboratory and sampling area.

2.2.1.1 Material sampling and preprocessing

The different materials will be unloaded in the material handling area in open and covered lot piles depending on specific material. Flux materials will be unloaded directly into the feed mix hall.

Metal shredder material will be unloaded from trucks in the open lot pile area outside as well. Metal shredder will basically be supplied at the needed particle size for the converter process already. Several storage boxes are used in the open lot pile area for the metal shredder material. The metal shredder material is further transported by front end loader to the feed mix hall.

Material that is processed in the shredding area include

- Printed Circuit Board material with a low copper grade,

- Printed Circuit Board materials with a medium or high copper grade and
- Insulated copper wire (ICW) material.

2.2.1.2 Shredder Process

The shredder process is performed for materials which cannot be delivered with the needed physical properties and particle size distributions. The process consists of three shredder aggregates. ICWs and copper scrap is fed into the first shredder (pre-shredder) by front loader or excavator into a filling hopper. The main material flow from the first shredder is conveyed by belt into the feed mix hall. Circuit board will be fed in to the second shredder system (two shredder in line) used to achieve the final physical properties. All shredder aggregates, belt conveyors and generally all intersections between aggregate conveying materials are ventilated with the plants secondary baghouse system (EP2A).

2.2.1.3 Material Handling Mixing and Feeding System

The feed mix hall is a closed building where all materials for processing in the furnaces are mixed after their respective preprocessing. Internal revert material is also provided in the feed mix hall for reprocessing. The input mixtures TBRCs must be uniform and suitable for charging. Vehicles such as front loaders, forklifts and excavators will be operated in the feed mix hall. The feed mix hall is equipped with material storage boxes for organizing and mixing the material handling. The storage boxes in the feed mix hall are designed to cover the input material supply of the whole plant for at least three days which results in nine converter batches.

2.2.1.4 Sampling Process

In the shredder area, the raw material will be broken down to grain sizes which can be treated in the sampling furnaces. Representative samples will be taken at the shredder area. The weight of these samples will be between 50 and 500 kilograms (kg) depending on the kind of material. The first steps in the sampling area is to dry sand mill the samples, before they are further reduced. In large and small induction furnaces the samples are going to be smelted to separate slag and metal. This process is supported by using additives. The metal and slag samples will be analyzed after milling, machining, or drilling, depending on the following analytical process in the laboratory. The sampling area will be equipped mainly with:

- Two 2 cubic meter (m^3) Heating Cabinets;
- Three 500 kilogram (kg) Induction Crucible Furnaces;
- A 50 kg Induction Crucible Furnace;
- A 0.5 m^3 Smelting with Induction Furnace;
- A 1000 kg/hour Pan Mill;
- Mills, drilling and machining equipment.

Table 2-4 shows the type and amount of material that will be processed in this area. The emissions from these units will consist of a minor amount of volatile organic compounds (VOC) and carbon monoxide (CO). The same emission factor for VOC and CO that was used for the TBRCs were used for the estimation of emissions in this area (See Section 3.4). The emissions of VOC from this process is estimated to be 0.043 tons per year (tpy) and the CO emissions are 0.37 tpy. Emission calculations are shown in Appendix C. Since the emission from the Sampling Furnaces do not exceed 5 tpy for VOC or CO and this is a laboratory type operation, Aurubis is proposing that this process be listed as insignificant in the air permit per Georgia Air Quality Rule 391-3-1-.03(6)(i)3(f)1.

Table 2-4: Sampling Material to be Processed

Material	Amount (tpy)	Where Processed
Shredded Material	606.3	Induction Furnace
Printed Circuit Boards	22.6	Induction Furnace
ICW	1,102.3	Smelting with Induction Furnace

2.2.1.5 Initial Startup of Material Receiving, Shredding and Sampling Furnaces

Aurubis plans to initially startup material receiving, shredding and sampling furnaces approximately 6-9 months prior to the startup of the secondary smelting operations for the purposes of qualify scrap materials and training employees. The above mentioned operations will utilize a temporary baghouse in the interim until the secondary baghouse is operational.

2.3 Pyro Metallurgical Process

Following the material preprocessing and handling steps different pyro metallurgical processes are operated to recover the valuable metals form input materials. Four TBRCs, a LTAF and a slag holding furnace are used along the process chain. The first aggregates of the pyro metallurgical process are the TBRCs. All four TBRCs are built identically. Each two of them are operated in parallel but in different process phases. After processing the input materials in the TBRCs the different products are further treated in the following furnaces. The slag out of the smelting phase of the TBRC is treated in the Slag Holding Furnace (SHF). The slag out of the converting phase of the TBRC is further treated in the LTAF process. The LTAF slag is treated in the SHF as well. The product blister copper is tapped at the end of the TBRC process; the product lead-tin-alloy is the product out of the LTAF/LTS process. All other metal content intermediate materials will be recharged into the TBRC.

2.3.1.1 TBRCs

The four TBRC reactors are used to process all raw materials. The reactor vessels comprise of a bottom, a cylindrical main part and a conical upper part. The vessel is open at the top of the conical upper part for charging and skimming products. Each TBRC reactor is operated in three successive process steps. These are initially the material smelting, followed by the converting process and finally a refining process is performed. A TBRC batch production has duration of roughly 16 hours. The initial smelting takes roughly seven hours while converting takes roughly 2.5 hours. All raw materials and fluxes provided for the process are continuously charged in the smelting phase. The converting process is charged continuously with some fluxes and shredded material. The TBRCs are operated alternatingly in terms of smelting and converting. Process scheduling is established to ensure the second TBRC will be converting while the first TBRC is smelting.

2.3.1.2 LTAF/LTS

The LTAF is a cylindrical drum furnace closed with two side covers. One side cover is equipped with a natural gas burner to keep the process at the needed temperature. The second side cover is equipped with a tap hole. The LTAF furnace process gas is ventilated, and all emissions are captured in a baghouse (BH02). The furnace is operated in three successive process steps reactively reducing the focus elements from the slag into a metal phase. In all three steps the furnace is rotated for a couple of degrees from one side to the other, stirring and moving the melt continuously. The metal phase (raw lead-tin-alloy) will be tapped into a small ladle, in which the metal is treated in the Ladle Treatment Stand

(LTS) further to lead-tin-alloy. This alloy will be casted in ingots for transportation and further treatment in Aurubis facilities.

2.3.2 Slag Holding Furnace

The SHF is a cylindrical drum furnace, like the LTAF vessel. It consists of a cylindrical shell with two side end covers. One side end cover is equipped with a tap hole. Just after the tap hole a relined launder is attached to drain the tapped melt straight into a metal ladle. The SHF is equipped with a central opening mouth for charging different kinds of liquid slag by crane and ladle comparable to the LTAF charging. Ventilated hoods are used to cover all emissions of the SHF process. These emissions are vented to a baghouse. The slag is kept at the targeted temperature of roughly 1,250°C. Metals entrained in the slag phase are settled at the bottom due to differences in their physical density. A metal phase with significant copper concentration is collected at the bottom of the SHF for a couple of days and multiple batches of the TBRCs and LTAF batches. A SHF batch is processed roughly four hours. Finally, the slag is skimmed through the opening by rotation of the furnace. The slag is guided by a launder into the granulation unit.

2.3.2.1 Blister copper casting and handling

Blister copper is tapped into ladles on a ladle car in front of the TBRC's. The ladle is then taken to the copper casting chair on the opposite side of the melt shop. The ladle is positioned in the casting chair, which is equipped with ventilated hoods. The process unit is called Copper Casting Unit (CCU). All emissions occurring by casting the blister are captured in a baghouse (BH03). The ladle is tilted by the electric cylinder to pour the blister copper melt into an adjacent ingot casting machine. The ingot caster is equipped with molds taking up roughly 200 kg of blister copper each. Continuous casting of one TBRC batch blister takes roughly one hour. The melt is first poured into a buffer tundish and further into a so-called pouring tundish. The molds are filled precisely out of the last tundish. The casting molds are chain driven and continuously returned. The upper side of the caster comprises a cooling unit using water spray to cool down the molds from top and downside as well. The blister copper solidifies until the end of the upper chain is reached. Solidified blister copper ingots are falling out of the molds when turned upside down for returning. The molds returning to the pouring tundish on the downside of the caster are preheated again with natural gas burners. Finally, they can be refilled again dry and preheated for continuous casting. The blister copper blocks are automatically conveyed further into a stacking and labeling unit. They are strapped automatically and finally provided in stacks for further transport by forklifts. Forklifts are used to take the material outside into the products storage area ready for shipping

2.3.2.2 Slag Granulation and Handling

The molten slag is guided by a launder from the SHF into the granulation process. A compressed air jet blows the slag into the granulation chamber. The slag is dispersed into droplets solidifying quickly. Extensive heat transfer results in solid granulated slag particles settling in the granulation chamber. The granulation chamber is ventilated to a baghouse (BH03, EP3). Also, the heat balance of the granulation chamber demands to discharge the heat from the slag as granulation is done roughly in one hour for one SHF batch. Cooled air is injected and ventilated again from the granulation chamber. The cooling air used has been ventilated at the copper casting and cooling unit described in chapter 2.3.2.1 before. The injected cooling air, granulation air and all emissions are further treated in a baghouse (BH04, EP3). Slag granulation takes roughly one hour and will occur with an interval of four hours. The granulation chamber can store the slag from multiple batches. For handling of the granulated slag, a door can be opened for a front loader to move the slag. The slag is a product available for the market in granulated form and is conveyed by front loader to the adjacent slag pile for further storage and sale. The Slag pile is located outside in the product handling area ready for shipping.

3. POTENTIAL EMISSIONS ESTIMATES

Potential emissions have been estimated to determine whether the facility is a major or minor source for purposes of identifying applicable permitting and other regulatory requirements. Emissions from the facility have been estimated as described below. Note that the total emissions include stack and fugitive emissions, as well as emissions from potentially insignificant sources. Detailed emission estimates are provided in Appendix B. The facility-wide emissions in tons per year (tpy) are presented in Table 3-1.

Table 3-1: Facility-Wide Potential Emissions Estimates

Pollutant[a]	Facility-Wide Emissions[b] (tpy)	Title V Threshold (tpy)	PSD Threshold (tpy)[e]
Total PM	65.97	100	100
PM_{10}	64.35	100	100
$PM_{2.5}$	63.96	100	100
NO_X	81.19	100	100
CO	67.32	100	100
SO_2	21.27	100	100
VOC	10.11	100	100
Max Single HAP[c]	0.49 (hexane)	10	NA
Total HAP[d]	2.01	25	NA
CO_{2e}	38,273	NA	f

a - PM – particulate matter; PM_{10} – particulate matter with an aerodynamic diameter less than 10 microns; $PM_{2.5}$ – particulate matter with an aerodynamic diameter less than 2.5 microns; NOx – nitrogen oxides; CO – carbon monoxide; SO_2 – sulfur dioxide; VOC – volatile organic compounds; HAP – hazardous air pollutant'; and CO_{2e} – carbon dioxide equivalent.
b –Values shown include potentially insignificant and exempt sources such as emergency engine, cooling tower, etc.
c – Single HAP with the highest PTE is hydrogen chloride, see Appendix B
d- Total HAPs includes organic HAP, metal HAPs, HCl, HF, HBr and dioxin furans.
e – The facility fits the category of secondary metal production plants and therefore, the PSD threshold is 100 tpy for criteria pollutants.
f – CO_{2e} would only be subject to PSD requirements if another criteria pollutant exceeded 100 tpy and the CO_{2e} from the project exceeded 75,000 tpy.

3.1 Particulate Matter Emissions

PM emissions sources are shown in Table 3-2. PM emissions were calculated based on readily available emission factors, manufacturer's specifications and / or data from a similarly operated facility.

Table 3-2: PM Emission Sources

Emission Source	PM Control Device(s)	Emission Point
TBRCs 1 & 2	Baghouse 01, Scrubber 01	EP1A
TBRCs 3 & 4	Baghouse 05, Scrubber 02	EP1B
LTAF and LTS	Baghouse 02	EP1A
SHF, DSG, CCU	Baghouse 04	EP3
Secondary – Smelting and Sampling Building 01	Baghouse 03	EP2A
Secondary – Smelting Building 02	Baghouse 06	EP2B
Carbon Silo 01	BV01	Bin Vent 01
Carbon Silo 02	BV02	Bin Vent 04
Flue Dust Silo 01	BV03	Bin Vent 02
Flue Dust Silo 02	BV04	Bin Vent 05
Launders	None	EP2A
Emergency Generators	None	EG01, EG02, EG03
Cooling Tower	None	CT01
Raw Material Handling	None	Fugitive
Slag Storage and Loading	None	Fugitive
Slag Pile Wind Erosion	None	Fugitive
Cooling Tower 01	None	Fugitive
Front End Loaders	None	Fugitive
Roadways	None	Fugitive
Six Roof Vents	Filters	RV01-06

PM emissions were calculated based on readily available emission factors, manufacturer's specifications and / or data from a similarly operated facility. Material handling and shredding will be vented to the secondary baghouses and are not included as PM emission sources separately.

3.1.1 TBRCs

The four TBRCs will be controlled by a baghouse (BH01 for TBRCs 1&2 and BH05 for TBRCs 3&4). The baghouse is designed to meet a grain loading of 0.002 grains/dry standard cubic feet (gr/dscf). Emissions were calculated by multiplying the grain loading factor by the flowrate (dry standard cubic feet [dscf]) for

each of the two baghouses, then converting to pounds per hour. Potential annual emissions were based on 8,760 hours of operation per year.

3.1.2 Building Emissions (Secondary Baghouses)

Emissions from the Smelting, Shredding and Sampling Building 01 will be controlled by secondary baghouses (BH03). A second baghouse (BH06) will control the Smelting operations in Building 2. The baghouses are designed to meet a grain loading of 0.002 gr/scf. Emissions were calculated by multiplying the grain loading factor by the flowrate, then converting to pounds per hour. Potential annual emissions were based on annual flowrates based on number of hours each emission source could operate in a year.

3.1.3 One LTAF and LTS

The LTAF and LTS. Emissions were calculated by multiplying the grain loading factor by the flowrate then converting to pounds per hour. Potential annual emissions were based on annual flowrates based on number of hours each emission source could operate in a year.

3.1.4 Slag Holding Furnace, Copper Casting and Dry Slag Granulation

The Slag Holding Furnace, Copper Casting and Dry Slag Granulation baghouse (BH03). The baghouse is designed to meet a grain loading of 0.002 gr/dscf. Emissions were calculated by multiplying the grain loading factor by the flowrate then converting to pounds per hour. Potential annual emissions are based on the specific hours of operation of each source per year.

3.1.5 Fuel Combustion

3.1.5.1 Preheaters

Particulate emissions from fuel combustion in the two preheaters (one for TBRC 1&2 and one for TBRC 3&4) will be captured by the Secondary baghouses (BH03 and BH06) above in Section 3.1.2.

3.1.5.2 LATF Heater

Particulate emissions from fuel combustion in the LTAF will be captured by the LTAF BH02 as discussed in Section 3.1.3.

3.1.5.3 Combustors

Particulate emissions from fuel combustion in the two combustor units will be captured in the TRBCs baghouses described in Section 3.1.1.

3.1.5.4 Launders

Particulate emissions from the fuel combustion in the Launders will be captured in the Secondary Baghouse (BH-03 and BH06) as described in Section 3.1.2.

3.1.5.5 Emergency Generators

Particulate emissions from the emergency generators were calculated based on the 40 CFR Standards of Performance for Stationary Compression Subpart IIII Ignition Internal Combustion Engines (NSPS). Emissions were calculated based on the NSPS emission limits of 0.2 grams/kW-hr.

3.1.6 Roof Vents

Six roof vents will be installed in the bunker bay of each of the melt-shops. The vents will provide cooling to the bunker bay areas. These will have filters to control particulate emissions. Emissions are based on an emission factor measured at a similar facility in Germany of 0.1 mg/m^3.

3.1.7 Raw Material (Scrap) Storage Piles

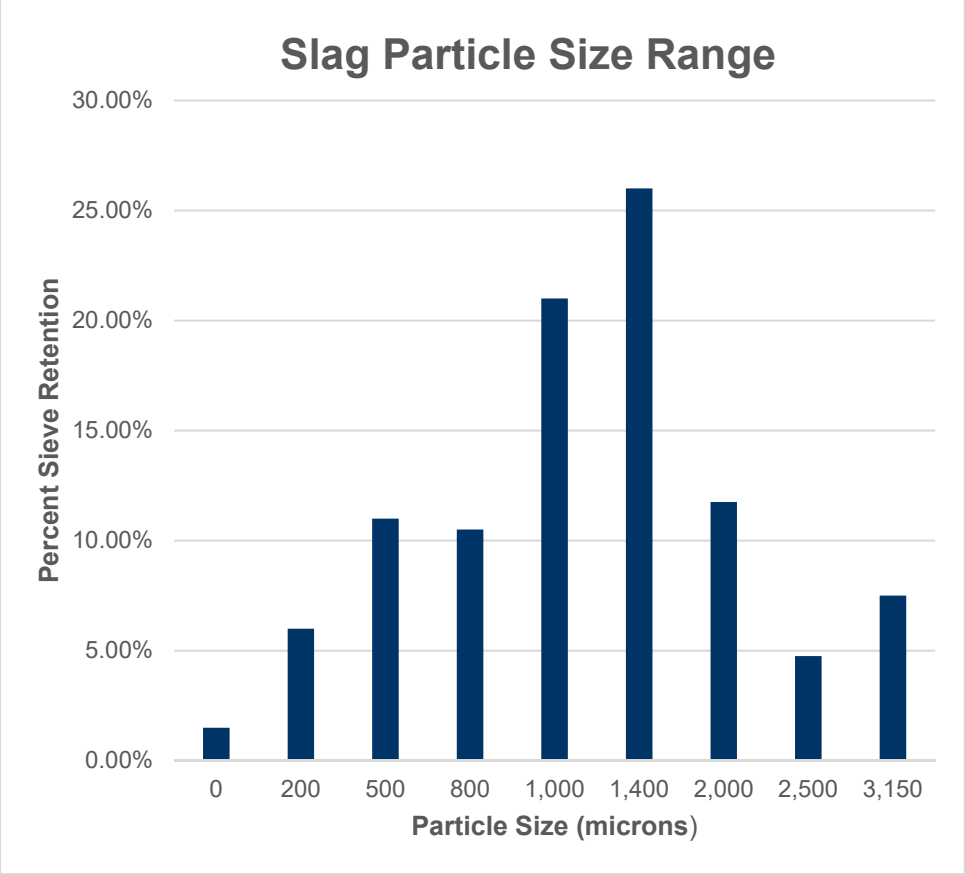
The Aurubis - Richmond Plant receives scrap, scrap substitutes, carbon, fluxes and other materials by truck. After unloading, the scrap is stored in stockpiles and pre-processed (shredded) and sampled. The scrap and other feedstock materials are then added on the conveyor prior to entering the TBRC. Particulate emissions from these operations were calculated based on AP-42 Chapter 13.2.4.

3.1.8 Slag Storage

3.1.8.1 Slag Handling

Particulate emission from Slag Handling were calculated using AP-42 Chapter 13.2.4. The aerodynamic particle size was determined using an analysis of slag from a similar facility in Germany. The results of this analysis are shown in Figure 3-1. Only 1.5% of the total slag is less than 200 microns (in the range from 0 microns to 200 microns). It was conservatively assumed that total PM_{70}, PM_{10}, and $PM_{2.5}$ were all equal to 1.5% of the total particulate in the pile.

Figure 3-1 Size Distribution of Slag



3.1.8.2 Slag Storage Wind Erosion

Particulate emissions from the Slag Storage piles due to Wind Erosion were calculated using AP-42 Chapter 13.2.5. The aerodynamic particle size was determined using an analysis of slag from a similar facility in Germany as discussed in Section 3.1.8.1.

3.1.9 Carbon Silos

Emissions of particulate matter from the two carbon silos were calculated using a grain loading of 0.01 gr/dscf. Emissions were calculated by multiplying the grain loading factor by the flowrate, then converting to pounds per hour.

3.1.10 Flue Dust Silo

Emissions of particulate matter from the two flue dust silos were calculated using a grain loading of 0.01 gr/dscf. Emissions were calculated by multiplying the grain loading factor by the flowrate, then converting to pounds per hour.

3.1.11 Paved Roads

Particulate emissions from the trucks traveling on paved roads were calculated based on AP-42 Chapter 13.2.1.

3.1.12 Front End Loaders

Particulate emissions from the front-end loaders moving raw material were calculated based on AP-42 Chapter 13.2.1.

3.1.13 Cooling Tower

The method used in determining emissions from the cooling tower is the “Expanded Resiman-Frisbie” method[1] .

3.2 Oxides of Nitrogen (NOx)

NOx will be emitted from the following sources:

- Four TBRCs;
- LTAF;
- Slag Holding Furnace;
- Two Combustors;
- Launders; and
- Three Emergency Generators.

The four TBRCs and the LTAF each have a preheater that use natural gas as a fuel to raise the temperature of the refractory material to the proper operational temperature. There are two post combustion chambers where at the exit of these chambers the control of NOx emissions occurs using SNRC. These combustion chambers also fire natural gas when needed. NO_x emissions will result from the combustion of natural gas in the five preheaters and two post-combustion chambers. In order to

[1] Smith, R, Woerner, A, and Hanna, T. “Determining PM10 and PM2.5 Emissions from Wet Cooling Towers”, ERM, October 2011.

control NO_x emission in the primary off-gas of the TBRCs, post-combustion chambers will use selective non-catalytic reduction (SNCR) with urea injection.

Emission of NO_x emissions were based on stack test at a similar facility in Germany and a conservative factor of 20% was added. That facility did not have SNCR, so the calculated emissions were reduced by 65% to reflect the SNCR controls.[2] In addition, the TBRC burners will operate on high oxygen which will further reduce NO_x emissions. Ninety percent of the NO_x was assumed to be emitted from the TBRCs and ten percent was emitted from the LTAF. The emissions from the LFAF will not be controlled.

The NO_x emissions from the natural gas combustion in the Slag Holding Furnace, the two Combustors and Launders were calculated using a conservative AP-42 Chapter 1.4 emission factor of 50 pounds per $MMft^3$ of natural gas. (NO_x Emissions (tpy) = NO_x emission factor (lb NO_X/million cubic feet of natural gas combusted x million cubic feet of natural gas combusted per year ($MMft^3$/yr) x 1 ton/2000 lbs).

The emergency generators will be subject to the NSPS Subpart IIII. Since the limit is for NOx + NMHC combined, the NOx and VOC emissions were calculated using a ratio of 67.8% NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.

3.3 Carbon Monoxide (CO)

CO will be emitted from the following sources:

- Four TBRCs;
- LTAF;
- Slag Holding Furnace;
- Two Combustors;
- Launders; and
- Three Emergency Generators.

In the four TBRCs and the LTAF CO is produced during the process due to the incomplete combustion in an oxygen deficient environment. Emissions of CO from the TBRCs will be reduced by the post combustors. Emission of CO were based on stack test at a similar facility in Germany were doubled to account for plastic content at the Augusta facility and a conservative factor of 20% was added. The facility in Germany that was tested was not operating the Combustors planned for the Augusta facility. When operating the Combustors will further reduce CO emissions.

Emissions of CO from the natural fuel combustion in the Slag Holding Furnace, two Combustors and Launders was calculated using a conservative AP-42[3] Chapter 1.4.emission factor of 84 lb/$MMft^3$ of natural gas. (CO emissions (tpy) = CO emission factor (lb CO/$MMft^3$ x $MMft^3$ of natural gas combusted per year ($MMft^3$/yr) x 1 ton/2000 lbs).

The emergency generators are subject to NSPS IIII. Emission factors used are from 40 CFR 1039 , Appendix I, Table 3, Emission Standards for Tier 3 engines >560 kW of 3.5 grams/kW-hr.

[2] Gideon M. Siringi. “Selective Non-Catalytic Reductions for Nitrogen Dioxides in Preheater Lime Kilns”, International Journal of Applied Science and Technology. Vol 9, No. 2, June 2019. https://www.researchgate.net/publication/333149107_Selective_Non-Catalytic_Reduction_for_Nitrogen_Dioxides_Reduction_in_Preheater_Lime_Kilns

[3] “Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources”, AP-42, Office of Air Quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. January 1995.

3.4 Volatile Organic Compounds (VOC)

VOC will be emitted from the following sources:

- Four TBRCs;
- LTAF;
- Slag Holding Furnace;
- Two Combustors;
- Launders; and
- Three Emergency Generators.

VOC emissions generated in the TBRCs were based on emission data provided by the Original Equipment Manufacturer (OEM) with a conservative factor of 20% was added. VOC emissions from the TBRCS will be reduced in the post-combustors.

The VOC emissions from the natural gas combustion in the two Combustors and Launders were calculated using a conservative AP-42 Chapter 1.4 emission factor of 5.5 pounds per $MMft^3$ of natural gas. (VOC Emissions (tpy) = VOC emission factor (lb VOC/million cubic feet of natural gas combusted x million cubic feet of natural gas combusted per year ($MMft^3$/yr) x 1 ton/2,000 lbs).

The emergency generators will be subject to NSPS Subpart IIII. Since the limit is for NOx + NMHC combined, the NOx and VOC emissions were calculated using a ratio of 67.8% NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.

3.5 Sulfur Dioxide (SO_2)

SO_2 will be emitted from the following sources:

- Four TBRCs;
- Slag Holding Furnace;
- Combustors;
- Launders; and
- Three Emergency Generators.

SO_2 emissions results from conditioning agent used in the wet off gas cleaning part of the facility. Emissions were based on data provided by the OEM with a conservative factor of 20% added.

The SO_2 emissions from the Post-Combustors, Slag Holding Furnace and Launders were calculated using an AP-42 Chapter 1.4 emission factor of 0.6 pounds per MMft3 of natural gas. (SO_2 Emissions (tpy) = SO_2 emission factor (lb SO_2/million cubic feet of natural gas combusted x million cubic feet of natural gas combusted per year (MMft3/yr) x 1 ton/2000 lbs).

SO_2 emissions from the emergency generators were calculated based on the emission factors in AP-42 Chapter 3.4 and an assumed 15 ppm sulfur limit.

3.6 Metal-HAPS

The federal EPA has identified 187 air pollutants as Hazardous Air Pollutants (HAP). While every effort is made to maximize the recovery of metals from the E-scrap, some amount of HAP in the form of certain

metals (metal-HAPS) will be generated. The emission of copper, aluminum, calcium, nickel, silicon, tin, and zinc from the process were estimated based an analysis of the material at various stages of the process from a similar facility in Germany or data from process modeling.

Emissions of cadmium, antimony, chromium, cobalt, lead, manganese, and mercury were based on emission testing at a similar facility in Germany. A conservative factor of 20% was added. Activated carbon is injected into the baghouses on the TBRCs to reduce potential mercury emissions.

The calculation of the metal-HAP emissions can be found in Appendix C.

3.7 Dioxin/Furan (D/F)

Polycyclic organic compounds including dioxins and furans are included in the federal HAP list. At its most basic, dioxins (polychlorinated dibenzo-p-dioxins (PCDD's), and furans (polychlorinated dibenzofurans (PCDFs)) are formed during the combustion of chlorinated compounds in the presence of hydrocarbons. The exact mechanisms for creation of D/F are complicated and have been demonstrated to be temperature dependent. Dioxins have different toxicities depending upon the number and position of chlorine atoms in their molecular structure. The toxicity of a specific dioxin is reported relative to 2, 3, 7, 8-tetrachlorodibenzo-p-dixoin (TCDD). This ratio, or toxic equivalency factor (TEF) allows the overall emissions of a mixture of dioxins to be stated in terms of their toxicity equivalent quantity (TEQ). TCDD has a TEF of one, and all of the others are expressed relative to TCDD to produce the TEQ of the mixture of dioxins being evaluated.

In order to prevent dioxins from forming, Post Combustors are used that hold a temperature of 1,000 ^{o}C for over two seconds followed by a quick cooling of the off-gas in a quench.

Aurubis has calculated the D/F TEQ based on stack testing conducted at a similar facility in Germany. The factor was doubled to account for plastic content at the Augusta facility and a conservative factor of 20% was added. Activated carbon is injected into the ductwork downstream from the TBRCs and post-combustors and water quench that quickly drop the temperature below D/F formation temperatures, but prior to the baghouses for the control of organic compounds including D/F.

3.8 Inorganic HAP

Hydrogen Bromide (HBr), Hydrogen Chloride (HCl) and Hydrogen Fluoride (HF) are also included on the federal HAP list and will be generated in TBRCs. The potential emissions of these acid gases were calculated based on stack testing conducted at a similar operation in Germany. The factors HF and HCl were doubled to account for the plastics in the raw material stream and an additional safety factor of 20% was applied for all three compounds. The facility in Germany did not have a scrubber therefore an additional control of 90% was assumed for HCl and HF.

3.9 GA Air Toxic Pollutants

In addition to the federally identified hazardous air pollutants, the State of Georgia (GA), has developed its own list of toxic air pollutants (TAP). A toxic air pollutant is defined as any substance which may have an adverse effect on public health, excluding any specific substance that is covered by a State or Federal ambient air quality standard. Emissions of GA TAPs are estimated based on evaluations of raw material, and baghouse dust at similar facilities and AP-42[4] Chapter 1.4. The evaluation of the GA Air Toxics is discussed in more detail in Section 5.

[4] "Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources", AP-42, Office of Air Quality Planning and Standards, Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. January 1995.

4. PERMITTING PROGRAMS

4.1 Title V Operating Permit Program

A Title V (Part 70) operating permit is required for facilities that meet the definition of a major source according to 40 CFR Part 70.2. Georgia has incorporated the federal Part 70 program in Georgia's Rule for Air Quality Control (GRAQC) 391-3-1-.03(10). A facility with criteria pollutant emissions greater than 100 tpy is a major source under the Title V permitting program. A Title V Operating Permit is also required for facilities with potential HAP emissions in excess of 10 tons of any single HAP in a twelve consecutive month period, and/or 25 tons in a consecutive 12-month period of all HAP combined. As shown in Table 2-1, the potential emissions from this facility will not exceed the Title V program thresholds and the facility will not be subject to Title V permitting. However, since 40 CFR 63 Subpart 40 CFR 63 Subpart FFFFFF – National Emission Standards for Hazardous Air Pollutants for Secondary Copper Smelting Area Sources does apply, 40 CFR §63.11153(d) states that "If you own or operate an area source subject to this subpart, you must obtain a permit under 40 CFR part 70 or 40 CFR part 71". Therefore, Aurubis will apply for a Title V permit within one year of the start of operation of the smelting operations.

Aurubis Richmond will be required to apply for a Title V Operating Permit as a result of being subject to 40 CFR Part 63 Subpart FFFFFF, Secondary Copper Smelting Area Sources NESHAP. Therefore, the Title V application should be due 12 months from startup of the smelting operations. Aurubis, requests that this is made clear in the Construction permit.

4.2 Prevention of Significant Deterioration (PSD)

The federal PSD program, codified in 40 CFR Part 52.21, requires any new major stationary source of air pollutants to obtain a PSD major source air construction permit before commencing construction. Georgia has incorporated the federal PSD program in GRAQC 391-3-1-.02(7). The PSD program applies considered one of the 28 listed PSD source categories specified in §52.21(b)(1)(i)(a) with a 100 tpy PSD major source threshold for regulated New Source Review (NSR), and therefore the facility will be subject to a 100 tpy PSD major source threshold. As shown in Table 2-1 the potential emissions will not exceed the PSD threshold and the proposed facility will not be subject to PSD.

4.3 Nonattainment Area New Source Review (NNSR)

Federal Nonattainment New Source Review (NNSR) is applicable to construction of a new major stationary source or a project that is a major modification at an existing major stationary source in an area designated as nonattainment for the National Ambient Air Quality Standards (NAAQS). The facility is located in Richmond County which is classified as an attainment or unclassifiable county for NSR pollutants.[5] Thus, the facility is not subject to NNSR.

4.4 Federal Standards

The potentially applicable federal New Source Performance Standards (NSPS) of 40 CFR 60 and the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) of 40 CFR 61 and 63 are examined below.

[5] 40 CFR 81.311

4.4.1 40 CFR Part 60, Subpart IIII – NSPS for Stationary Compression Ignition Internal Combustion Engines

NSPS Subpart IIII applies to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that commence construction, reconstruction, or modification after July 11, 2005. Per §60.4219, stationary internal combustion engine means any internal combustion engine, except combustion turbines, that converts heat energy into mechanical work and is not mobile. Stationary ICEs differ from mobile ICEs in that a stationary internal combustion engine is a non-road engine as defined at 40 CFR 1068.30 (excluding paragraph (2)(ii) of that definition), and is not used to propel a motor vehicle, aircraft, or a vehicle used solely for competition. Stationary ICE include reciprocating ICEs, rotary ICEs, and other ICEs, except combustion turbines.

The facility will have three emergency generator engines constructed after July 11, 2005 that are considered a CI ICE. Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder, that are not fire pump engines, must comply with the emission standards for new non-road CI engines in §60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

Aurubis will comply with the requirements of Subpart IIII by purchasing EPA certified engine and will meet the fuel requirements of 40 CFR 80.510(b) for non-road engines. There are no limitations on the use of this engine during emergency conditions. The emergency engines may be operated for a maximum of 100 hours per calendar year for the purposes of maintenance checks and readiness testing. Additionally, the emergency engines may be operated 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. Potential emissions from the engine are based on 500 hours of operation per year.

4.4.2 40 CFR Part 63, Subpart ZZZZ – MACT for Stationary RICE

Stationary reciprocating internal combustion engines (RICE) located at area and major sources of HAP that are new, existing, or reconstructed are subject to this subpart. For stationary RICE located at an area source of HAP emissions, the stationary RICE is considered existing if construction was commenced prior to June 12, 2006. Any stationary RICE constructed after this time is considered new under MACT Subpart ZZZZ. New engines comply with Subpart ZZZZ by demonstrating compliance under either NSPS Subpart IIII, or JJJJ.

The facility will have a CI emergency generator engine and will comply with the requirements of NSPS Subpart IIII.

4.4.3 40 CFR Part 63, Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

MACT Subpart DDDDD applies to industrial, commercial, or institutional boilers and process heaters located at a major source of HAP. The facility is an area source of HAP; therefore, MACT Subpart DDDDD is not applicable to the Aurubis facility.

4.4.4 40 CFR 63 Subpart FFFFFF – National Emission Standards for Hazardous Air Pollutants for Secondary Copper Smelting Area Sources

This rule is applicable to the Aurubis facility. The rule requires Aurubis to operate a capture and control system for particulate matter (PM) emissions from any process operation that melts copper scrap, alloys, or other metals or that processes molten material. Emissions of PM from the control device must not

exceed 0.002 grains per dry standard cubic meter. Aurubis must also prepare and follow a written plan for the selection, inspection, and pretreatment of copper scrap to minimize, to the extent practicable, the amount of oil and plastics in the scrap that is charged to the TBRCs

Aurubis must also install, operate, and maintain a bag leak detection system on all baghouses used to comply with the PM emissions limit must

- prepare and operate by a site-specific monitoring plan according to the regulation;
- take corrective action as specified in the rule; and
- record information as specified.

Each bag leak detection system must:

- Be certified by the manufacturer to be capable of detecting PM emissions at concentrations of 1 milligram per actual cubic meter (0.00044 grains per actual cubic foot) or less.
- Provide output of relative PM loadings. Aurubis must continuously record the output from the bag leak detection system using electronic or other means (e.g., using a strip chart recorder or a data logger.)
- Be equipped with an alarm system that will sound when the system detects an increase in relative particulate loading over the alarm set point established according to the rule and the alarm must be located such that it can be heard by the appropriate plant personnel.
- In the initial adjustment of the bag leak detection system, Aurubis must establish, at a minimum, the baseline output by adjusting the sensitivity (range) and the averaging period of the device, the alarm set points, and the alarm delay time.
- Following initial adjustment, Aurubis will not adjust the averaging period, alarm set point, or alarm delay time without approval from EPD.
- Once per quarter, Aurubis may adjust the sensitivity of the bag leak detection system to account for seasonal effects, including temperature and humidity, according to the procedures specified in the rule.
- Aurubis must install the bag leak detection sensor downstream of the baghouse and upstream of the scrubbers.
- Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

Aurubis must also develop and submit to the EPD for approval a site-specific monitoring plan for each bag leak detection system, as specified in the rule. Aurubis must operate and maintain the bag leak detection system according to the site-specific monitoring plan at all times.

For each bag leak detection system, Aurubis must initiate procedures to determine the cause of every alarm within 1 hour of the alarm. Aurubis must alleviate the cause of the alarm within 3 hours of the alarm by taking whatever corrective action(s) are necessary.

Aurubis must maintain records of the information specified in the rule.

Aurubis must conduct a performance test to demonstrate initial compliance with the PM emissions limit within 180 days after startup and report the results in your notification of compliance status. Aurubis must also conduct subsequent performance tests to demonstrate compliance with the PM emissions limit at least once every 5 years.

4.4.5 40 CFR 63 Subpart TTTTTT--National Emission Standards for Hazardous Air Pollutants for Secondary Nonferrous Metals Processing Area Sources

This subpart applies to *secondary nonferrous metals processing facilities,* meaning brass and bronze ingot making, secondary magnesium processing, or secondary zinc processing plant that uses furnace melting operations to melt post-consumer nonferrous metal scrap to make products including bars, ingots, blocks, or metal powders. Aurubis will not produce bronze or brass ingots, no conduct secondary manganese processing and not conduct secondary zinc processing. Therefore, this regulation does not apply.

4.4.6 40 CFR 63 Subpart YYYYYY--National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloys Production Facilities

Subpart YYYYYY applies to ferroalloys production facilities that are area sources of hazardous air pollutant (HAP) emissions. A ferroalloys production facility manufactures silicon metal, ferrosilicon, ferrotitanium using the aluminum reduction process, ferrovanadium, ferromolybdenum, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, high-carbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese, ferromanganese silicon, calcium carbide or other ferroalloy products using electrometallurgical operations including electric arc furnaces (EAFs) or other reaction vessels. The Aurubis facility does not meet this definition and therefore is not subject to this regulation.

4.4.7 40 CFR 63 Subpart ZZZZZZ--National Emission Standards for Hazardous Air Pollutants: Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries

This regulation applies to aluminum, copper or other nonferrous foundry at an area source. A copper foundry is defined as a foundry that melts copper or copper-based alloys and pours the molten copper or copper base alloy castings (excluding die casting), that are complex shapes. The definitions does not include primary or secondary metal producers that cast molten coper to produce simple shapes such as ingots, sows, billets, bars, anode copper rods or copper cake. Aurubis will produce copper ingots that will be re-melted and processed to anode copper. Therefore this regulation does not apply.

4.4.8 40 CFR 63 Subpart RRR--National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production

One potentially applicable NESHAP rule appears to be 40 CFR Subpart RRR, specifically the area source provisions and D/F emission limitations for scrap dryers/delacquering kilns/decoating Kilns. Per the definitions in §63.1503, scrap dryer/delacquering kiln/decoating kiln means a unit used primarily to remove various organic contaminants such as oil, paint, lacquer, ink, plastic, and/or rubber from aluminum scrap (including used beverage containers) prior to melting, or that separates aluminum foil from paper and plastic in scrap. Aluminum scrap means fragments of aluminum stock removed during manufacturing (i.e., machining), manufactured aluminum articles or parts rejected or discarded and useful only as material for reprocessing, and waste and discarded material made of aluminum. Aluminum is physically removed, to the extent possible, from materials to be processed by Aurubis. Aurubis will not process aluminum and this regulation does not apply.

4.4.9 40 CFR 60 Subpart LL--Standards of Performance for Metallic Mineral Processing Plants

This regulation applies to crushers and screens, bucket elevators, conveyors, thermal dryers and other related sources at metallic mineral processing plants that produce metallic mineral concentrates from ore. The Aurubis facility will not process ore. Therefore, this regulation does not apply.

4.4.10 40 CFR 60 Subpart UUU--Standards of Performance for Calciners and Dryers in Mineral Industries

This regulation is not applicable because the Aurubis facility will not produce alumina, ball clay, bentonite, diatomite, or any of the other listed minerals contained in Subpart UUU.

4.4.11 40 CFR 60 Subpart CCCC--Standards of Performance for Commercial and Industrial Solid Waste Incineration Units

This regulation applies to incineration units that meet all of the following:

- Incinerator units constructed after June 4, 2010, or units reconstructed or modified after August 7, 2013;
- The unit in question is defined as a Commercial or Industrial Solid Waste Incineration Unit;
- The unit is not otherwise exempt under §60.2020.

Important definitions from the Subpart CCCC include the following:

60.2020(g) exempts materials recover units that combust waste for the primary purpose of recovering metals such as primary and secondary smelters. Aurubis will combust waste material for the primary purpose of recovering metals in a secondary smelter and is exempt from this regulation.

4.4.12 40 CFR 60 Subpart DDDD--Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units

This subpart establishes emission guidelines and compliance schedules for the control of emissions from commercial and industrial solid waste incineration units (CISWIs). The federal EPA established that the various states must develop a plan to U.S. Environmental Protection Agency (EPA) standards that implements the emission guidelines for the enforcement of Subpart CCCC. For the same reasons given for Subpart CCCC, Subpart DDDD does not apply to the Aurubis facility.

4.4.13 40 CFR 60 Subpart AAAA--Standards Of Performance For Small Municipal Waste Combustion Units For Which Construction Is Commenced After August 30, 1999 Or For Which Modification Or Reconstruction Is Commenced After June 6, 2001, 40 CFR 60 Subpart BBBB--Emission Guidelines And Compliance Times For Small Municipal Waste Combustion Units Constructed On Or Before August 30, 1999, 40 CFR 60 Subpart DDDD--Emissions Guidelines And Compliance Times For Commercial And Industrial Solid Waste Incineration Units

For all of the same reasons cited as to why the Aurubis facility is not subject to the CISWI rule, it is also not subject to the incinerator regulations listed directly above.

4.5 State Standards

In addition to the rules and requirements of the federal EPA, the State of Georgia has its own regulations and administers the permitting program.

4.5.1 Summary of Applicability of State Rule Requirements

The State requirements are addressed in Table 4-1 and applicability is addressed as generally applicable, not applicable with rationale or applicable.

Table 4-1: Applicability of State Rule Requirements

Citation	Requirement	Applicability
Rule 391-3-1-.01	Definitions	Generally applicable
Rule 391-3-1-.02(1)	Provisions general requirement	Generally applicable
Rule 391-3-1-.02(2)(a)	Emission limitation and standards general provisions	Generally applicable. See Section 6. For Air Toxics Evaluation.
Rule 391-3-1-.02(2)(b)	Visible Emissions	Generally applicable
Rule 391-3-1-.02(2)(c)	Incinerators	Not applicable – The Aurubis facility will not include an incinerator. See expanded discussion below.
Rule 391-3-1-.02(2)(d)	Fuel-Burning Equipment[6]	Not Applicable – The TBRCs, LTAF and post-combustors do not meet the definition of fuel-burning equipment (391-3-1-.01)(cc).
Rule 391-3-1-.02(2)(e)	Particulate Emission from Manufacturing Processes	Applicable.
Rule 391-3-1-.02(2)(f)	Normal Superphosphate Manufacturing Facilities	Not applicable – The Aurubis facility will not have superphosphate manufacturing facilities
Rule 391-3-1-.02(2)(g)	Sulfur Dioxide	Generally applicable – The Aurubis facility will use natural gas for the TRBC preheaters LTAF and the post-combustors.
Rule 391-3-1-.02(2)(h)	Portland Cement Plants	Not applicable – The Aurubis facility will not have a Portland Cement Plant
Rule 391-3-1-.02(2)(i)	Nitric Acid Plants	Not applicable – The Aurubis include a Nitric Acid Plant.
Rule 391-3-1-.02(2)(j)	Sulfuric Acid Plants	Not applicable – The Aurubis facility will not have sulfuric acid plants
Rule 391-3-1-.02(2)(k)	Particulate Emission from Asphaltic Concrete Hot Mix Plants	Not applicable – The Aurubis facility will not have asphaltic concrete hot mix plants

[6] Georgia Rule 391-3-1-.01(cc) define "**Fuel-burning equipment"** to mean equipment the primary purpose of which is the production of thermal energy from the combustion of any fuel. Such equipment is generally that used for, but not limited to, heating water, generating or super heating steam, heating air as in warm air furnaces, furnishing process heat indirectly, through transfer by fluids or transmissions through process vessel walls.

Citation	Requirement	Applicability
Rule 391-3-1-.02(2)(n)	Fugitive Dust	Generally applicable
Rule 391-3-1-.02(2)(p)	Particulate Emissions from Kaolin and Fuller's Earth Processes	Not applicable – Kaolin and Fuller's earth processes will not be used at the Aurubis facility.
Rule 391-3-1-.02(2)(q)	Particulate Emissions from Cotton Gins	Not applicable – Cotton gins will not used at the Aurubis facility.
Rule 391-3-1-.02(2)(r)	Particulate Emissions from Granular and Mixed Fertilizer Manufacturing Units	Not applicable –Fertilizer manufacturing will not be conducted at the Aurubis facility.
Rule 391-3-1-.02(2)(t)	VOC Emissions from Automobile and Light-Duty Truck Manufacturing	Not applicable –Automobile or truck manufacturing will not be conducted at the Aurubis facility.
Rule 391-3-1-.02(2)(u)	VOC Emissions from Can Coating	Not applicable –Can coating will not be conducted at the Aurubis facility.
Rule 391-3-1-.02(2)(v)	VOC Emissions from Coil Coating	Not applicable –There is no coil coating at the site
Rule 391-3-1-.02(2)(w)	VOC Emissions from Paper Coating	Not applicable –There is no paper coating at the site
Rule 391-3-1-.02(2)(x)	VOC Emissions from Fabric and Vinyl Coating	Not applicable –There is no fabric and vinyl coating at the site
Rule 391-3-1-.02(2)(y)	VOC Emissions from Metal Furniture Coating	Not applicable –There is no metal furniture coating at the site
Rule 391-3-1-.02(2)(z)	VOC Emissions from Large Appliance Surface Coating	Not applicable –There is no large appliance coating at the site
Rule 391-3-1-.02(2)(aa)	VOC Emissions from Wire Coating	Not applicable –There is no wire coating at the site
Rule 391-3-1-.02(2)(bb)	Petroleum Liquid Storage	Not applicable –There is no petroleum liquid storage at the site
Rule 391-3-1-.02(2)(cc)	Bulk Gasoline Terminals	Not applicable –There is no bulk gasoline terminals at the site
Rule 391-3-1-.02(2)(dd)	Cutback Asphalt	Not applicable – Cutback asphalts are not used at the site
Rule 391-3-1-.02(2)(ee)	Petroleum Refinery	Not applicable – There is no petroleum refinery at the site
Rule 391-3-1-.02(2)(ff)	Solvent Metal Cleaning	Not applicable – Other than maintenance, metal cleaning will not be conducted using solvents at the Aurubis facility.
Rule 391-3-1-.02(2)(gg)	Kraft Pulp Mills	Not applicable – There is no Kraft pulp mills at the site

Citation	Requirement	Applicability
Rule 391-3-1-.02(2)(hh)	Petroleum Refinery Equipment Leaks	Not applicable – There is no petroleum refinery at the site
Rule 391-3-1-.02(2)(ii)	VOC Emissions from Surface Coating of Miscellaneous Metal Parts and Products	Not applicable – The site will not coat metal parts.
Rule 391-3-1-.02(2)(jj)	VOC Emissions from Surface Coating of Flat Wood Panelling	Not applicable – There is no surface coating of flat wood panelling at the site
Rule 391-3-1-.02(2)(kk)	VOC Emissions from Synthesized Pharmaceutical Manufacturing	Not applicable – There is no synthesized pharmaceutical manufacturing at the site
Rule 391-3-1-.02(2)(ll)	VOC Emissions from the Manufacture of Pneumatic Rubber Tires	Not applicable – There is no pneumatic tire manufacturing at the site
Rule 391-3-1-.02(2)(mm)	VOC Emissions from Graphic Arts Systems	Not applicable – There is no packaging rotogravure, publication rotogravure or flexographic printing facilities at the site
Rule 391-3-1-.02(2)(nn)	VOC Emissions from External Floating Roof Tanks	Not applicable – There is no external floating tanks at the site
Rule 391-3-1-.02(2)(oo)	Fiberglass Insulation Manufacturing Plants	Not applicable – There is no fiberglass insulation manufacturing at the site
Rule 391-3-1-.02(2)(pp)	Bulk Gasoline Plants	Not applicable – There is no bulk gasoline tanks at the site
Rule 391-3-1-.02(2)(qq)	VOC Emissions from Large Petroleum Dry Cleaners	Not applicable – There is no large petroleum dry cleaners at the site
Rule 391-3-1-.02(2)(rr)	Gasoline Dispensing Facility - Stage I	Not applicable – There is no gasoline dispensing facility at the site
Rule 391-3-1-.02(2)(ss)	Gasoline Transport Vehicles and Vapor Collection Systems	Not applicable – There is no loading or unloading of gasoline from a gasoline transport vehicle at the site
Rule 391-3-1-.02(2)(tt)	VOC Emissions from Major Sources Requirement for RACT	Not Applicable - The site is not classified a major source for VOCs as described in this part.
Rule 391-3-1-.02(2)(uu)	Visibility Protection of Class I Areas	Not applicable – This is not a major modification to the permit
Rule 391-3-1-.02(2)(vv)	Volatile Organic Liquid Handling and Storage	Not applicable – No transfer of any volatile organic liquid other than gasoline from any delivery vessel into a stationary storage tank of greater than 4,000 gallons occurs as provided in (vv)(1)

Citation	Requirement	Applicability
Rule 391-3-1-.02(2)(yy)	Emissions of Nitrogen Oxides from Major Sources Requirement for RACT	Not applicable - The site has is not located in an affected county.
Rule 391-3-1-.02(2)(zz)	Gasoline Dispensing Facilities--Stage II	Not applicable – There is no gasoline dispensing facility at the site
Rule 391-3-1-.02(2)(ccc)	VOC Emissions from Bulk Mixing Tanks (located at a site with potential VOC emissions exceeding 25 tons per year)	Not Applicable - The site does not have exceed the VOC applicability threshold, further it is not located in an affected county.
Rule 391-3-1-.02(2)(ddd)	VOC Emissions from Offset Lithography and Letterpress	Not applicable – There is no offset lithography and letterpress operations at the site
Rule 391-3-1-.02(2)(eee)	VOC Emissions from Expanded Polystyrene Products Manufacturing	Not applicable – There is no expanded polystyrene product manufacturing at the site
Rule 391-3-1-.02(2)(fff)	Particulate Matter Emissions from Yarn Spinning Operations	Not applicable – There is no yarn spinning operations at the site
Rule 391-3-1-.02(2)(ggg)	Existing Municipal Solid Waste Landfills	Not applicable – There is no municipal solid waste landfill at the site
Rule 391-3-1-.02(2)(hhh)	Wood Furniture Finishing and Cleaning Operations	Not applicable – There is no wood furniture finishing and cleaning operations at the site
Rule 391-3-1-.02(2)(iii)	Hospital/Medical/Infectious Waste Incinerators	Not applicable – There are no hospital, medical and infection waste incinerators at the site
Rule 391-3-1-.02(2)(jjj)	NOX Emissions from Electric Utility Steam Generating Units	Not applicable – There are no electric utility steam generating units at the site
Rule 391-3-1-.02(2)(kkk)	VOC Emissions from Aerospace Manufacturing and Rework Facilities	Not applicable – There are no aerospace manufacturing and rework facilities at the site
Rule 391-3-1-.02(2)(lll)	NOX Emissions From Fuel-Burning Equipment located in certain counties must have burners that meet 30 ppm NOx at 3% Oxygen	Not Applicable – The facility will not be located in one of the subject counties.
Rule 391-3-1-.02(2)(mmm)	NOX Emissions from Stationary Gas Turbines and Stationary Engines used to Generate Electricity	Not applicable – The site does not have gas turbines or stationary engines to generate electricity

Citation	Requirement	Applicability
Rule 391-3-1-.02(2)(nnn)	NOX Emissions from Large Stationary Gas Turbines	Not applicable – The site does not have gas turbines or stationary engines to generate electricity
Rule 391-3-1-.02(2)(ppp)	Commercial and Industrial Solid Waste Incineration Units	Not applicable – The site does not have commercial or industrial solid waste incinerators
Rule 391-3-1-.02(2)(qqq)	VOC Emissions from Extruded Polystyrene Products Manufacturing Utilizing a Blowing Agent	Not applicable – The site does not have extruded polystyrene manufacturing
Rule 391-3-1-.02(2)(rrr)	NOx Emissions from Small Fuel-Burning Equipment	Not applicable – The site is not located in an affected county.
Rule 391-3-1-.02(2)(sss)	Multipollutant Control for Electric Utility Steam Generating Units	Not applicable – The site does not have electric utility steam generating units
Rule 391-3-1-.02(2)(uuu)	SO2 Emissions from Electric Utility Steam Generating Units	Not applicable – The site does not have electric utility steam generating units
Rule 391-3-1-.02(2)(vvv)	VOC Emissions from Surface Coating of Miscellaneous Plastic Parts and Products	Not applicable – The site does not apply coatings to plastic parts.
Rule 391-3-1-.02(2)(www)	Sewage Sludge Incineration Units	Not applicable – The site does not incinerate sewage sludge.
Rule 391-3-1-.02(2)(yyy)	VOC Emissions from the Use of Miscellaneous Industrial Adhesives	Not applicable – The site does not use industrial adhesives.
Rule 391-3-1-.02(2)(zzz)	VOC Emissions from the Fiberglass Boat Manufacturing	Not applicable – The site does not manufacture fiberglass boats.
Rule 391-3-1-.02(2)(aaaa)	Industrial Cleaning Solvents	Not Applicable – Cleaning materials are applied to exempt sources of emissions.
Rule 391-3-1-.02(3)	Sampling	Generally applicable
Rule 391-3-1-.02(4)	Ambient Air Standards	Generally applicable
Rule 391-3-1-.02(5)	Open Burning	Generally applicable
Rule 391-3-1-.02(6)(a)(1) & (2)	Specific Monitoring and Reporting Requirements for Particular Sources	Generally applicable
Rule 391-3-1-.02(6)(a)(3) & (4)	Sources, subject to any limitation of paragraphs (2)(tt)	Generally applicable
Rule 391-3-1-.02(6)(b)	General Monitoring and Reporting Requirements	Generally applicable

Citation	Requirement	Applicability
Rule 391-3-1-.02(7)	Prevention of Significant Deterioration of Air Quality	Not applicable – This project does not constitute a PSD Major Source.
Rule 391-3-1-.02(8)	New Source Performance Standards	References Federal New Source Performance Standards of 40 CFR 60. See Section 4.4
Rule 391-3-1-.02(9)	Emission Standards for Hazardous Air Pollutants	References Federal National Emission Standards for Hazardous Air Pollutants of 40 CFR 61 & 63. See Section 4.4
Rule 391-3-1-.02(10)	Chemical Accident Prevention Provisions	References Chemical Accident Prevention Provisions of 40 CFR 68. Other than the general duty clause these provisions are not applicable because Aurubis facility will not have any of the listed chemicals in quantities that exceed applicability thresholds
Rule 391-3-1-.02(11)	Compliance Assurance Monitoring	References Compliance Assurance Monitoring provisions of 40 CFR 64. These provisions are not applicable because this site does not have a Title V air permit. Will be applicable within one year of start-up.
Rule 391-3-1-.02(12)	Cross State Air Pollution Rule NOx Annual Trading Program	References Cross State Air Pollution Rule NOx Annual Trading Program provisions of 40 CFR 97. These provisions are not applicable because this site does not have boilers or engines that exceed the program's thresholds.
Rule 391-3-1-.02(13)	Cross State Air Pollution Rule SO2 Annual Trading Program	References Cross State Air Pollution Rule SO2 Annual Trading Program provisions of 40 CFR 97. These provisions are not applicable because this site does not have boilers or engines that exceed the program's thresholds.
Rule 391-3-1-.02(14)	Cross State Air Pollution Rule NOx Ozone Season Trading Program	References Cross State Air Pollution Rule Ozone Season Trading Program provisions of 40 CFR 97. These provisions are not applicable because this site does not have boilers or engines that exceed the program's thresholds.
Rule 391-3-1-.03	Permits	Applicable – This permit application is for a Construction SIP Permit and follows the provisions of 391-3-1-.03(1)

Citation	Requirement	Applicability
Rule 391-3-1-.04	Air Pollution Episodes	Generally applicable
Rule 391-3-1-.07	Inspections and Investigations	Generally applicable
Rule 391-3-1-.08	Confidentiality of Information	Generally applicable
Rule 391-3-1-.09	Enforcement	Generally applicable
Rule 391-3-1-.10	Continuance of Prior Rules	Generally applicable
Rule 391-3-1-.11	Small Business Stationary Source Technical and Environmental Compliance Assistance Program Administration	Not applicable – This action applies to the manager of the Department of Natural Resources
Rule 391-3-1-.12	Duties of the Small Business Stationary Source Technical and Environmental Compliance Assistance Program	Not applicable – This action applies to the manager of the Department of Natural Resources
Rule 391-3-1-.13	Acid Rain	Not Applicable – This rule refers to the federal rule in 40 CFR 72 which have equipment thresholds for boilers and engines. Equipment at the site are below these thresholds.
Rule 391-3-1-.14	General Conformity	Not Applicable – This rule refers to the federal rule in 40 CFR 51 Subpart W which apply to projects that are federally funded. This site does not have projects that are federally funded.
Rule 391-3-1-.15	Transportation Conformity	Not Applicable – This rule refers to the “Transportation Conformity Manual” dated April 15, 2010, implement the requirements of Section 176(c)(4)(E) of the Clean Air Act for state implementation plans to include criteria and procedures for consultation, enforcement, and enforceability with respect to the conformity of transportation plans, programs, and projects developed, funded or approved under Title 23 United States Code (23 U.S.C.) or the Federal Transit Laws to the applicable implementation plan. This site does not have mobile sources that fall under that domain.

4.5.2 Expanded Examination of State Rule 391-3-1-.02(2)(c) - Incinerators

Per 391-3-1-.01 Definitions of the GA regulations, "Incinerators" means all devices intended or used for the reduction or destruction of solid, liquid, or gaseous waste by burning. Incinerator requirements are found in 391-3-1-.2(2)(c) and limit the amount of particulate matter they may emit. Units with charging rates in excess of 500 pounds per hour of combustible waste, including water, are limited to 0.20 pounds per 100 pounds of charge. In addition to a particulate matter emission limit, sources subject to this rule are also required to limit opacity to twenty (20) percent except for one 6-minute period per hour of not more than twenty-seven (27) percent opacity.

Paragraph (2)(c)6 of this rule excludes incinerators that are subject to one of a number of other more specific state standards based on the types of waste burned including the various federal NSPS standards that have been incorporated into the Georgia regulations by reference. The exclusion of applicability allowed by the federal rules for material recovery does not appear to be included in the Georgia exclusions. While Aurubis does not believe the proposed facility meets the definition of an incinerator under the Georgia regulations, this source is capable of meeting the particulate and opacity limitations contained in 391-3-1-.0(2)(c).

5. AIR TOXICS EVALUATION

Georgia Rule for Air Quality 391-3-1-.02(2)(a)3.(ii) requires that sources of air emissions safeguard the public health, safety and welfare of the people of the State of Georgia. To this end, an air toxics impact review was performed in accordance with GA EPD Guidance.[7] The emissions of air toxics were calculated using emissions data from a similar facility and/or process design values. The resulting potential annual TAP emissions were compared against the Minimum Emission Rate (MER) required for modeling contained in the Georgia Air Toxics Guideline document. For those pollutants emitted at rates above the MER, air dispersion modeling was conducted to determine whether or not the modeled ground level concentration was below the Acceptable Ambient Concentrations (ACC). Table 5-1 provides a listing of the TAP emissions compared to the MER and indicates those TAPs that are required to be modeled.

Air dispersion modeling analysis was performed to evaluate the likely effects that the proposed emissions may have on ambient air quality. An air dispersion model incorporates the source-specific parameters such as stack height, exit temperature, flow rate, and spatial location with meteorological conditions and building geometry to approximate the dispersion characteristics of a given stack plume across a study area. Dispersion modeling is used primarily to estimate the likely ambient concentration of the air constituent within the surrounding air. This demonstration supports the permit application for the proposed new installations by Aurubis, fulfilling the requirement to evaluate whether the potential ambient air concentrations of toxic air pollutants (TAP) at locations outside the facility boundary are acceptable.

[7] GUIDELINE FOR AMBIENT IMPACT ASSESSMENT OF TOXIC AIR POLLUTANT EMISSIONS, Revised May 2017

Table 5-1: Air Toxics Modeling Requirement Summary

Air Toxic Compound		Facility-wide PTE (lb/yr)	Minimum Emission Rate (MER) (lb/yr)	Modelling Required (yes/no)
CAS No.	Substance			
7440-38-2	Arsenic	8.28E-04	0.0567	No
7440-36*0	Antimony	21.22	58.40	No
7664-41-7	Ammonia	42,470	24,33	Yes
7440-04-17	Beryllium	2.70E-03	0.973	No
7440-43-9	Cadmium	0.70	1.35	No
7440-47-3	Chromium	21.22	58.4	No
7440-48-4	Cobalt	21.22	11.7	Yes
7440-50-8	Copper	2,305	117	Yes
10035-10-6	Hydrogen Bromide	229	1,158	No
7647-01-0	Hydrogen Chloride	958	4,867	No
7664393	Hydrogen Fluoride	700	284	Yes
7439-92-1	Lead	75.82	5.84	Yes
7439-96-5	Manganese	26.69	12.2	Yes
7440-02-0	Nickel	99.44	89.6	Yes
7439-97-6	Mercury	66.18	73	No
7439-98-87	Molybdenum	0.26	1,738	No
7782-49-2	Selenium	5.41E-03	23.36	No
7440-02-13	Silicon	2,562	1,159	Yes
1314132	Zinc Oxide[a]	71,102	29,000	Yes
1746-01-6	2,3,7,8 TCDD	3.03E-05	7.30E-02	No
75-07-0	Acetaldehyde	0.69	1,107	No
107-02-8	Acrolein	0.22	4.87	No
71-43-2	Benzene	22.64	31.63	No
50-00-0	Formaldehyde	43.28	167	No
95-50-1	Dichlorobenzene	0.66	17,375	No
110-54-3	n-hexane	987	170,331	No
91-50-3	Naphthalene	0.33	730	No
109-66-0	Pentane	1,425	170,331	No
108-88-3	Toluene	9.59	1,216,650	No
108-38-3	o-Xylene	5.31	24,333	No

[a] Since the EPD MER is for zinc oxide, the calculated zinc emissions were converted to zinc oxide by multiplying by the ratio of the molecular weights of zinc oxide to that of zinc.

5.1 Model Selection and Setup Parameters

For the purposes of this dispersion modeling analysis, the USEPA regulatory model AERMOD version 21112 was used. AERMOD is the recommended model for air quality analyses per USEPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). AERMOD is steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The modeling was performed with AERMOD View commercial software developed by Lakes Environmental. Several model options and input parameters are specified in order to customize the dispersion calculations to best approximate actual aerodynamic conditions at the project site. The model options and input parameters used for this analysis project were selected in accordance with EPD guidelines and are discussed below.

5.2 Model Processing Options

AERMOD model setup options must be specified at the start of the analysis to properly adjust dispersion calculations so that they are representative of actual aerodynamic conditions over the study area. Additionally, AERMOD has several options, some of which are designated "non-default," that may be appropriate on a case-by-case basis. For this analysis, the "regulatory default" selection of model options was used. The regulatory default options direct AERMOD to use:

- Elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Stack tip downwash (building downwash automatically overrides);
- Calms processing routines;
- Buoyancy-induced dispersion; and
- Missing meteorological data processing routines.

5.3 Project-Specific Parameters

Regional and site-specific model inputs such as meteorological data, surrounding terrain conditions, building influences, and emission source characteristics each must be evaluated and appropriately selected in preparation of running AERMOD. The AERMOD Modeling System includes preprocessor programs AERSURFACE, AERMET, and AERMAP to develop the required input parameters representing meteorological conditions and the terrain elevations across the study area. Procedures for developing the project-specific model input data for the proposed facility are described below.

5.3.1 Dispersion Coefficients

The AERMOD dispersion model can account for differences in air dispersion influences that are attributed to the land use in the study area as being characteristically urban or rural. The appropriate dispersion coefficients for taking land use into account are determined using the USEPA-preferred land use classification technique in 40 CFR 51, Appendix W, known as the "Auer" method. This classification method involves assessing land use for Auer's categories within a three (3) kilometer radius of the site. USEPA recommends using urban dispersion coefficients and mixing heights if greater than 50 percent of the area is considered urban; otherwise, rural coefficients and mixing heights apply. Based on a review of land use in the vicinity of the site using USGS surface data and by inspecting aerial imagery, the "rural" dispersion option is used for this analysis. An aerial image of the land within 3-km of the facility is shown in Figure 1.

5.3.2 Meteorological Data

Careful consideration must be given when selecting a location from which to obtain actual meteorological data that most closely represent meteorological conditions experienced in the study area. EPD provides recommended meteorological data sets, by county, for conducting dispersion model analyses. For Augusta, GA (Richmond County), EPD provides the surface level meteorological data collected at Augusta Daniel Field, GA, and the Upper Air meteorological data collected at the Peachtree City-Falcon Field, GA. The five-year meteorological data sets collected 2016 through 2020 were obtained from EPD's website. The full five year data set processed by EPD with the "ADJ_U*" option was used for this demonstration.

5.3.3 Surface Characteristics

Meteorological data available from EPD comes pre-processed with terrain surface characteristics incorporated for different regions across the state. Appropriate values for the albedo and Bowen ratio are pre-determined by EPD for a given area and were incorporated in the meteorological data files. Therefore, for this analysis, executing AERMET and AERSURFACE was not necessary.

5.3.4 Receptors

A Cartesian system of receptors were defined to geographically map the resultant dispersion pattern over the study area. Receptor locations begin at the Aurubis property boundary and were defined to extend uniformly at 100 meter intervals out a distance of approximately 2,000 meters in each direction. A second tier of receptors was defined, covering the area extending between 2,000 and 5,000 meters from the facility. The second tier receptors are spaced at 200 meter intervals in North-South and East-West directions.

In addition to the receptor array, a system of receptors that traverses along the property boundary at intervals of 25 meters or less was defined in the model. Elevations were assigned to each receptor using the USEPA's AERMAP utility, which extracts elevations from USGS National Elevation Dataset (NED) data available for the area. In this evaluation, the 1-degree resolution data in GeoTIFF format was used. For the base elevations of the facility's buildings and stacks, the elevations are taken from design elevation drawings for the site.

5.3.5 Good Engineering Practice Stack Height and Building Downwash

Section 123 of the Clean Air Act, as amended, required the USEPA to promulgate regulations to assure that the degree of emission limitation required for the control of any air pollutant under an applicable state implementation plan (SIP) is not affected by that portion of any stack height which exceeds Good Engineering Practice (GEP) or by any other dispersion technique. These regulations were first promulgated under 40 CFR 51 on July 8, 1985. A GEP stack height analysis is required for new and existing air pollution sources subject to a modeling analysis in order to determine whether building wake effects and downwash conditions need to be addressed. Building wake effects may cause the predicted concentrations near a point source to be higher than what would otherwise occur in the absence of those effects.

The formula for GEP stack height is given as:

$H_{GEP} = H_B + 1.5L_B$ where:

- H_{GEP} = formula GEP stack height;
- H_B = the building's height above stack base; and
- L_B = the lesser of the building's height or maximum projected width.

A second definition of GEP stack height is “regulatory” GEP stack height. Regulatory GEP stack height is either 65 meters (m) or formula GEP stack height, whichever is greater. Sources are not allowed to take credit for ambient air concentrations that result from stacks that are higher than regulatory GEP stack height.

To address GEP stack height criteria, the USEPA Building Profile Input Program “PRIME” version (BPIPPRM) was used. BPIPPRM requires a geo-referenced depiction of the facility’s buildings, stacks and other nearby structures that may influence dispersion. The position and height of buildings relative to the stack positions must be evaluated in the GEP analysis for determining how structures influence dispersion for each wind direction. This utility produces the necessary direction-specific dimensions that are subsequently used by AERMOD to account for building wake and building “cavity” effects. UTM coordinates for the SK Battery proposed structures were identified using site plan and profile design drawings and a geo-referenced mapping utility. Output from the BPIPPRM analysis is incorporated into the AERMOD input file. An electronic copy of the BPIPPRM input and output files will be submitted electronically to EPD.

5.3.6 Source Input Data

When setting up the AERMOD model, it is necessary to identify and input the emission source locations, dimensions, and vent parameters to best capture the actual site conditions that directly influence exhaust plume formation and dispersion patterns predicted by the model. For point sources uses in this analysis (i.e. stacks), these data include stack coordinates, base elevation, height, diameter, exit temperature and exit flow rate. Table 5-2 provides a list of these model input parameters for SK Battery’s point sources, obtained from geo-referenced design plan drawings and equipment specifications. Table 5-3 shows the emissions by source for each emission source modeled. Figure 5-2 illustrates the approximate locations of the process stacks on site that were modeled.

Table 5-2: Model Input Stack Parameters

Emission Unit	Stack ID	Stack Height	Stack Diameter	Exit Velocity	Exit Temp	Orientation
		(m)	(m)	(m/s)	(°K)	
TRBC 1&2/LTAF	EP1A	45.0	2.60	14.18	344.26	Vertical
TBRC 3&4	EP1B	45.0	2.00	17.29	344.26	Vertical
Secondary 01	EP2A	45.0	3.70	13.66	313.71	Vertical
Secondary 02	EP2B	45.0	3.20	13.78	313.71	Vertical
SHF/CCU	EP3	45.0	3.20	16.59	410.93	Vertical
Flue Dust Silo 1	FDS1	15.24	0.15	8.01	Ambient	Horizontal
Flue Dust Silo 2	FDS2	15.24	0.15	8.01	Ambient	Horizontal
Slag Pile	SP	Area source 25 m W x 35 m L x 6 m H				

Table 5-3: Modeled Emission Rates (lb/hr)

Source	Stack ID	Ammonia	Cobalt	Copper	Hydrogen Fluoride	Lead	Manganese	Nickel	Silicon	Zinc Oxide
TRBC 1&2/LTAF	EP1A	2.42E+00	1.62E-03	6.05E-02	5.34E-02	2.04E-03	2.04E-03	7.82E-04	4.16E-03	1.12E+00
TBRC 3&4	EP1B	2.42E+00	1.62E-03	3.58E-02	5.34E-02	1.23E-03	2.04E-03	4.62E-04	4.16E-03	6.65E-01
Secondary 01	EP2A	0.00E+00	3.09E-09	9.36E-02	0.00E+00	3.61E-03	1.40E-08	1.79E-03	0.00E+00	5.34E+00
Secondary 02	EP2B	0.00E+00	0.00E+00	7.90E-02	0.00E+00	2.73E-03	0.00E+00	1.51E-03	0.00E+00	4.51E+00
SHF/CCU	EP3	0.00E+00	1.18E-08	2.21E-01	0.00E+00	1.25E-03	5.34E-08	1.40E-02	4.30E-01	1.43E+00
Flue Dust Silo 1	FDS1	0.00E+00	0.00E+00	2.31E-04	0.00E+00	2.27E-05	0.00E+00	1.29E-05	2.27E-05	1.85E-02
Flue Dust Silo 2	FDS2	0.00E+00	0.00E+00	2.31E-04	0.00E+00	2.27E-05	0.00E+00	1.29E-05	2.27E-05	1.85E-02
Slag Pile[a]	SP	0.00E+00	0.00E+00	1.54E-03	0.00E+00	4.91E-04	0.00E+00	3.47E-04	0.00E+00	5.54E-03

[a] Emissions from the slag pile are converted to g/m^2 for modeling purposes.

5.4 Model Results

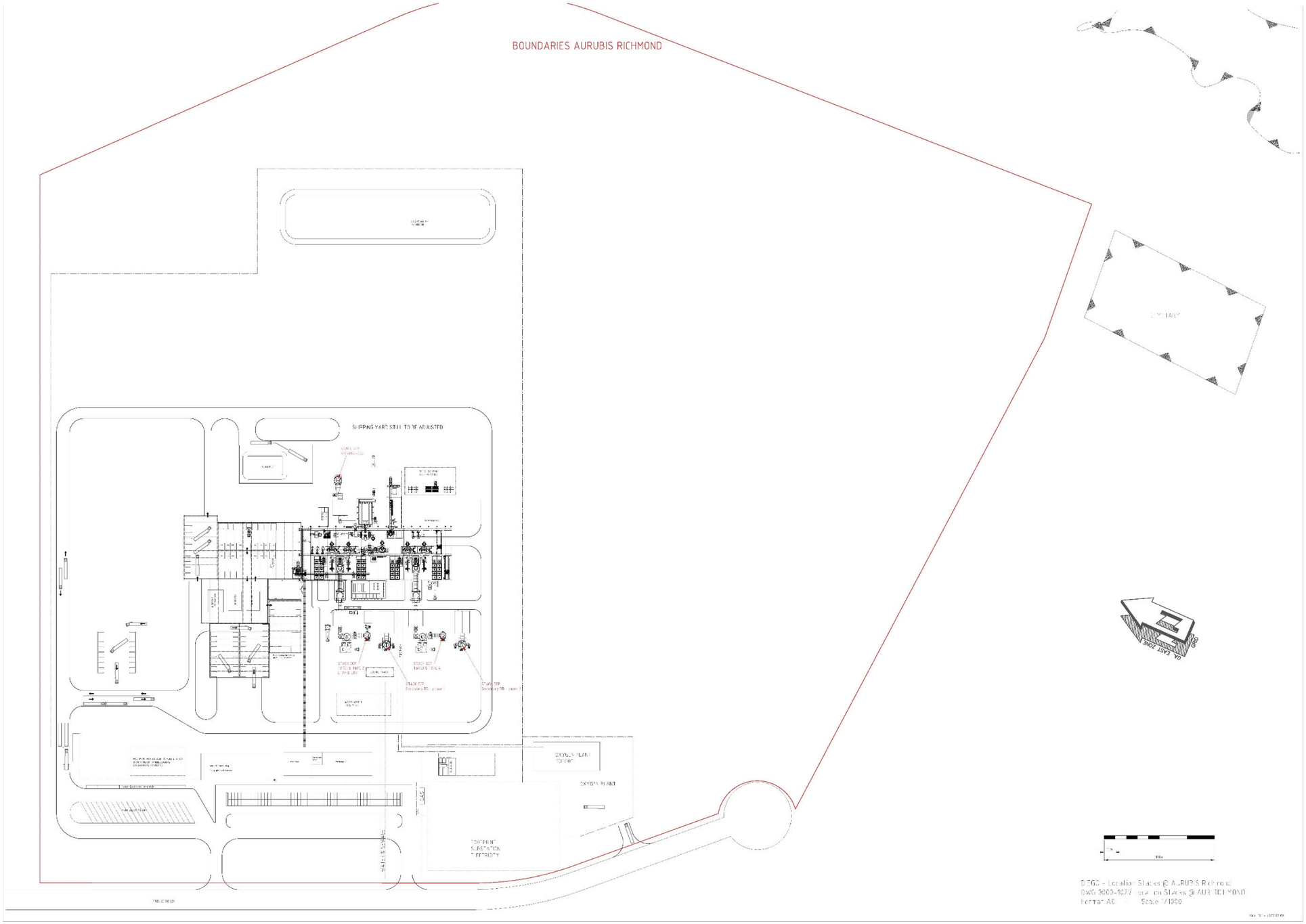
The MGLC for the five-year data set is compared with the corresponding AAC for each pollutant and averaging period in Table 5-3. Since AERMOD does not report predicted concentrations in time averages less than 1-hour, the 15-minute average values are derived by multiplying 1-hour average results from AERMOD by a factor of 1.32. The use of this multiplying factor is done in accordance with the "Georgia Guideline for Ambient Impact Assessment of TAP."

The results indicate that the predicted ambient concentrations for each modeled TAP are less than the AAC values that are considered to be protective of human health and the environment. A copy of the AERMOD, AERMAP and BPIPPRM input and output files will be provided to EPD electronically.

Table 5-4: TAP Air Dispersion Modeling Results

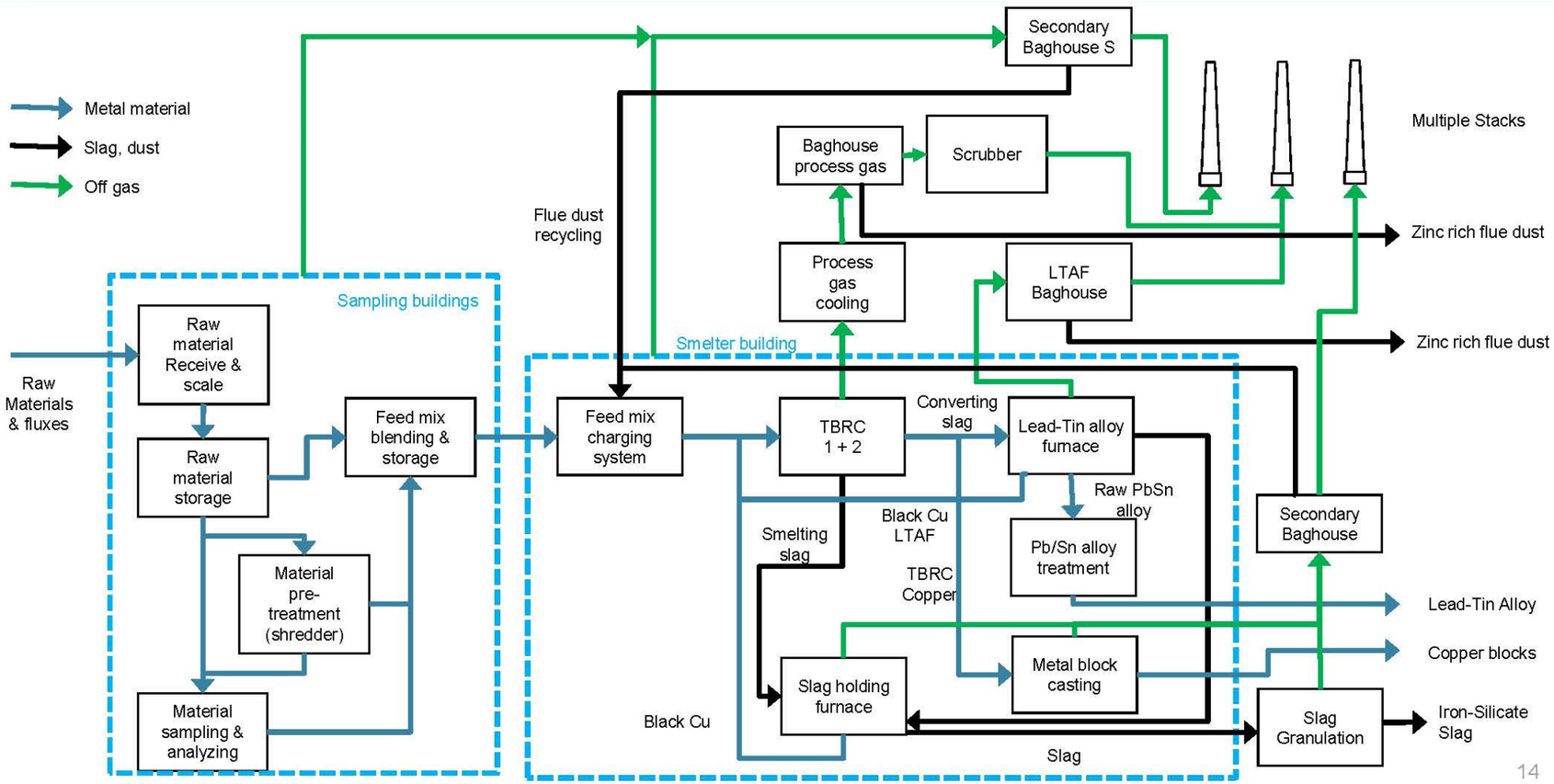
TAP	AAC (µg/m^3)	Time Average	Max Model Concentration (µg/m^3)	Percent of AAC (%)
Cobalt	0.24	24-hour	2.01E-3	0.84%
Ammonia	100	Annual	0.29	0.29%
Ammonia	2,400	15-min	12.35	0.51%
Copper	2.4	24-hour	0.18	7.67%
Hydrogen Fluoride	245	15-min	0.27	0.11%
Hydrogen Fluoride	5.84	24-hour	0.066	1.14%
Lead	0.12	24-hour	0.016	13.50%
Manganese	500	15 min	0.010	0.0020%
Manganese	0.05	Annual	2.50E-04	0.50%
Nickel	0.794	24-hour	0.011	1.42%
Silicon	23.81	24-hour	0.20	0.83%
Zinc Oxide	1,000	15 min	36.17	3.62%
Zinc Oxide	12.00	24-hour	6.89	57.40%

APPENDIX A SITE MAP AND PROCESS FLOW DIAGRAMS (PFD)

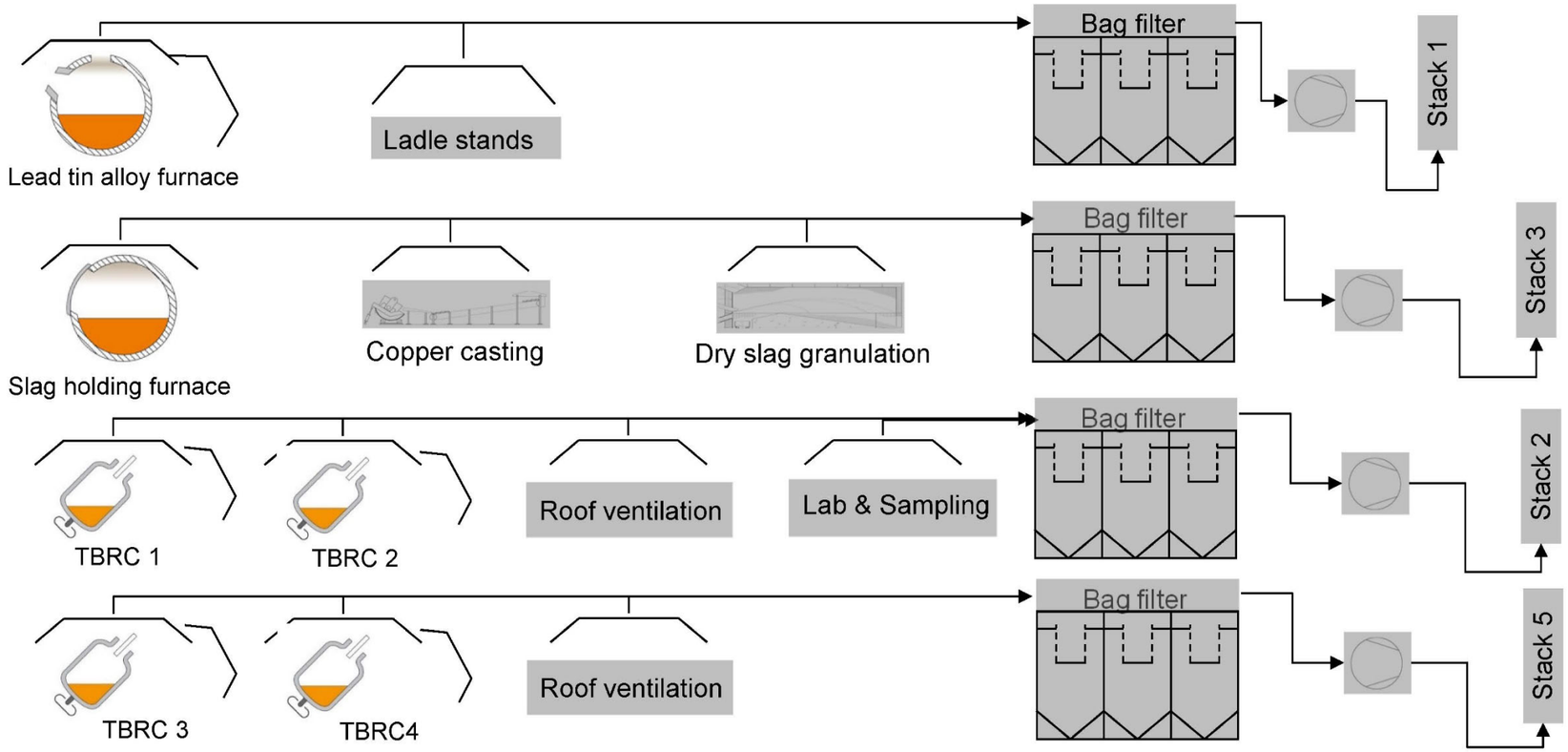

BOUNDARIES AURUBIS RICHMOND
SHIPPING YARD STILL TO BE ADJUSTED
OXYGEN PLANT
OXYGEN PLANT
FOOTPRINT
SUBSTATION
ELECTRICITY
PUBLIC ROAD
DA EAST ZONE
GROUP
DIEGO - Location Stacks @ AURUBIS Richmond
DWG 0000-1027 Location Stacks @ AURUBIS RICHMOND
Format A0 Scale 1/1000

Preliminary Process Flow Diagram (step1)

Aurubis



Secondary gas cleaning



APPENDIX B SOURCE EMISSIONS AND FACILITY-WIDE POTENTIAL TO EMIT (PTE)

Potential Controlled Emissions (tpy)													
Emission Unit	**Emission Unit ID**	**Control Device (s)**	**Stack ID**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**CO**	**SO_2**	**VOC**	**Lead**	**Total HAPs**	**CO_{2e}**
HAP/TAP													
CAS													
Preheater TBRC 1 & 2	PH01	BH01	EP1A									0.21	13,305
Fuel Combustion LTAF	PH02	BH02	EP1A									0.044	2,817
Preheater TBRC 3 & 4	PH03	BH04	EP1B									0.21	13,305
Ladle Heater	PH04	BH02	EP1A									0.058	3,652
Post Combustor 1		BH01	EP1A				0.017	0.028	2.01E-04	1.84E-03	1.67E-07	6.30E-04	39.95
Post Combustor 2		BH04	EP1B				0.017	0.028	2.01E-04	1.84E-03	1.67E-07	6.30E-04	39.95
TBRC Baghouse 1 & 2		CMB01, SCR01, BH01	EP1A	4.05	4.05	4.05	27.47	27.73	10.62	3.19	4.01E-03	0.48	
TBRC Baghouse 3 & 4		CMB02, SCR02, BH02	EP1B	4.05	4.05	4.05	27.47	27.73	10.62	3.19	4.01E-03	0.48	
LTAF Baghouse P2		BH02	EP1A	2.61	2.61	2.61	17.44				2.66E-03	0.40	
Secondary Baghouse 1 P2		BH03	EP2A	21.87	21.87	21.87					0.012	0.017	
Secondary Baghouse 2 P2		BH06	EP2B	16.51	16.51	16.51					8.95E-03	0.013	
Slag Holding Furnace P2		BH03	EP3	13.16	13.16	13.16	1.12	1.88	1.34E-02	0.12	4.085E-03	0.076	2,673
Launders		BH04	EP2A				0.083	0.14	9.94E-04	9.11E-03	8.28E-09	3.12E-03	198
Scrap Pile		F	F	0.073	0.034	5.21E-03							
Slag Pile		F	F	0.42	0.42	0.42					2.15E-03	3.67E-03	
Slag Pile Wind Erosion		F	F	1.52E-03	2.27E-05	2.27E-05					4.08E-07	6.95E-07	
Carbon Silo 01		BV01	BV01	1.71E-05	1.71E-05	1.71E-05							
Carbon Silo 02		BV04	BV04	1.71E-05	1.71E-05	1.71E-05							
Flue Dust Silo 01		BV02	BV02	0.11	0.11	0.11						1.56E-04	
Flue Dust Silo 02		BV05	BV04	0.11	0.11	0.11						1.56E-04	
Roads		F	F	0.54	0.11	0.027							
Front End Loaders		F	F	1.41	0.28	0.069							
Cooling Tower		F	F	0.092	0.069	2.07E-04							
Roof Vents 01, 02, 03	RV01		RV01	0.21	0.21	0.21							
Roof Vents 04, 05, 06	RV02		RV02	0.21	0.21	0.21							
Emergency Generator 01		EG01	EG01	0.22	0.22	0.22	3.03	3.91	8.25E-03	1.44		8.66E-03	897
Emergency Generator 02		EG02	EG02	0.22	0.22	0.22	3.03	3.91	8.25E-03	1.44		8.66E-03	897
Emergency Generator 03		EG03	EG03	0.11	0.11	0.11	1.52	1.96	4.13E-03	0.72		4.33E-03	450
Total (tpy) Potentnial				65.97	64.35	63.96	81.19	67.32	21.27	10.11	0.038	2.01	38,273
Total (tpy) Actual				60.91	59.41	59.05	74.97	62.16	19.64	9.33	0.035	1.86	35,337

Potential Controlled Emissions (lb/yr)														
Emission Unit	**Aluminum**	**Ammonia**	**Hydrogen Bromide**	**Copper**	**Hydrogen Chloride**	**Hydrogen Fluoride**	**Lead**	**Nickel**	**Silicon**	**Tin**	**Zinc Oxide**	**Acet-aldehyde**	**Acrolein**	**Benzene**
HAP/TAP		**T**	**T**	**T**	**H,T**	**H,T**	**H,T**	**H,T**	**T**		**T**	**T,H**	**T,H**	**T,H**
CAS		7664417	10035106	7440508	7647010	7664393	7439921	7440020	7440213		1314132	75070	107028	71432
Preheater TBRC 1 & 2														0.47
Fuel Combustion LTAF														0.13
Preheater TBRC 3 & 4														0.47
Ladle Heater														0.13
Post Combustor 1				5.69E-06			3.35E-04	1.40E-05			1.94E-04			7.02E-07
Post Combustor 2				5.69E-06			3.35E-05	1.40E-05			1.94E-04			7.02E-07
TBRC Baghouse 1 & 2	20.25	21,235	114.70	313.43	479.10	350.09	8.03	4.05	36.45	160.36	5,824			
TBRC Baghouse 3 & 4	20.25	21,235	114.70	313.43	479.10	350.09	8.03	4.05	36.45	160.36	5,824			
LTAF Baghouse P2	13.04			201.92			5.33	2.61		103.31	3,752			
Secondary Baghouse 1 P2				520.41			23.66	9.97		174.93	29,709			
Secondary Baghouse 2 P2				392.85			17.90	7.53		132.05	22,426			
Slag Holding Furnace P2	3,507.95			545			8.17	67.97	2,286	228.49	3,116			0.094
Launders				2.81E-05			1.66E-05	2.21E-03			1.20E-03			6.95E-03
Scrap Pile														
Slag Pile	71			13			4.30	3.04		4.39	48.51			
Slag Pile Wind Erosion	0.01			0.00			0.00	0.00		0.00	0.01			
Carbon Silo 01														
Carbon Silo 02														
Flue Dust Silo 01	0.56			2.03			0.20	0.11	101.37	4.46	201.68			
Flue Dust Silo 02	0.56			2.03			0.20	0.11	101.37	4.46	201.68			
Roads														
Front End Loaders														
Cooling Tower														
Roof Vents 01, 02, 03														
Roof Vents 04, 05, 06														
Emergency Generator 01												0.28	0.087	8.54
Emergency Generator 02												0.28	0.087	8.54
Emergency Generator 03												0.14	0.043	4.27
Total (lb/yr) Potential	3,634	42,470	229.40	2,305	958.19	700.19	75.82	99.44	2,562	972.80	71,102	0.69	0.22	22.64
Total (tpy) Potential	1.82	21.24	0.11	1.15	0.48	0.35	0.038	0.050	1.28	0.49	35.55	3.47E-04	1.08E-04	1.13E-02
Total (tpy) Actual	1.68	19.61	0.11	1.06	0.44	0.32	0.035	0.046	1.18	0.45	32.82	3.20E-04	1.00E-04	1.04E-02

Potential Controlled Emissions (lb/yr)																				
Emission Unit	**Dichloro-benzene**	**Formald-ehyde**	**Hexane**	**Naphth-alene**	**pentane**	**Polycyclic Organic Matter**	**Toluene**	**o-Xylene**	**Arsenic**	**Antimony**	**Beryllium**	**Cadmium**	**Chromium**	**Cobalt**	**Manganese**	**Mercury**	**Molyb-denum**	**tetrachloro dibenzo-p-dioxin (2,3,7,8-)**	**Selenium**	**Vanadium**
HAP/TAP	**T,H**	**T,H**	**T,H**	**T,H**	**T**	**H**	**T,H**	**T,H**	**T,H**	**H**	**T,H**	**T,H**	**T**	**T,H**	**T,H**	**T,H**	**T**	**T,H**	**T**	
CAS	95501	50000	110543	91203	109660		108883	108383	7440382	7440360	7440417	7440439	7440473	7440484	7439965	7439976	7439987	1746016	7782492	7440622
Preheater TBRC 1 & 2	0.27	16.71	401.02	0.14	579.25	0.02	0.76		4.46E-04		2.67E-03						2.45E-01		5.35E-03	0.51
Fuel Combustion LTAF	0.057	3.54	84.90	0.029	122.63	4.16E-03	0.16		1.22E-04		7.34E-06						6.73E-04		1.47E-05	1.41E-03
Preheater TBRC 3 & 4	0.27	16.71	401.02	0.14	579.25	0.02	0.76		4.46E-05		2.67E-06						2.45E-03		5.35E-06	5.12E-03
Ladle Heater	7.17E-03	0.45	10.76	3.65E-03	15.54	5.27E-04	0.020		1.20E-04		7.17E-06						6.58E-03		1.43E-05	1.37E-02
Post Combustor 1	8.03E-04	0.050	1.20	4.08E-04	1.74	5.90E-05	2.27E-03		6.69E-10		4.01E-11	3.68E-09	4.68E-09	5.62E-07	2.54E-06	1.74E-04	7.36E-06		1.54E-05	
Post Combustor 2	8.03E-04	0.050	1.20	4.08E-04	1.74	5.90E-05	2.27E-03		6.69E-10		4.01E-11	3.68E-09	4.68E-09	5.62E-07	2.54E-06	1.74E-04				
TBRC Baghouse 1 & 2										10.61		2.82E-01	10.61	10.61	13.35	33.09		1.52E-05		
TBRC Baghouse 3 & 4										10.61		2.82E-01	10.61	10.61	13.35	33.09		1.52E-05		
LTAF Baghouse P2																				
Secondary Baghouse 1 P2												0.070								
Secondary Baghouse 2 P2												0.070								
Slag Holding Furnace P2	0.054	3.36	80.57	0.027	116.37	3.95E-03	0.15		8.95E-05		5.37E-06	4.92E-04	6.27E-04	3.76E-05	1.70E-04	1.16E-02	4.92E-04		1.07E-05	1.03E-03
Launders	3.97E-03	0.25	5.96	2.02E-03	8.61	2.92E-04	0.011		6.62E-06		8.83E-07	3.64E-05	3.64E-05	2.78E-06	6.29E-09	8.61E-04	3.64E-05		7.95E-07	7.62E-05
Scrap Pile																				
Slag Pile																				
Slag Pile Wind Erosion																				
Carbon Silo 01																				
Carbon Silo 02																				
Flue Dust Silo 01																				
Flue Dust Silo 02																				
Roads																				
Front End Loaders																				
Cooling Tower																				
Roof Vents 01, 02, 03																				
Roof Vents 04, 05, 06																				
Emergency Generator 01		0.87					3.09	2.12												
Emergency Generator 02		0.87					3.09	2.12												
Emergency Generator 03		0.43					1.55	1.06												
Total (lb/yr) Potential	0.66	43.28	987	0.33	1,425	0.048	9.59	5.31	8.28E-04	21.22	2.70E-03	0.70	21.22	21.22	26.69	66.18	0.26	3.03E-05	5.41E-03	0.53
Total (tpy) Actual	3.29E-04	0.022	0.49	1.67E-04	0.71	2.42E-05	4.80E-03	2.65E-03	4.14E-07	0.011	1.35E-06	3.52E-04	0.011	0.011	0.013	0.033	1.28E-04	1.52E-08	2.70E-06	2.67E-04
0	3.04E-04	0.020	0.46	1.54E-04	0.66	2.23E-05	4.43E-03	2.45E-03	3.82E-07	9.80E-03	1.25E-06	3.25E-04	9.80E-03	9.80E-03	0.012	0.031	1.18E-04	1.40E-08	2.50E-06	2.46E-04

TBRC 1&2 Preheater and Operational Heater

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	222.790	MMcf/yr	
Hourly Natural Gas Usage	0.067	MMcf/hr	
Rated Heat Capacity	68.24	MMBtu/hr	
Rated Heat Capacity	227,246	MMBtu/yr	
Metals Control Efficiency	99.00%	%	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas or lb/MMBtu emission factors

Emission Calculations

Pollutant[5]	Emission Factor		Hourly Emission Rate	Annual Emission Rate	Notes	
	($lb/10^6$ scf)	(lb/MMBtu)	(lb/hr)	(tpy)		
CO_2		117.0	7,983	13,291	3	
N_2O		2.20E-04	1.50E-02	2.50E-02	3	
CH_4		2.20E-03	1.50E-01	2.50E-01	3	
CO_2e			7,991	13,305	4	
Benzene	2.10E-03	2.06E-06	1.40E-04	2.34E-04	5	H, T
Dichlorobenzene	1.20E-03	1.18E-06	8.03E-05	1.34E-04	5	H, T
Formaldehyde	7.50E-02	7.35E-05	5.02E-03	8.35E-03	5	H,T
Hexane	1.80E+00	1.76E-03	1.20E-01	2.01E-01	5	H,T
Naphthalene	6.10E-04	5.98E-07	4.08E-05	6.80E-05	5	H,T
pentane	2.60E+00	2.55E-03	1.74E-01	2.90E-01	5	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	5.90E-06	9.83E-06	5	H
Toluene	3.40E-03	3.33E-06	2.27E-04	3.79E-04	5	HT
Arsenic	2.00E-04	1.96E-07	1.34E-07	2.23E-07	6	H,T
Beryllium	1.20E-05	1.18E-08	8.03E-09	1.34E-06	6	H,T
Molybdenum	1.10E-03	1.08E-06	7.36E-07	1.23E-04	6	T
Selenium	2.40E-05	2.35E-08	1.61E-08	2.67E-06	6	H,T
Vanadium	2.30E-03	2.25E-06	1.54E-06	2.56E-04	6	T
Total HAPs			0.13	0.21		

Notes:

2. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-1.
3. Emission factors 40 CFR 98 Subpart C, Tables C-1 and C-2..
4. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.
5. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.
6. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%.

LTAF Ladle Fuel Combustion Phase 2

BH02, EP1A

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	47.17	MMcf/yr	
Hourly Natural Gas Usage	0.0134	MMcf/hr	
Rated Heat Capacity	13.65	MMBtu/hr	
Rated Capacity	48,111	MMBtu/yr	
Metals Control Efficidncy	99.00%	%	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas of lb/MMBtu emission factors:

Emission Calculations

Pollutant[5]	Emission Factor		Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emissions	Notes	
	(lb/10^6 scf)	(lb/MMBtu)	(lb/hr)	(tpy)			
CO_2		117.0	1,596.5	2,814	2.81E+03	2	
N_2O		2.20E-04	3.01E-03	5.30E-03	5.30E-03	2	
CH_4		2.20E-03	3.01E-02	5.30E-02	5.30E-02	2	
CO_2e		-	1,598	2,817	2,817	3	
Benzene	2.10E-03	2.06E-06	2.81E-05	4.95E-05	4.95E-05	4	H, T
Dichlorobenzene	1.20E-03	1.18E-06	1.61E-05	2.83E-05	2.83E-05	4	H, T
Formaldehyde	7.50E-02	7.35E-05	1.00E-03	1.77E-03	1.77E-03	4	H,T
Hexane	1.80E+00	1.76E-03	2.41E-02	4.25E-02	4.25E-02	4	H,T
Naphthalene	6.10E-04	5.98E-07	8.16E-06	1.44E-05	1.44E-05	4	H,T
pentane	2.60E+00	2.55E-03	3.48E-02	6.13E-02	6.13E-02	4	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	1.18E-06	2.08E-06	2.08E-06	4	H
Toluene	3.40E-03	3.33E-06	4.55E-05	8.02E-05	8.02E-05	4	HT
Arsenic	2.00E-04	1.96E-07	2.68E-08	4.72E-08	4.72E-06	5	H,T
Beryllium	1.20E-05	1.18E-08	1.61E-09	2.83E-09	2.83E-07	5	H,T
Molybdenum	1.10E-03	1.08E-06	1.47E-05	2.59E-07	2.59E-05	5	T
Selenium	2.40E-05	2.35E-08	3.21E-09	5.66E-09	5.66E-07	5	H,T
Vanadium	2.30E-03	2.25E-06	3.08E-07	5.42E-07	5.42E-05	5	T
Total HAPs			0.025	0.044	0.044		

Notes:

2. Emission factors 40 CFR 98 Subpart C, Tables C-1 and C-2..
3. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.
4.. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.
5. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%

TBRC 3&4 Preheat and Operational Fuel Combustion

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	222.79	MMcf/yr	
Hourly Natural Gas Usage	0.067	MMcf/hr	
Rated Heat Capacity	68.24	MMBtu/hr	
Rated Heat Capacity	227,246	MMBtu/yr	
Metals Control Efficiency	99.00%	%	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas or lb/MMBtu emission factors:

Emission Calculations

Pollutant[5]	Emission Factor (lb/10^6 scf)	Emission Factor (lb/MMBtu)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes	
CO_2		117.0	7,982.7	13,291	2	
N_2O		2.2E-04	1.50E-02	2.50E-02	2	
CH_4		2.2E-03	1.50E-01	2.50E-01	2	
CO_2e		-	7,991	13,305	3	
Benzene	2.10E-03	2.06E-06	1.40E-04	2.34E-04	4	H, T
Dichlorobenzene	1.20E-03	1.18E-06	8.03E-05	1.34E-04	4	H, T
Formaldehyde	7.50E-02	7.35E-05	5.02E-03	8.35E-03	4	H,T
Hexane	1.80E+00	1.76E-03	1.20E-01	2.01E-01	4	H,T
Naphthalene	6.10E-04	5.98E-07	4.08E-05	6.80E-05	4	H,T
pentane	2.60E+00	2.55E-03	1.74E-01	2.90E-01	4	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	5.90E-06	9.83E-06	4	H
Toluene	3.40E-03	3.33E-06	2.27E-04	3.79E-04	4	HT
Arsenic	2.00E-04	1.96E-07	1.34E-07	2.23E-07	5	H,T
Beryllium	1.20E-05	1.18E-08	8.03E-09	1.34E-08	5	H,T
Molybdenum	1.10E-03	1.08E-06	7.36E-07	1.23E-06	5	T
Selenium	2.40E-05	2.35E-08	1.61E-08	2.67E-08	5	H,T
Vanadium	2.30E-03	2.25E-06	1.54E-06	2.56E-06	5	T
Total HAPs			1.26E-01	2.10E-01		

Notes:

2. Emission factors 40 CFR 98 Subpart C, Tables C-1 and C-2..

3. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.

4.. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.

5. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%

Ladle Heater

LH01

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	61.15	MMcf/yr	
Hourly Natural Gas Usage	0.0167	MMcf/hr	
Rated Heat Capacity	17.06	MMBtu/hr	
Rated Heat Capacity	62,373	MMBtu/yr	
Metals Control Efficiency	99.00%	Percent	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas or lb/MMBtu emission factors:

Emission Calculations

Pollutant[5]	Emission Factor (lb/10^6 scf)	Emission Factor (lb/MMBtu)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes	
CO_2		117.0	1,996	3,648	2	
N_2O		2.20E-04	3.761E-03	6.88E-03	2	
CH_4		2.20E-03	3.76E-02	6.88E-02	2	
CO_2e			1,998	3,652	3	
Benzene	2.10E-03	2.06E-06	3.51E-05	6.42E-05	4	H, T
Dichlorobenzene	1.20E-03	1.18E-06	2.01E-05	3.67E-05	4	H, T
Formaldehyde	7.50E-02	7.35E-05	1.25E-03	2.29E-03	4	H,T
Hexane	1.80E+00	1.76E-03	3.01E-02	5.50E-02	4	H,T
Naphthalene	6.10E-04	5.98E-07	1.02E-05	1.87E-05	4	H,T
pentane	2.60E+00	2.55E-03	4.35E-02	7.95E-02	4	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	1.48E-06	2.70E-06	4	H
Toluene	3.40E-03	3.33E-06	5.69E-05	1.04E-04	4	HT
Arsenic	2.00E-04	1.96E-07	3.35E-08	6.12E-08	5	H,T
Beryllium	1.20E-05	1.18E-08	2.01E-09	3.67E-07	5	H,T
Molybdenum	1.10E-03	1.08E-06	1.84E-07	3.36E-05	5	T
Selenium	2.40E-05	2.35E-08	4.01E-09	7.34E-07	5	H,T
Vanadium	2.30E-03	2.25E-06	3.85E-07	7.03E-05	5	T
Total HAPs			3.148E-02	0.058		

Notes:

2. Emission factors 40 CFR 98 Subpart C, Tables C-1 and C-2..

3. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.

4.. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.

5. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%

Post-Combustor 1

PC01

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	0.67	MMcf/yr	
Hourly Natural Gas Usage	6.690E-03	MMcf/hr	
Rated Heat Capacity	6.82	MMBtu/hr	
Rated Heat Capacity	682.42	MMBtu/yr	
Metals Control Efficiency	99.00%	Percent	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas or lb/MMBtu emission factors:

Emission Calculations

Pollutant[5]	Emission Factor (lb/10^6 scf)	Emission Factor (lb/MMBtu)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes	
NO_X	50		3.35E-01	1.67E-02	2	
CO	84		5.62E-01	2.81E-02	2	
SO_2	0.6	5.88E-04	4.01E-03	2.01E-04	3	
Lead	0.0005		3.35E-06	1.67E-07	3	
VOC	5.5		3.68E-02	1.84E-03	3	
CO_2		117.0	798	39.91	4	
N_2O		2.20E-04	1.50E-03	7.52E-05	4	
CH_4		2.20E-03	1.50E-02	7.52E-04	4	
CO_2e		-	799	39.95	5	
Benzene	2.10E-03	2.06E-06	1.40E-05	7.02E-07	6	H, T
Dichlorobenzene	1.20E-03	1.18E-06	8.03E-06	4.01E-07	6	H, T
Formaldehyde	7.50E-02	7.35E-05	5.02E-04	2.51E-05	6	H,T
Hexane	1.80E+00	1.76E-03	1.20E-02	6.02E-04	6	H,T
Naphthalene	6.10E-04	5.98E-07	4.08E-06	2.04E-07	6	H,T
pentane	2.60E+00	2.55E-03	1.74E-02	8.70E-04	6	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	5.90E-07	2.95E-08	6	H
Toluene	3.40E-03	3.33E-06	2.27E-05	1.14E-06	6	HT
Arsenic	2.00E-04	1.96E-07	1.34E-08	6.69E-10	7	H,T
Beryllium	1.20E-05	1.18E-08	8.03E-10	4.01E-11	7	H,T
Cadmium	1.10E-03	1.08E-06	7.36E-08	3.68E-09	7	H,T
Chromium	1.40E-03	1.37E-06	9.37E-08	4.68E-09	7	H,T
Cobalt	8.40E-05	8.24E-08	5.62E-09	2.81E-10	7	T
Copper	8.50E-04	8.33E-07	5.69E-08	2.84E-09	7	T
Manganese Compounds	3.80E-04	3.73E-07	2.54E-08	1.27E-09	7	H,T
Mercury	2.60E-04	2.55E-07	1.74E-06	8.70E-08	7	H,T
Molybdenum	1.10E-03	1.08E-06	7.36E-08	3.68E-09	7	T
Nickel	2.10E-03	2.06E-06	1.40E-07	7.02E-09	7	H,T
Selenium	2.40E-05	2.35E-08	1.61E-09	8.03E-11	7	H,T
Vanadium	2.30E-03	2.25E-06	1.54E-07	7.69E-09	7	T
Zinc Oxide	2.90E-02	2.84E-05	2.42E-06	9.70E-08	7,8	T
Total HAPs			0.013	6.30E-04		

Notes:

2. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-1.

3. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-2.

4. Emission factors from 40 CFR 98 Subpart C, Tables C-1 and C-2.

5. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1 and A-2.

6. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.

7. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%, except for Mercury.

8. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

Post-Combustor 2

PC02

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Operating Hours	100	hrs/yr	
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	0.67	MMcf/yr	
Hourly Natural Gas Usage	0.007	MMcf/hr	
Rated Heat Capacity	6.82	MMBtu/hr	2
Rated Heat Capacity	682.42	MMBtu/yr	
Metals Control Efficiency	99.00%	%	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas or lb/MMBtu emission factors.

Emission Calculations

Pollutant	Emission Factor		Hourly Emission Rate	Annual Emission Rate	Notes	
	(lb/10^6 scf)	(lb/MMBtu)	(lb/hr)	(tpy)		
NO_X	50		0.33	0.017	2	
CO	84		0.56	0.028	2	
SO_2	0.6	5.88E-04	4.01E-03	2.01E-04	3	
VOC	5.5		0.037	1.84E-03	3	
Lead	0.0005	4.90E-07	3.345E-06	1.67E-07	3	
CO_2		117.0	798	39.91	4	
N_2O		2.20E-04	1.50E-03	7.52E-05	4	
CH_4		2.20E-03	1.50E-02	7.52E-04	4	
CO_2e		-	799	39.95	5	
Benzene	2.10E-03	2.06E-06	1.40E-05	7.02E-07	6	H, T
Dichlorobenzene	1.20E-03	1.18E-06	8.03E-06	4.01E-07	6	H, T
Formaldehyde	7.50E-02	7.35E-05	5.02E-04	2.51E-05	6	H,T
Hexane	1.80E+00	1.76E-03	1.20E-02	6.02E-04	6	H,T
Naphthalene	6.10E-04	5.98E-07	4.08E-06	2.04E-07	6	H,T
pentane	2.60E+00	2.55E-03	1.74E-02	8.70E-04	6	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	5.90E-07	2.95E-08	6	H
Toluene	3.40E-03	3.33E-06	2.27E-05	1.14E-06	6	HT
Arsenic	2.00E-04	1.96E-07	1.34E-08	6.69E-10	7	H,T
Beryllium	1.20E-05	1.18E-08	8.03E-10	4.01E-11	7	H,T
Cadmium	1.10E-03	1.08E-06	7.36E-08	3.68E-09	7	H,T
Chromium	1.40E-03	1.37E-06	9.37E-08	4.68E-09	7	H,T
Cobalt	8.40E-05	8.24E-08	5.62E-09	2.81E-10	7	T
Copper	8.50E-04	8.33E-07	5.69E-08	2.84E-09	7	T
Manganese Compounds	3.80E-04	3.73E-07	2.54E-08	1.27E-09	7	H,T
Mercury	2.60E-04	2.55E-07	1.74E-06	8.70E-08	7	H,T
Molybdenum	1.10E-03	1.08E-06	7.36E-08	3.68E-09	7	T
Nickel	2.10E-03	2.06E-06	1.40E-07	7.02E-09	7	H,T
Selenium	2.40E-05	2.35E-08	1.61E-09	8.03E-11	7	H,T
Vanadium	2.30E-03	2.25E-06	1.54E-07	7.69E-09	7	T
Zinc Oxide	2.90E-02	2.84E-05	2.42E-06	9.70E-08	7,8	T
Total HAPs			0.013	6.30E-04		

Notes:

2. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-1.
3. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-2.
4. Emission factors from 40 CFR 98 Subpart C, Tables C-1 and C-2.
5. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1 and A-2.
6. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.
7. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%, except for Mercury.
8. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

#

TBRC 1 and 2 HAP/TAP Emissions

HAP and TAP emission calculations based on percent present in raw material:

$$\frac{lb\ pollutant}{hr} = \frac{lb\ particulate}{hr}\ x\ \%\ pollutant\ in\ material$$

or

$$\frac{lb\ pollutant}{hr} = toms\ throughput\ x\ \frac{lb\ polltant}{ton}$$

oe

$$\frac{lb\ pollutant}{hr} = concentration\left(\frac{lb}{ft^3}\right)x\left(\frac{ft^3}{min}\right)x\left(\frac{60\ nin}{hr}\right)$$

HAP/TAP Emissions:

Pollutant	Dust	Emission	Emission	HAP/TAP	Annual	Uncontrolled Emission	Reference
	(%)	lb/ton	lb/ft^3	(lb/hr)	(tpy)	(tpy)	
Aluminum	0.25%			2.31E-03	1.01E-02	1.01	7
Antimony		8.16E-05		1.62E-03	5.30E-03		8
Ammonia			7.49E-07	2.42	10.62		5
Calcium	1.07%			9.89E-03	4.33E-02	4.33	7
Cadmium		2.71E-06		4.30E-05	1.41E-04	1.41E-02	8,9
Chromium		8.16E-05		1.62E-03	5.30E-03		8
Cobalt		8.16E-05		1.62E-03	5.30E-03		8
Copper	3.87%			3.58E-02	0.16	15.67	7
Hydrogen Bromide		8.82E-03		1.75E-02	5.73E-02	0.57	8
Hydrogen Chloride		3.68E-02		7.31E-02	0.24	2.40	8
Hydrogen Fluoride		2.69E-02		5.34E-02	0.18	1.75	8
Lead				1.22E-03	4.01E-03	4.01E-01	8, 10
Manganese		1.03E-04		2.04E-03	6.67E-03	6.67E-01	8
Mercury		2.54E-04		5.05E-03	1.65E-02		8,11
Nickel	0.050%			4.62E-04	2.02E-03	0.20	7
Silicon	0.45%			4.16E-03	1.82E-02	1.82	7
Dioxins	NA	1.17E-10		2.31E-09	7.584E-09	7.58E-09	8
Tin	1.98%			1.83E-02	8.02E-02	8.02	7
Zinc Oxide	57.75%			0.66	2.91	291.18	7,13
Total HAPs				0.15	0.48	5.34	

Note:

3. Emission of NOx emissions were based on continuous monitoring data at a similar facility in Germany and a conservative factor of 20% was added. That facility did not have SNCR, so the calculated emissions were reduced by 65% to reflect the SNCR controls

4. Emission of CO were based on continuous monitoring data at a similar facility in Germany. The emissions were doubled to account for plastic content at the

5. Emissions of SO_2, VOC and ammonia emissions are based on OEM informationwith a 20% fator added.

6. CO_2 emissions are based on converting 99% of the CO to CO_2 in the coumbustor.

7. Based on percentage of pollutant in dust.

8. Based on stack test and/or continuous monitored data derived emission factor from a similar facility in Germany with a 20% factor added.

9. Eighty percent of the cadmium is emited from the TBRC and tenty percent is emitted from the Secondary Baghouse.

10. Emissions of lead are distributed as follows: 11.3% from TBRCs 1&2, 11.3% from TBRCs 3&4, 7.5% from the LTAF, 33.3% from the Secondary Baghouse 1,

11. All the Mercury is assumed to be emitted from the TBRCs.

12, Ninety percent of the $NO_{X\ i}$ is assumed to be emitted through the TBRCs and 10% through the LATF.

13. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

Sampling Furnaces
SF

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Average Throughput	1,731	tons/yr	
Maximum Throughput Rate	0.55	ton/hr	
Design Volumetric Vent Rate	1,498	dscfm	1
Volumetric Vent rate	377,242,906	dscf/yr	

Note:

1. Flow rates estimated by multiplying the esttimated tonnage throughput of the Sampling Furnaces by the flow rate of the TBRC divided by the tonnage of the TBRC.

Emissions Summary

Source Description	Pollutant	Emission Factor	Emission Factor Units	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Reference
Sampling Furnace	VOC	2.25E-07	lb/ft^3	2.02E-02	4.24E-02	2
	CO	0.43	lb/ton	0.24	0.37	2

2. Same emission factor used for the TBRC.

Emission Calculation Equations for VOC

$$\frac{lb\ VOC}{hr} = Emission\ Factor\left(\frac{lb}{ft^3}\right)x\left(\frac{ft^3}{min}\right)x\left(\frac{60\ nin}{hr}\right)$$

$$\frac{ton\ VOC}{yr} = Emission\ Factor\left(\frac{lb}{ft^3}\right)x\left(\frac{ft^3}{yr}\right)x\left(\frac{1\ ton}{2{,}000\ lb}\right)$$

Emission Calculation Equations for CO

$$\frac{lb\ CO}{hr} = Emission\ Factor\left(\frac{lb}{ton}\right)x\left(\frac{ton}{hr}\right)$$

$$\frac{ton\ CO}{yr} = Emission\ Factor\left(\frac{lb}{ton}\right)x\left(\frac{ton}{yr}\right)x\left(\frac{1\ ton}{2{,}000\ lb}\right)$$

TBRC 3 and 4 Baghouse

BH05, EP1B

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Hours of Operation	8,760	hrs/yr	
Annual Average Throughput	130,084	tons/yr	
Maximum Throughput Rate	19.84	ton/hr	
Grain Loading Emission Factor	0.002	gr/scf	1
PMControl Efficiency	99.00%	%	
NOx Control Efficiency	65.00%	%	
Acid Gas Control Efficiency	90.00%	%	
Design Volumetric Vent Rate	53,931	scfm	2
Volumetric Vent rate	28,346,301,099	scf/yr	

Note:

1. Design grain loading of the TBRC baghouse.
2. Design flow rate.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)	Reference
TRBC 3 and 4	Filterable PM	0.92	4.05	404.95	
	PM_{10}	0.92	4.05	404.95	
	$PM_{2.5}$	0.92	4.05	404.95	
	Total HAP	0.15	0.48	5.34	
	NO_x	8.380	27.47	78.48	3, 12
	CO	8.460	27.73	27.734	4, 12
	SO_2	0.040	10.62	10.618	5
	VOC	0.727	3.19	3.185	5, 12

Emission Calculation Equations

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\text{ min}}{\text{hour}} \times \frac{\text{lb}}{7000\text{ gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\text{ hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\text{ lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Hourly and Annual Emission Calculations

Pollutant	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Emission Rate (tpy)
Filterable PM	53,931	0.002	0.92	4.0495	404.95
PM_{10}	53,931	0.002	0.92	4.05	404.95
$PM_{2.5}$	53,931	0.002	0.92	4.05	404.95

TBRC 3 and 4 Baghouse - HAP/TAP Emission

HAP and TAP emission calculations based on percent present in raw material:

$$\frac{lb\ pollutant}{hr} = \frac{lb\ particulate}{hr}\ x\ \%\ pollutant\ in\ material$$

or

$$\frac{lb\ pollutant}{hr} = toms\ throughput\ x\ \frac{lb\ polltant}{ton}$$

HAP/TAP Emissions:

Pollutant	Dust Concentration	Emission Factor	Emission Factor	HAP/TAP Hourly Emission Rate	Annual Emission Rate	Uncontrolled Emission Rate	Reference
	(%)	lb/ton	lb/ft3	(lb/hr)	(tpy)	(tpy)	
Aluminum	0.25%			2.31E-03	1.01E-02	1.01	7
Ammonia		8.16E-05		2.42	10.62		8
Antimony			7.49E-07	1.62E-03	5.30E-03		5
Hydrogen Bromide				0.017	0.057	5.73E-01	7
Cadmium		2.71E-06		4.30E-05	1.41E-04	1.41E-02	8,9
Calcium	1.07%	8.16E-05		9.89E-03	0.043	4.33	8
Chromium		8.16E-05		1.62E-03	5.30E-03		8
Cobalt				1.62E-03	5.30E-03		7
Copper	3.87%	8.82E-03		0.036	0.157	15.67	8
Hydrogen Chloride		3.68E-02		0.073	0.24	2.40	8
Hydrogen Fluoride		2.69E-02		0.053	0.18	1.75	8
Lead				1.22E-03	4.01E-03	0	8, 10
Manganese		1.03E-04		2.04E-03	6.67E-03		8
Mercury		2.54E-04		5.05E-03	0.017		11
Nickel	0.050%			4.62E-04	2.02E-03	0.20	7
Silicon	0.45%			4.16E-03	0.018	2	7
Dioxins		1.17E-10		2.31E-09	7.58E-09		8
Tin	1.98%			0.018	0.080	8.02	7
Zinc Oxide	57.75%			0.66	2.91	291	7, 13
Total HAPs				0.15	0.48	5.34	

Note:

20% was added. That facility did not have SNCR, so the calculated emissions were reduced by 65% to reflect the SNCR controls.

4. Emission of CO were based on continuous monitoring data at a similar facility in Germany. The emissions were doubled to account for plastic content at the Augusta facility and a conservative factor of 20% was added.

5. Emissions of SO_2, VOC and ammonia emissions are based on OEM informationwith a 20% fator added.

6. CO_2 emissions are based on converting 99% of the CO to CO_2 in the coumbustor.

7. Based on percentage of pollutant in dust.

8. Based on stack test and/or continuous monitored data derived emission factor from a similar facility in Germany with a 20% factor added.

9, Eighty percent of the cadmium is emited from the TBRC and tenty percent is emitted from the Secondary Baghouse.

10. Emissions of lead are distributed as follows: 11.3% from TBRCs 1&2, 11.3% from TBRCs 3&4, 7.5% from the LTAF, 33.3% from the Secondary Baghouse 1, 25.2% from the Secondary Baghouse 2, and 11.5% from the Slag Furnace.

11. All the mercury is assumed to be emitted from the TBRCs.

12. Ninety percent of the NO_X is assumed to be emitted through the TBRCs and 10% through the LATF.

13. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

LATF
BH02

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Grain Loading Emission Factor	0.0020	gr/scf	1
Control Efficiency	99.00%	%	
Control of Acid Gases	90.00%	%	
Design Volumetric Flow Rate	37,242	scfm	2
Design Volumetric Flow Rate	18,261,097,740	scf/yr	

Note:

1. Design grain loading of dust silo bin vent. 8,197,946,733
2. Design flow rate of dust silo bin vent.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)	Reference
LTAF Baghouse	Filterable PM	0.638	2.61	260.87	
	PM_{10}	0.638	2.61	260.87	
	$PM_{2.5}$	0.638	2.61	260.87	
	Total HAP	3.969E-03	0.40	0.00	
	NO_x	5.321	17.44	17.44	5

Emission Calculation Equations

Particulate emission calculations based on grain loading emission factor:

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{\text{60 min}}{\text{hour}} \times \frac{\text{lb}}{\text{7000 gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{\text{8,760 hours}}{\text{year}} \times \frac{\text{ton}}{\text{2,000 lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP and TAP emission calculations based on percent present in raw material:

$$\frac{lb\ pollutant}{hr} = \frac{lb\ particulate}{hr}\ x\ \%\ pollutant\ in\ material$$

Hourly and Annual Emission Calculations

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Emission Rate (tpy)
Filterable PM	0.64	2.61	260.87
PM_{10}	0.64	2.61	260.87
$PM_{2.5}$	0.64	2.61	260.87

HAP Emissions:

Pollutant	Dust Concentration[3] (%)	HAP/TAP Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Emission Rate (tpy)	Reference
Aluminum	0.25%	1.60E-03	6.52E-03	0.65	3
Copper	3.87%	0.025	0.101	10.10	3
Lead		8.13E-04	2.66E-03	0.27	4
Nickel	0.05%	3.19E-04	1.30E-03	0.13	3
Tin	1.98%	0.013	0.052	5.17	3
Zinc Oxide	57.75%	0.46	1.88	187.58	3,6
Total HAPs		1.13E-03	3.97E-03	0.40	

Note:

3. Based on percentage of pollutant in dust.
4. Emissions of lead are distributed as follows: 11.3% from TBRCs 1&2, 11.3% from TBRCs 3&4, 7.5% from the LTAF, 33.3% from
5. Ninety percent of the NO_X is assumed to be emitted through the TBRCs and 10% through the LATF.
6. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

Secondary Baghouse 1 - Roof Ventilation and Lab & Sampling

BH03

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Hours of Operation	8,760	hrs/yr	
Annual Average Throughput	130,084	tons/yr	
Maximum Throughput Rate	14.85	ton/hr	
Grain Loading Emission Factor	0.002	gr/scf	1
Control Efficiency	99.00%	%	
Design Volumetric Vent Rate	458,612	scfm	2
Volumetric Vent Rate	153,061,201,055	scf/yr	

Note:

1. Design grain loading of the Secondary Baghouse
2. Design flow rate of dust silo bin vent.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
Secondary Baghouse 1 - Roof Ventilation and Lab & Sampling	Filterable PM	7.86	21.87	2,187
	PM_{10}	7.86	21.87	2,187
	$PM_{2.5}$	7.86	21.87	2,187
	Total HAP	5.41E-03	0.017	1.69
	Lead			**1.18**

Emission Calculation Equations

Particulate emission calculations based on grain loading emission factor:

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{\text{60 min}}{\text{hour}} \times \frac{\text{lb}}{\text{7000 gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{\text{8,760 hours}}{\text{year}} \times \frac{\text{ton}}{\text{2,000 lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP and TAP emission calculations based on percent present in raw material:

$$\frac{lb\ pollutant}{hr} = \frac{lb\ particulate}{hr}\ x\ \%\ pollutant\ in\ material$$

or

$$\frac{lb\ pollutant}{hr} = toms\ throughput\ x\ \frac{lb\ polltant}{ton}$$

Hourly and Annual Emission Calculations

Pollutant	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emissions (tpy)
Filterable PM	458612.0437	0.002	7.86	21.87	2,186.59
PM_{10}	458612.0437	0.002	7.86	21.87	2,186.59
$PM_{2.5}$	458612.0437	0.002	7.86	21.87	2,186.59

HAP Emissions:

Pollutant	Dust Concentration (%)	HAP/TAP Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emissions (tpy)	Reference
Cadmium		8.04E-06	3.52E-05	0.00	4,5
Copper	1.19%	0.094	0.26	26.02	3
Lead		3.61E-03	0.012	1.18	4,6
Mercury		0.00	0.00		7
Nickel	0.023%	1.79E-03	4.99E-03	0.50	3
Tin	0.40%	0.03	0.087	8.75	3
Zinc Oxied	54.56%	5.34	14.854	1485.43	3,8
Total HAPs		5.41E-03	0.017	1.685	

Note:

3. Based on percentage of pollutant in dust.
4. Based on stack test and/or continuous monitoring data derived emission factor from a similar facility in Germany with a 20% factor added.
5. Eighty percent of the cadmium is emitted from the TBRC and twenty percent is emitted from the Secondary Baghouse.
6. Emissions of lead are distributed as follows: 11.3% from TBRCs 1&2, 11.3% from TBRCs 3&4, 7.5% from the LTAF, 33.3% from the Secondary Baghouse 1, 25.2% from the Secondary Baghouse 2, and 11.5% from the Slag Furnace.
7. All the mercury is assumed to be emitted from the TBRCs.
8. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

Secondary Baghouse -2
BH06

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Hours of Operation	8,760	hrs/yr	
Annual Average Throughput	130,084	tons/yr	
Maximum Throughput Rate	14.85	ton/hr	
Grain Loading Emission Factor	0.002	gr/scf	1
Control Efficiency	99.00%	%	
Design Volumetric Vent Rate	387,230	scfm	2
Volumetric Vent Rate	115,542,945,698	scf/yr	

Note:

1. Design grain loading of the Secondary Baghouse.
2. Design flow rate of dust silo bin vent.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
Secondary Baghouse -2	Filterable PM	6.64	16.51	1,651
	PM_{10}	6.64	16.51	1,651
	$PM_{2.5}$	6.64	16.51	1,651
	Total HAP	4.25E-03	0.013	1.28

Emission Calculation Equations

Particulate emission calculations based on grain loading emission factor:

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{\text{60 min}}{\text{hour}} \times \frac{\text{lb}}{\text{7000 gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{\text{8,760 hours}}{\text{year}} \times \frac{\text{ton}}{\text{2,000 lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP and TAP emission calculations based on percent present in raw material:

$$\frac{lb\ pollutant}{hr} = \frac{lb\ particulate}{hr} x\ \%\ pollutant\ in\ material$$

or

$$\frac{lb\ pollutant}{hr} = toms\ throughput\ x\ \frac{lb\ polltant}{ton}$$

Hourly and Annual Emission Calculations

Pollutant	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emissions (tpy)
Filterable PM	387,230	0.002	6.64	16.51	1,650.61
PM_{10}	387,230	0.002	6.64	16.51	1,650.61
$PM_{2.5}$	387,230	0.002	6.64	16.51	1,650.61

HAP Emissions:

Pollutant	Dust Concentration (%)	HAP/TAP Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emissions (tpy)	Reference
Cadmium		8.04E-06	3.52E-05	0.00	4
Copper	1.19%	0.079	0.196	19.64	3
Lead		2.73E-03	8.95E-03	0.90	4
Mercury		0.00E+00	0.000	0.00	7
Nickel	0.02%	1.51E-03	0.0038	0.38	3
Tin	0.40%	0.03	0.066	6.60	3
Zinc Oxide	54.56%	4.51	11.213	1121.32	3,8
Total HAPs		4.25E-03	1.28E-02	1.28	

Note:

3. Based on percentage of pollutant in dust.
4. Based on stack test and/or continuous monitoring data derived emission factor from a similar facility in Germany with a 20% factor added.
3. Based on percentage of pollutant in dust.
4. Based on stack test and/or continuous monitoring data derived emission factor from a similar facility in Germany.
5. Two percent of the cadmium is emitted from the TBRC and 98% is emitted from the Secondary Baghouse.
33.3% from the Secondary Baghouse 1, 25.2% from the Secondary Baghouse 2, and 11.5% from the Slag Furnace.
7. All the mercury is assumed to be emitted from the TBRCs.
8. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

0

Slag Holding Furnace, Copper Casting and Dry Slag Granulation

BH04

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Grain Loading Emission Factor	0.002	gr/scf	1
Natural Gas Heating Value	1,020	Btu/scf	
Natural Gas Usage	44.76	MMcf/yr	
Hourly Natural Gas Usage	0.014	MMcf/hr	
Rated Heat Capacity	14.33	MMBtu/hr	
Rated Heat Capacity	45,654	MMBtu/yr	
PM Control Efficiency	99%	Percent	
Total Design Volumetric Vent Rate	308,521	scfm	2
Annual Design Volumetric Rate	92,102,336,600	scf/yr	
Hourly Volume Flow Rate A	200,501	scfm	
Annual Volume Flow Rate A	63,714,630,114	scf/yr	
Hourly Volume Flow Rate B	308,521	scfm	
Annual Volume Flow Rate B	28,387,706,486	scf/yr	

Note:

1. Design grain loading.
2. Design flow rate.

Emissions Summary

Source Description	Pollutant	Emission Factor	Emission Factor Units	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)	Reference
Slag Holding Furnace, Copper Casting and Dry Slag Granulation	Filterable PM	0.002	gr/scf	5.29	13.16	1,316	3
	PM (A)	0.002	gr/scf	3.44	9.10	910	
	PM(B)	0.002	gr/scf	5.29	4.06	406	
	PM_{10}	0.002	gr/scf	5.29	13.16	1,316	3
	$PM_{2.5}$	0.002	gr/scf	5.29	13.16	1,316	3
	Total HAP	NA	NA	0.04	0.08	0.08	
	NO_x	50	lb/MMscf	0.70	1.12	1.12	4
	CO	84.0	lb/MMscf	1.18	1.88	1.88	4
	SO2	0.6	lb/MMscf	0.01	1.34E-02	0.01	5
	VOC	5.5	lb/MMscf	0.08	1.23E-01	0.123	5
	CO_2	117.0	lb/MMBtu	1,676	2,670	2,670	6
	N_2O	2.20E-04	lb/MMBtu	3.16E-03	5.03E-03	5.03E-03	7
	CH_4	2.20E-03	lb/MMBtu	3.16E-02	5.03E-02	5.03E-02	7
	CO_2e			1,678	2,673	2,673	8

Note:

3 Emission rates based on design grain loading.

4. Emission factors based on AP-42 Table 1.4-1.

5. Emission factors based on AP-42 Table 1.4-2.

6. Emission factors based on Table C-1 of 40 CFR 98 Subpart C.

7. Emission factors based on Table C-2 of 40 CFR 98 Subpart C.

8 Global warming potential based on Table A-1 of 40 CFR 98 Subpart A.

Emission Calculation Equations

Particulate emission calculations based on grain loading emission factor:

$$\frac{lb\ pollutant}{hr} = \frac{lb}{10^6 scf} x \frac{dscf}{min} x \frac{60\ min}{hr} x \frac{lb}{7{,}000\ gr}$$

Criteria Pollutants and HAPs from fuel combustion based on AP42

$$\frac{lb\ pollutant}{hr} = \frac{lb}{10^6 scf\ gas} x \frac{10^6 scf\ gas}{hr}$$

HAPs and TAPs as particulate

$$\frac{lb\ pollutant}{hr} x \frac{8{,}760\ hr}{yr} x \frac{ton}{2{,}000\ lb} = \frac{ton}{yr}$$

Annual Emissions

$$\frac{lb\ pollutant}{hr} x \frac{8{,}760\ hr}{yr} x \frac{ton}{2{,}000\ lb} = \frac{ton}{yr}$$

Slag Holding Furnace, Copper Casting and Dry Slag Granulation - HAP/TAP Emissions

Pollutant	Dust Concentration[3]	Emission Factor		HAP/TAP Hourrly Emission Rate	Annual Emission Rate	Uncontrolled Emission Rate	Reference
	(%)	(lb/10^6 scf)	(lb/MMBtu)	(lb/hr)	(tpy)	(tpy)	
Aluminum A	19.27%	NA	NA	0.662	1.75		9
Aluminum B	0.00%	NA	NA	0.000	0.00		9
Total Aluminum		NA	NA	0.662	1.75	175.40	
Calcium A	8.43%	NA	NA	0.290	0.77		9
Calcium B	0.00%	NA	NA	0.000	0.00		9
Total Calcium		NA	NA	0.290	0.77	76.73	
Copper A	1.60%	NA	NA	0.055	0.15		9
Copper B	3.13%	NA	NA	0.166	0.13		9
Total Copper		NA	NA	0.221	0.27	27.26	
Nickel A	0.36%	NA	NA	0.012	0.03		9
Nickel B	0.03%	NA	NA	1.59E-03	0.00		9
Toal Nickel		NA	NA	0.014	0.03	3.40	
Silicon A	12.56%	NA	NA	0.43	1.14		9
Silicon B	0.00%	NA	NA	0.000	0.00		9
Total Silicon		NA	NA	0.432	1.14	114.32	
Dioxin		NA	NA	0.00	0.00		
Tin A	0.52%	NA	NA	0.018	0.05		9
Tin B	1.65%	NA	NA	0.087	0.07		9
Total Tin		NA	NA	0.105	0.11	11.42	
Zinc A	5.75%	NA	NA	0.246	0.65		9
Zinc B	17.95%	NA	NA	1.182	0.91		9
Total Zinc Oxide		NA	NA	1.428	1.56	193.99	**12**
Benzene		2.10E-03	2.06E-06	2.95E-05	4.70E-05	4.70E-05	10
Dichlorobenzene		1.20E-03	1.18E-06	1.69E-05	2.69E-05	2.69E-05	10
Formaldehyde		7.50E-02	7.35E-05	1.05E-03	1.68E-03	1.68E-03	10
Hexane		1.80E+00	1.76E-03	2.53E-02	4.03E-02	0.040	10
Lead				1.25E-03	4.09E-03	0.41	13, 14
Naphthalene		6.10E-04	5.98E-07	8.57E-06	1.37E-05	1.37E-05	10
pentane		2.60E+00	2.55E-03	3.65E-02	5.82E-02	0.06	10
Polycyclic Organic Matter		8.82E-05	8.65E-08	1.24E-06	1.97E-06	1.97E-06	10
Toluene		3.40E-03	3.33E-06	4.78E-05	7.61E-05	7.61E-05	10
Arsenic		2.00E-04	1.96E-07	2.81E-08	4.48E-08	4.48E-06	11
Beryllium		1.20E-05	1.18E-08	1.69E-09	2.69E-09	2.69E-07	11
Cadmium		1.10E-03	1.08E-06	1.55E-07	2.46E-07	2.46E-05	11
Chromium		1.40E-03	1.37E-06	1.97E-07	3.13E-07	3.13E-05	11
Cobalt		8.40E-05	8.24E-08	1.18E-08	1.88E-08	1.88E-06	11
Manganese Compounds		3.80E-04	3.73E-07	5.34E-08	8.50E-08	8.50E-06	11
Mercury		2.60E-04	2.55E-07	3.65E-08	5.82E-06	5.82E-06	11
Molybdenum		1.10E-03	1.08E-06	1.55E-07	2.46E-07	2.46E-05	11
Selenium		2.40E-05	2.35E-08	3.37E-09	5.37E-09	5.37E-07	11
Vanadium		2.30E-03	2.25E-06	3.23E-07	5.15E-07	5.15E-05	11
Total HAPs				0.040	0.076	3.441	

Notes:

9. Emissions based on measured percentage of HAP/TAP in dust multiplied by the PM emission rate.
10. Emission factor from AP-42 1.4-3.
11. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%, except Mercury..
12. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.
13. Emissions of lead based on stack test at a similar facility in Germancy.
14. Emissions of lead are distributed as follows: 11.3% from TBRCs 1&2, 11.3% from TBRCs 3&4, 7.5% from the LTAF, 33.3% from the Secondary Baghouse 1, 25.2%

Launders

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Natural Gas Heating Value	1,020	Btu/scf	1
Natural Gas Usage	3.31	MMcf/yr	
Hourly Natural Gas Usage	3.68E-03	MMcf/hr	
Rated Heat Capacity	3.75	MMBtu/hr	
Rated Heat Capacity	3,378	MMbtu/yr	
Metals Control Efficiency	99.00%	%	

Notes:

1. AP-42 basis for natural gas heating value.

Emission calculations based on lb/million scf of natural gas emission factors:

$$\frac{\text{lb pollutant}}{\text{million scf}} \times \frac{\text{scf}}{1{,}020\ \text{Btu}} \times \frac{\text{million Btu}}{\text{hr}} = \frac{\text{lb pollutant}}{\text{hr}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Emission Calculations

Pollutant[5]	Emission Factor (lb/10^6 scf)	Emission Factor (lb/MMBtu)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes	
NO_x	50	4.90E-02	0.18	0.08	2	
CO	84	8.24E-02	0.31	0.14	2	
SO_2	0.6	5.88E-04	2.21E-03	9.94E-04	3	
Lead	5.00E-04	4.90E-07	1.84E-08	8.28E-09	3	
VOC	5.5	5.39E-03	0.020	9.11E-03	3	
CO_2		117.0	439.0	197.57	4	
N_2O		2.2E-04	8.27E-04	3.72E-04	4	
CH_4		2.2E-03	8.27E-03	3.72E-03	4	
CO_2e		-	440	197.78	5	
Benzene	2.10E-03	2.06E-06	7.73E-06	3.48E-06	6	H, T
Dichlorobenzene	1.20E-03	1.18E-06	4.42E-06	1.99E-06	6	H, T
Formaldehyde	7.50E-02	7.35E-05	2.76E-04	1.24E-04	6	H,T
Hexane	1.80E+00	1.76E-03	6.62E-03	2.98E-03	6	H,T
Naphthalene	6.10E-04	5.98E-07	2.24E-06	1.01E-06	6	H,T
Pentane	2.60E+00	2.55E-03	9.57E-03	4.31E-03	6	T
Polycyclic Organic Matter	8.82E-05	8.65E-08	3.25E-07	1.46E-07	6	H
Toluene	3.40E-03	3.33E-06	1.25E-05	5.63E-06	6	HT
Arsenic	2.00E-04	1.96E-07	7.36E-09	3.31E-09	7	H,T
Beryllium	1.20E-05	1.18E-08	4.42E-10	1.99E-10	7	H,T
Cadmium	1.10E-03	1.08E-06	4.05E-08	1.82E-08	7	H,T
Chromium	1.40E-03	1.37E-06	5.15E-08	2.32E-08	7	H,T
Cobalt	8.40E-05	8.24E-08	3.09E-09	1.39E-09	7	T
Copper	8.50E-04	8.33E-07	3.13E-08	1.41E-08	7	T
Manganese Compounds	3.80E-04	3.73E-07	1.40E-08	6.29E-09	7	H,T
Mercury	2.60E-04	2.55E-07	9.57E-07	4.31E-07	7	H,T
Molybdenum	1.10E-03	1.08E-06	4.05E-08	1.82E-08	7	T
Nickel	2.10E-03	2.06E-06	7.73E-08	3.48E-08	7	H,T
Selenium	2.40E-05	2.35E-08	8.83E-10	3.97E-10	7	H,T
Vanadium	2.30E-03	2.25E-06	8.46E-08	3.81E-08	7	T
Zinc Oxide	2.90E-02	2.84E-05	1.33E-06	5.98E-07	7,8	T
Total HAPs			6.93E-03	3.12E-03		

Notes:

2. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-1.
3. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-2.
4. Emission factors from 40 CFR 98 Subpart C Tables C-1 and C-2.
5. Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.
6. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-3.
7. Emission factors from AP-42 Section 1.4 Natural Gas Combustion Table 1.4-4 assumed controlled by 99%, except Mercury..
8. Converted to zinc oxide based on the ratio of the molecular weights of zinc oxide and zinc.

Scrap Pile Loading and Unloading

Scrap01

Aurubis

Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Operating Hours	8,760	hrs	
Days of Operation per Year	365	days	
Average Wind Speed	5.50	mph	1
Annual Throughput for All Outside Piles	218,506	tons/yr	2
Hourly Loading Rate to Scrap Pile	160	ton/hr.	
Hourly Loadout Rate	160	ton/hr	3
Material Moisture Content	5.50	%	4

Notes:

1. Based on average wind speed for Bush Field Airport, Augusta, Georgia (1981 through 2010).
2. Based on annual production rate at the Melt Shop.
3. Based on maximum hourly production rate in the smelter building.
4. AP-42 Section 13.2.4: Aggregate Handling and Storage Piles, Table 13.2.4-1 Typical Silt and Moisture Contents of Materials at Various Industries.

Emissions Summary

Source Description	Pollutant	Hourly	Annual
Storage Pile Loading/Loadout	Filterable PM [6]	0.21	0.073
	PM_{10}	0.098	0.034
	$PM_{2.5}$	1.49E-02	5.21E-03

6. Per AP-42 (Table 13.2.2-2), PM30 is assumed equivalent to total PM.

Storage Pile Loading and Loadout

Calculation Basis:

Calculation methodology derived from Section 13.2.4 "Aggregate Handling and Storage Piles," AP-42 (11/06).

Transfer Locations: (1) stacker/dump to pile; (2) reclaimer/loader out of pile into scrap truck

Emission Factor (lb PM / ton handled)

$$Emission\ factor\ (lb/ton) = k * (0.0032) * \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where U = Mean wind speed (mph) for the area [7]
M = Material moisture content (%) [8]
k = Particle size multiplier [9]

Note:
7. Bush Field Airport, Augusta, Georgia (10981 throug 2010).
8. From AP-42 (11/06), Section 13.2.4.2, Table 13.2.4-1
9. From AP-42 (11/06), Section 13.2.4.3

Aerodynamic Particle Size Multiplier (k)	
< 30 micrometers	**0.74**
< 15 micrometers	0.48
< 10 micrometers	**0.35**
< 5 micrometers	0.2
< 2.5 micrometers	**0.053**

Calculation of Average Annual Controlled Emission Rate

Annual Emission Rate (tons/yr) = Material Throughput (tons/yr) * EF (lb PM/ton) * (Number of Drops) / (2,000 lb/ton)

Hourly Emission Rate (lb/hr) = Annual Emission Rate (tons/yr) * 2000 lb/ton / 8760 hrs/yr

Scrap Pile Emission Calculations

Particulate (Filterable PM) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Hourly Throughput	Emission Factor	Number of Drops	Controlled Emission Rates	
	(tons/yr)	(tons/hr)	(lb/ton)		(lb/hr)	(tpy)
Storage Pile Loading	111,941	160	0.0007	1	0.10	0.036
Storage Pile Loadout	111,941	160	0.0007	1	0.10	0.036
TOTAL					**0.21**	**0.07**

Particulate (PM_{10}) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Hourly Throughput	Emission Factor	Number of Drops	Controlled Emission Rates	
	(tons/yr)	(tons/hr)	(lb/ton)		(lb/hr)	(tpy)
Storage Pile Loading	111,941	160	0.0003	1	0.049	0.017
Storage Pile Loadout	111,941	160	0.0003	1	0.049	0.017
TOTAL					**0.10**	**0.03**

Particulate ($PM_{2.5}$) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Hourly Throughput	Emission Factor	Number of Drops	Controlled Emission Rates	
	(tons/yr)	(tons/hr)	(lb/ton)		(lb/hr)	(tpy)
Storage Pile Loading	111,941	160	0.0000	1	7.45E-03	2.61E-03
Storage Pile Loadout	111,941	160	0.0000	1	7.45E-03	2.61E-03
TOTAL					**0.015**	**5.21E-03**

Slag Processing Storage Pile

Slag01

Aurubis

Augusta, GA

Inputs

Description	Value	Units
Annual Operating Hours	8,760	hrs
Days of Operation per Year	365	days
Average Wind Speed [1]	5.50	mph
Annual Throughput	117,131	tons/yr
Material Moisture Content - Pre-quench [2]	0.10	%
Material Moisture Content - Post-quench [2]	0.10	%
Number of days with <0.1 in rain per year [1]	105	days
Anemometer Height [3]	33	ft
Roughness Height [4]	0.005	m
Pile Height [5]	20	ft
Pile Length (Base) [5]	82	ft
Pile Width (Base) [5]	115	ft
Side Slope [6]	37	°
Surface Area [7]	8,068	m^2
Threshold Friction Velocity [8]	0.54	m/s
Maximum Wind Speed [9]	14.40	mph
Material Moved per Disturbance [10]	20.00	ton/load
Number of Disturbances/Day [11]	1152	dist/day
Capture Efficiency	na	%
Control Efficiency [12]	0%	%

1. Based on average wind speed for Bush Field Airport Station, Augusta, Georgia (1981 through 2010).
2. No moisture as material is produced by dry granulation.
3. Anemometer height at Bush Field, Augusta, Georgia.
https://mesowest.utah.edu/cgi-bin/droman/station_total.cgi?stn=KAGS
4. Standard roughness height derived from AP-42 Section 13.2.5: Industrial Wind Erosion
5. Provided by Aurubis.
6. Standard pile slope derived from AP-42 13.2.5: Industrial Wind Erosion
7. Assume pile is a flat-topped oval in shape.
8. Threshold friction velocity from AP-42 Table 13.2.5-2.
9. Maximum daily wind speed was obtained from surface data collected at Bush Field Airport Station, Augusta, Georgia for 2021..
10. Maximum amount of possible daily disturbances based on front end loader capacity.
11. Number of Disturbance/Day is based on the weighted average of additions and subtractions to the pile.
12. From EPA document: Control of Open Fugitive Dust Sources, published September 1988.

Material Stacking and Reclaiming

Calculation Basis:

Calculation methodology derived from Section 13.2.4 "Aggregate Handling and Storage Piles," AP-42 (11/06).

Transfer Locations: (1) stacker/dump to pile; (2) reclaimer/loader out of pile onto conveyor or into truck

Aerodynamic Particle Size Multiplier (k)	
<70 micrometers	**0.015**
< 15 micrometers	**0.015**
< 10 micrometers	**0.015**
< 5 micrometers	**0.015**
< 2.5 micrometers	**0.015**

Emission Factor (lb PM / ton handled)

$$Emission\ factor\,(lb/ton) = k * (0.0032) * \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where U = Mean wind speed (mph) for the area [14]

M = Material moisture content (%) [15]

k = Particle size multiplier [16]

Note: 14. Based on average wind speed for Bush Field Airport Station, Augusta, Georgia (1981 through 2010).
15. From AP-42 (11/06), Section 13.2.4.2, Table 13.2.4-1
16. From AP-42 (11/06), Section 13.2.4.3

Calculation of Average Annual Controlled Emission Rate

Annual Controlled Emission Rate (tons/yr) = Material Throughput (tons/yr) * EF (lb PM/ton) * Number of Drops * (1 - Control Efficiency) / 2000 lb/ton

Hourly Controlled Emission Rate (lb/hr) = Average Controlled Emission Rate (tons/yr) * 2000 lb/ton / 8760 hrs/yr

Emission Calculations

Slag Pile

Particulate (Filterable PM) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Emission Factor	Number of Drops	Uncontrolled Emissions	Overall Control Efficiency	Controlled Emission Rates	
	(tons/yr)	(lb/ton)		(lb/yr)	%	(lb/hr)	(tpy)
Storage Pile (stacker)	117,131	0.00	1.0	422	0.0%	0.048	0.21
Storage Pile (reclaimer)	117,131	0.00	1.0	422	0.0%	0.048	0.21
TOTAL						**0.096**	**0.42**

Particulate (PM_{10}) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Emission Factor	Number of Drops	Uncontrolled Emissions	Overall Control Efficiency	Controlled Emission Rates	
	(tons/yr)	(lb/ton)		(lb/yr)	%	(lb/hr)	(tpy)
Storage Pile (stacker)	117,131	0.004	1.0	422	0.0%	0.048	0.21
Storage Pile (reclaimer)	117,131	0.004	1.0	422	0.0%	0.048	0.21
TOTAL						**0.096**	**0.42**

Particulate ($PM_{2.5}$) Emissions from Material Storage Pile Transfers

Transfer Location	Annual Throughput	Emission Factor	Number of Drops	Uncontrolled Emissions	Overall Control Efficiency	Controlled Emission Rates	
	(tons/yr)	(lb/ton)		(lb/yr)	%	(lb/hr)	(tpy)
Storage Pile (stacker)	117,131	0.004	1.0	422	0.0%	0.048	0.21
Storage Pile (reclaimer)	117,131	0.004	1.0	422	0.0%	0.048	0.21
TOTAL						**0.096**	**0.42**

HAPs

Pollutant	Dust Concentration[3]	PM Emission Rate	Hourly Emission Rate	Annual Emission Rate
	(%)	(lb/hr)	(lb/hr)	(tpy)
Aluminum	8.43%	0.10	0.01	0.036
Calcium	19.27%	0.10	0.02	0.08
Copper	1.60%	0.10	0.002	0.007
Lead	0.51%	0.10	4.91E-04	2.15E-03
Nickel	0.36%	0.10	3.47E-04	1.52E-03
Tin	0.52%	0.10	5.01E-04	2.19E-03
Zinc Oxide	5.75%	0.10	0.006	0.024
Total HAPs			8.379E-04	3.670E-03

Wind Erosion

Calculation Basis:

Calculation methodology derived from AP-42 13.2.5, "Industrial Wind Erosion" (2006).

Assume a flat topped oval shaped pile with 37° side slope.

The pile is subdivided into wind regimes, which correspond to a sub-surface area distribution. (us/ur ratio)

The total emissions from wind erosion are represented as a numerical sum of the contributions from each us/ur ratio or section.

AP-42 Figure 13.2.5-2, "Contour of Normalized Surface Windspeeds, us/ur" Pile B3 is used to define the wind regime for conservatism

$$Equivalent\ Friction\ Velocity\ \left(\frac{m}{s}\right) = 0.1\ x\ Surface\ Wind\ Speed\ \left(\frac{m}{s}\right)$$

$$Equivalent\ Friction\ Velocity\ \left(\frac{m}{s}\right) = 0.1\ x\ Surface\ Wind\ Speed\ \left(\frac{m}{s}\right)$$

$$If\ Equivalent\ Friction\ Velocity\ >\ Threshold\ Friction\ Velocity\ \left(0.54\frac{m}{s}\right) from\ Table\ 13.2.5-2$$

$$Erosion\ Potential\ \left(\frac{g}{m^2}\right) = 58\ (Surface\ Velocity - Friction\ Velocity)^2 + 25\ (Equivalent\ Friction\ Velocity - Threshold\ Friction\ Velocity)^2$$

$$Erosion\ Potential\ \left(\frac{g}{m^2}\right) = 58\ (Surface\ Velocity - Friction\ Velocity)^2 + 25\ (Equivalent\ Friction\ Velocity - Threshold\ Friction\ Velocity)^2$$

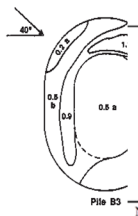
$$Erosion\ Potential\ x\ \left(\frac{day}{24 - hr}\right)$$

$$Annual\ Emission\ Rate\ (tpy) = Average\ Emission\ Rate\ x\ \left(\frac{8{,}760\ hr}{yr}\right) x\ \left(\frac{ton}{2{,}000\ lb}\right) x\ \left(\frac{365 - P}{365}\right)$$

Where P is the number of days with > 0.1 inches of rainfall

Based on Slag Measured Partkle Size

Aerodynamic Particle Size Multiplier	
< 30 micrometers	**0.015**
< 15 micrometers	**0.015**
< 10 micrometers	**0.015**
< 2.5 micrometers	**0.015**



Pile Subarea	Pile B3
0.2a	3
0.2b	25
0.2c	NA
0.6a	28
0.6b	26
0.9	14
1.1	4

NA = not applicable.

Wind Erosion Emission Calculations:

Material Moved per Disturbance	Surface Area of Pile	Annual Throughput	% of Surface Area Affected per Disturbance
(tons/dist)	(m2)	(tons)	(%/dist)
20.00	**8,068**	**117,131**	**0.017%**

Percent of Surface Area Affected per Disturbance (%/dist) = Material Moved per Disturbance (tons/dist) / Annual Throughput (tons)

For us/ur ratio of 0.2:

Pollutant	Average Monthly Maximum Wind Speed at 10 m[17]	Days with >0.1 inch of Rainfall[18]	us/ur Ratio[19]	Surface Wind Speed[20]	Equivalent Friction Velocity[21]	Threshold Velocity	Erosion Potential[22]	Sub-Surface Area[23]	Hourly Emission Rate[24]	Annual Emission Rate[25]
	(m/s)	(days/yr)		(m/s)	(m/s)	(m/s)	(g/m2)	%	(lb/hr)	(tpy)
Filterable PM	5.10	105	0.2	1.02	0.10	0.54	0.0E+00	28%	0.00E+00	0.00E+00
PM10	5.10	105	0.2	1.02	0.10	0.54	0.0E+00	28%	0.00E+00	0.00E+00
PM2.5	5.10	105	0.2	1.02	0.10	0.54	0.0E+00	28%	0.00E+00	0.00E+00

For us/ur ratio of 0.6:

Pollutant	Average Monthly Maximum Wind Speed at 10 m(17)	Days with >0.1 inch of Rainfall(18)	us/ur Ratio[19]	Surface Wind Speed[20]	Equivalent Friction Velocity[21]	Threshold Velocity	Erosion Potential[22]	Sub-Surface Area[23]	Hourly Emission Rate[24]	Annual Emission Rate[25]
	(m/s)	(days/yr)		(m/s)	(m/s)	(m/s)	(g/m2)	%	(lb/hr)	(tpy)
Filterable PM	5.10	105	0.6	3.06	0.31	0.54	0.0E+00	54%	0.00E+00	0.00E+00
PM10	5.10	105	0.6	3.06	0.31	0.54	0.0E+00	54%	0.00E+00	0.00E+00
PM2.5	5.10	105	0.6	3.06	0.31	0.54	0.0E+00	54%	0.00E+00	0.00E+00

For us/ur ratio of 0.9:

Pollutant	Average Monthly Maximum Wind Speed at 10 m(17)	Days with >0.1 inch of Rainfall(18)	us/ur Ratio[19]	Surface Wind Speed[20]	Equivalent Friction Velocity[21]	Threshold Velocity	Erosion Potential[22]	Sub-Surface Area[23]	Hourly Emission Rate[24]	Annual Emission Rate[25]
	(m/s)	(days/yr)		(m/s)	(m/s)	(m/s)	(g/m2)	%	(lb/hr)	(tpy)
Filterable PM	5.10	105	0.9	4.59	0.46	0.54	0.0E+00	14%	0.00E+00	0.00E+00
PM10	5.10	105	0.9	4.59	0.46	0.54	0.0E+00	14%	0.00E+00	0.00E+00
PM2.5	5.10	105	0.9	4.59	0.46	0.54	0.0E+00	14%	0.00E+00	0.00E+00

For us/ur ratio of 1.1:

Pollutant	Average Monthly Maximum Wind Speed at 10 m(17)	Days with >0.1 inch of Rainfall(18)	us/ur Ratio[19]	Surface Wind Speed[20]	Equivalent Friction Velocity[21]	Threshold Velocity	Erosion Potential[22]	Sub-Surface Area[23]	Average of Calm Wind Hours[27]	Hourly Emission Rate[24]	Annual Emission Rate[25]
	(m/s)	(days/yr)		(m/s)	(m/s)	(m/s)	(g/m2)	%		(lb/hr)	(tpy)
Filterable PM	5.10	105	1.1	5.61	0.561	0.54	0.56	4%	77	1.2E-03	1.5E-03
PM10	5.10	105	1.1	5.61	0.561	0.54	0.56	4%	77	1.8E-05	2.3E-05
PM2.5	5.10	105	1.1	5.61	0.561	0.54	0.56	4%	77	1.82E-05	2.3E-05

Calculations based on AP-42 13.2.5:

17. Average Monthly Max Windspeed @ 10 m (mph) = Daily Max Windspeed @ anemometer height (mph) * (ln(ref anemometer height (10 m))/ roughness height)/ ln(actual anemometer height / roughness height))

18. Assume wind erosion does not occur on days with at least 0.1 inch of rainfall since the material is wetted. Rainfall data is from onsite weather station.

19. Assume an oval flat-topped pile-see Pile B3 in AP-42 13.2.5 Figure 13.2.5-2 for us/ur ratios.

20. Surface Wind Speed (m/s) = us/ur * Daily Max Wind Speed at 10 m (m/s)

21. Equivalent Friction Velocity (m/s) = 0.10 * Surface Wind Speed (m/s)

22. Erosion Potential (g/m2) = 58 * [Equivalent Friction Velocity (m/s) - Threshold Friction Velocity (m/s)]2 + 25 * [Equivalent Friction Velocity (m/s) - Threshold Friction Velocity (m/s)]; Erosion Potential = 0 if Equivalent Friction Velocity ≤ Threshold Friction Velocity

23. Assume a flat-topped oval pile-see Pile B3 in AP-42 13.2.5 Table 13.2.5-3 for subdivided surface areas. However, only a very small fraction of the surface area is affected by each disturbance, as calculated above.

24. Hourly Emission Rate (lb/hr) = Erosion Potential (g/m2) * Surface Area (m2) * Sub-surface Area % * Particle Size Multiplier * disturbances per day / 24 hr/day / 454 g/lb

25. Annual Emission Rate (tpy) = Hourly Emission Rate (lb/hr) * (Number of Operating Hours per Year - Hours of Calm Winds)/ 2000 lb/ton * Number of days with <0.1 inches of rain / 365 days/yr

26. Average number of calm hours obtained from ARMOD

HAP Emissions:

Pollutant	Dust Concentration[26]	PM Hourly Emission Rate	Hourly Emission Rate	Annual Emission Rate
	%	(lb/hr)	(lb/hr)	(tpy)
Aluminum	8.43%	1.82E-05	1.54E-06	6.74E-06
Calcium	19.27%	1.82E-05	3.52E-06	1.54E-05
Copper	1.60%	1.82E-05	2.92E-07	1.28E-06
Lead	0.51%	1.82E-05	9.31E-08	4.08E-07
Nickel	0.36%	1.82E-05	6.57E-08	2.88E-07
Tin	0.52%	1.82E-05	9.49E-08	4.16E-07
Zinc Oxide	5.75%	1.82E-05	1.31E-06	5.72E-06
Total HAPs			1.59E-07	6.95E-07

Carbon Silo 1

BV01

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Reference
Annual Operating Hours	8	hrs/yr	
Carbon Throughput Annually	342	tons/yr	
Silo Bin Vent Exhaust Flow Rate	50	scfm	
Control Efficiency	99.00%	%	
Bin Vent Exhaust Grain Loading	0.01	gr/scf	1

1. Assumed grain loading.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Carbon Silo 1	Filterable PM	4.29E-03	1.71E-05
	PM_{10}	4.29E-03	1.71E-05
	$PM_{2.5}$	4.29E-03	1.71E-05

Emission Calculations

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\text{ min}}{\text{hour}} \times \frac{\text{lb}}{7000\text{ gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\text{ hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\text{ lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV01	Carbon Silo 1	50	0.010	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Particulate (PM_{10}) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV01	Carbon Silo 1	50	0.01	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Particulate ($PM_{2.5}$) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV01	Carbon Silo 1	50	0.01	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Carbon Silo 2

BV04

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Reference
Annual Operating Hours	8	hrs/yr	
Carbon Throughput Annually	342	tons/yr	
Silo Bin Vent Exhaust Flow Rate	50	scfm	
Control Efficiency	99.00%	%	
Bin Vent Exhaust Grain Loading	0.01	gr/scf	1

1. Assumed grain loading.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate	Annual Emission Rate
		(lb/hr)	(tpy)
Carbon Silo 02	Filterable PM	4.29E-03	1.71E-05
	PM_{10}	4.29E-03	1.71E-05
	$PM_{2.5}$	4.29E-03	1.71E-05

Emission Calculations

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \text{ x } \frac{\text{std ft}^3}{\text{min}} \text{ x } \frac{60 \text{ min}}{\text{hour}} \text{ x } \frac{\text{lb}}{7000 \text{ gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{8{,}760 \text{ hours}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate	Outlet Grain Loading	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(gr/scf)	(lb/hr)	(tpy)	(tpy)
BV02	Carbon Silo No.2	50	0.01	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Particulate (PM_{10}) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate	Outlet Grain Loading	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(gr/scf)	(lb/hr)	(tpy)	(tpy)
BV02	Carbon Silo No.2	50	0.01	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Particulate ($PM_{2.5}$) Emissions from Carbon Silos

EP No.	Description	Exhaust Flow Rate	Outlet Grain Loading	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(gr/scf)	(lb/hr)	(tpy)	(tpy)
BV02	Carbon Silo No.2	50	0.01	4.29E-03	1.71E-05	1.71E-03
TOTAL				**4.29E-03**	**1.71E-05**	**1.71E-03**

Flue Dust Silo 1

BV02

Aurubis
Augusta, GA

Inputs

Description		Value	Units	Reference
Annual Operating Hours		8,760	hrs/yr	
Silo Bin Vent Exhaust Flow Rate		300	scfm	
Bin Vent Exhaust Grain Loading		0.01	gr/scf	1
Control Efficiency		99.00%	%	

1. Assumed grain loading.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Flue Dust Silos	Filterable PM	0.026	0.11
	PM_{10}	0.026	0.11
	$PM_{2.5}$	0.026	0.11

Emission Calculations

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\text{ min}}{\text{hour}} \times \frac{\text{lb}}{7000\text{ gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\text{ hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\text{ lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV03	Flue Dust Silo No.1	300	0.010	0.026	0.11	11.26
TOTAL				**0.026**	**0.11**	**11.26**

Particulate (PM10) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV03	Flue Dust Silo No.1	300	0.01	0.026	0.11	11.26
TOTAL				**0.026**	**0.11**	**11.26**

Particulate (PM2.5) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
BV03	Flue Dust Silo No.1	300	0.01	0.026	0.11	11.26
TOTAL				**0.026**	**0.11**	**11.26**

HAP Emissions:

Pollutant	Dust Concentration[3] (%)	PM Emission Rate (lb/hr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Emission Rate (tpy)	Reference
Aluminum	0.25%	0.0257	6.43E-05	0.000	0.028	2
Calcium	1.07%	0.0257	2.75E-04	1.21E-03	0.12	2
Copper	0.90%	0.0257	2.31E-04	1.01E-03	0.10	2
Lead			2.27E-05	9.96E-05	9.96E-03	3
Nickel	0.050%	0.0257	1.29E-05	5.63E-05	5.63E-03	2
Silicon	0.45%	0.0257	1.16E-04	5.07E-04	0.05	2
Tin	1.98%	0.0257	5.09E-04	2.23E-03	0.22	2
Zinc Oxide	57.75%	0.0257	1.85E-02	1.01E-01	10.08	2,4
Total HAPs			3.56E-05	1.56E-04	0.016	

3. Based on percentage of pollutant in dust.

4. Based on stack test and/or continuous monitoring data derived emission factor from a similar facility in Germany.

Flue Dust Silo 2

BV05

Aurubis
Augusta, GA

Inputs

Description	Value	Units
Annual Operating Hours	8,760	hrs/yr
Silo Bin Vent Exhaust Flow Rate	300	scfm
Bin Vent Exhaust Grain Loading	0.01	gr/scf
Control Efficiency	99.00%	%

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Flue Dust Silos	Filterable PM	0.026	0.11
	PM_{10}	0.026	0.11
	$PM_{2.5}$	0.026	0.11

Emission Calculations

$$\frac{\text{gr pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\text{ min}}{\text{hour}} \times \frac{\text{lb}}{7000\text{ gr}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\text{ hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\text{ lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
B V04	Flue Dust Silo No.2	300	0.010	0.03	0.11	11.26
TOTAL				**0.03**	**0.11**	**11.26**

Particulate (PM10) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
B V04	Flue Dust Silo No.2	300	0.010	0.03	0.11	11.26
TOTAL				**0.03**	**0.11**	**11.26**

Particulate (PM2.5) Emissions from Flue Dust Silos

EP No.	Description	Exhaust Flow Rate (scfm)	Outlet Grain Loading (gr/scf)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
B V04	Flue Dust Silo No.2	300	0.01	0.03	0.11	11.26
TOTAL				**0.03**	**0.11**	**11.26**

HAP Emissions:

Pollutant	Dust Concentration[3] (%)	PM Emission Rate (lb/hr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Umcontrolled Emission Rate (tpy)	Reference
Aluminum	0.25%	0.03	6.43E-05	2.82E-04	0.028	1
Calcium	1.07%	0.03	2.75E-04	1.21E-03	0.12	1
Copper	0.90%	0.03	2.31E-04	1.01E-03	0.10	1
Lead			2.27E-05	9.96E-05	0.01	2
Nickel	0.050%	0.03	1.29E-05	5.63E-05	0.01	1
Silicon	0.45%	0.03	1.16E-04	5.07E-04	0.05	2
Tin	1.98%	0.03	5.09E-04	2.23E-03	0.22	1
Zinc Oxide	57.75%	0.03	0.018	0.10	10.08	1
Total HAPs				1.56E-04	1.56E-02	

Note:

1. Based on percentage of pollutant in dust.

2. Based on stack test derived emission factor from a similar facility in Germany.

Roof Vents
RV01, RV02, RV03

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Reference
Annual Operating Hours	8,760	hrs/yr	
Roof Vent Flow	125,400	scfm	1
Control Efficiency	85%	Percent	2
PM Emission Factor	6.24E-09	lb/scf	3

1. Estimated flowrate for the Roof Vent.

2. Efficiency of the roof vent based on F7 Filter Class rating.

3. Emission factor derived from a measurement of 0.1 mg/m^3 at a similar facility in Germany.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate	Annual Emission Rate	Reference
		(lb/hr)	(tpy)	
Roof Vent 01	Filterable PM	0.047	0.21	1
	PM_{10}	0.047	0.21	2
	$PM_{2.5}$	0.047	0.21	3

Emission Calculations

$$\frac{\text{lb pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\ \text{min}}{\text{hour}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate	Emission Factor	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(lb/scf)[1]	(lb/hr)	(tpy)	(tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

Particulate (PM_{10}) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate	Emission Factor	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(lb/scf)1	(lb/hr)	(tpy)	(tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

Particulate ($PM_{2.5}$) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate	Emission Factor	Hourly Emission Rate	Annual Emission Rate	Uncontrolled Annual Emission Rate
		(scfm)	(lb/scf)1	(lb/hr)	(tpy)	(tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

1 Based on a measurement of 0.1 mg/m^3 at a similar operation in Germany.

Roof Vents Bunker 02

RV04, RV05, RV06

Aurubis

Augusta, GA

Inputs

Description	Value	Units	Reference
Annual Operating Hours	8,760	hrs/yr	
Roof Vent Flow	125,400	scfm	1
Control Efficiency	85%	percent	2
PM Emission Factor	6.24E-09	lb/scf	3

1. Estimated flowrate for the Roof Vent.

2. Efficiency of the roof vent based on F7 Filter Classe rating.

3. Emission factor derived from a measurement of 0.1 mg/m^3 at a similar facility in Germany.

Emissions Summary

Source Description	Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Roof Vent 01	Filterable PM	4.70E-02	0.206
	PM_{10}	4.70E-02	0.206
	$PM_{2.5}$	4.70E-02	0.206

Emission Calculations

$$\frac{\text{lb pollutant}}{\text{std ft}^3} \times \frac{\text{std ft}^3}{\text{min}} \times \frac{60\ \text{min}}{\text{hour}} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \times \frac{8{,}760\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Particulate (Filterable PM) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate (scfm)	Emission Factor (lb/scf)[1]	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

Particulate (PM_{10}) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate (scfm)	Emission Factor (lb/scf)[1]	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

Particulate ($PM_{2.5}$) Emissions from the Roof Vent

EP No.	Description	Exhaust Flow Rate (scfm)	Emission Factor (lb/scf)[1]	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Uncontrolled Annual Emission Rate (tpy)
RV01	Roof Vent	125,400	6.24E-09	0.047	0.21	1.37
TOTAL				**0.047**	**0.21**	**1.37**

1 Based on a measurement of 0.1 mg/m^3 at a similar operation in Germany.

Emergency Generator 1

EPEG01

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Operating Hours	500	hrs/yr	1
Engine Rating	2,720	hp	2
Engine Rating	22.00	MMBtu/hr	3
Piston Displacement per Cylinder	3.1	liters	2
Sulfur Content in Diesel Fuel	15	ppm	4

Notes:

1. Emergency generators PTE is based on 100 hours of non-emergency usase.
2. Engine manufacturer has not been determined at this time.
3. Based on 8,089 Btu/hp - "Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry", American Petroleum Institute, August 2009.
4. Per 40 CFR 80.3510(b)(1)(i), represents maximum sulfur content for nonroad diesel fuel.

Emissions Summary

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Total PM	0.89	0.224
PM_{10}	0.89	0.224
$PM_{2.5}$	0.89	0.224
NO_x	12.13	3.03
CO	15.65	3.91
SO_2	3.30E-02	0.01
VOC	5.76	1.44
CO_2e	3,599.83	899.96
Total HAPs	0.03	0.01

Emission Calculation Equations

Criteria pollutant emission calculations based on lb/hp-hr emission factor:

$$\frac{\text{lb pollutant}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP emission calculations based on lb/million Btu emission factor:

$$\frac{\text{lb pollutant}}{10^6 \, Btu} \text{ x } \frac{7{,}000 \text{ Btu}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

Emissions Calculations

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes
Total PM	--	3.29E-04	0.89	0.22	5
PM_{10}	--	3.29E-04	0.89	0.22	5
$PM_{2.5}$	--	3.29E-04	0.89	0.22	5
NO_X	--	4.5E-03	12.13	3.03	5,6
CO	--	5.75E-03	15.65	3.91	5
SO_2		1.2E-05	3.30E-02	8.25E-03	7
VOC	--	2.12E-03	5.76	1.44	5,6
CO_2	163		3,588	897	8
N_2O	1.32E-03		2.91E-02	0.01	9
CH_4	6.61E-03		1.46E-01	3.64E-02	9
CO_2e	--	--	3,600	900	10
Benzene	7.76E-04		1.71E-02	4.27E-03	11
Toluene	2.81E-04		6.18E-03	1.55E-03	11
Xylenes	1.93E-04		4.2E-03	1.06E-03	11
Formaldehyde	7.89E-05		1.7E-03	4.34E-04	11
Acetaldehyde	2.52E-05		5.5E-04	1.39E-04	11
Acrolein	7.88E-06		1.7E-04	4.33E-05	11
Polycylic aromatic hydrocarbons (PAH)	2.12E-04		4.7E-03	1.17E-03	11
Total HAPs	--	--	0.03	8.66E-03	

Notes:

5. Engine is subject to NSPS IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Emission factors used are from 40 CFR 1039 , Appendix I, Table 3, Emission Standards for Tier 3 engines >560 kW. Assume Total PM=PM_{10}=$PM_{2.5}$

6. The nitrogen oxide limit from Table 3 of Appendix I of 40 CFR 1039 is 4 grams NOx+NMHC/kW-hr. Since the limit is for NOx + NMHC, the NOx and VOC limits were calculated using a ratio of 67.8% NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.
7. SO_2 emission factor from AP-4 Section 3.4 - Large Stationary Diesel and All Stationary Duel-fuel Engines Table 3.4-1 and a sulfur content of 0.015%.
8. Emission factor from 40 CFR 98 Table C-1 to Subpart C for petroleum fuel (kg pollutant/MMBtu). Converted kg/MMBtu to lb/MMBtu by (2.205 lb/kg).
9. Emission factor from 40 CFR 98 Table C-2 to Subpart C for petroleum fuel (kg pollutant/MMBtu). Converted kg/MMBtu to lb/MMBtu by (2.205 lb/kg).
10 Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.
11. Emission factors from AP-42 Section 3.3 - Gasoline and Diesel Industrial Engines, Table 3.3-2 (lb/MMBtu).

Emergency Generator 2

EG02

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Operating Hours	500	hrs/yr	1
Engine Rating	2,720	hp	2
Engine Rating	22.00	MMBtu/hr	3
Piston Displacement per Cylinder	3.1	liters	2
Sulfur Content in Diesel Fuel	15	ppm	4

Notes:

1. Emergency generators PTE is based on 100 hours of non-emergency usage.
2. Engine manufacturer has not been determined at this time.
3. Based on 8,089 Btu/hp - "Cmpendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry", American Petroleum Institute, August 2009.
4. Per 40 CFR 80.3510(b)(1)(i), represents maximum sulfur content for nonroad diesel fuel.

Emissions Summary

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Total PM	0.89	0.224
PM_{10}	0.89	0.224
$PM_{2.5}$	0.89	0.224
NO_x	12.13	3.03
CO	15.65	3.91
SO_2	3.30E-02	0.01
VOC	5.76	1.44
CO_2e	3,599.83	899.96
Total HAPs	0.03	0.01

Emission Calculation Equations

Criteria pollutant emission calculations based on lb/hp-hr emission factor:

$$\frac{\text{lb pollutant}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP emission calculations based on lb/million Btu emission factor:

$$\frac{\text{lb pollutant}}{10^6 \, Btu} \text{ x } \frac{7{,}000 \text{ Btu}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

Emissions Calculations

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes
Total PM	--	3.29E-04	0.89	0.224	5
PM_{10}	--	3.29E-04	0.89	0.224	5
$PM_{2.5}$	--	3.29E-04	0.89	0.224	5
NO_X	--	4.5E-03	12.13	3.03	5,6
CO	--	5.75E-03	15.65	3.91	5
SO_2		1.2E-05	3.30E-02	8.25E-03	7
VOC	--	2.12E-03	5.760	1.44E+00	5,6
CO_2	163		3,588	897	8
N_2O	1.32E-03		2.91E-02	0.01	9
CH_4	6.61E-03		1.46E-01	3.64E-02	9
CO_2e	--	--	3,600	900	10
Benzene	7.76E-04		1.71E-02	4.27E-03	11
Toluene	2.81E-04		6.18E-03	1.55E-03	11
Xylenes	1.93E-04		4.2E-03	1.06E-03	11
Formaldehyde	7.89E-05		1.7E-03	4.34E-04	11
Acetaldehyde	2.52E-05		5.5E-04	1.39E-04	11
Acrolein	7.88E-06		1.7E-04	4.33E-05	11
Polycylic aromatic hydrocarbons (PAH)	2.12E-04		4.7E-03	1.17E-03	11
Total HAPs	--	--	0.03	8.66E-03	

Notes:

5. Engine is subject to NSPS IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Must meet the emission limits in 40 CFR 60.4202(a)(2) for 2007 model year emergency engines and later with a maximum power >130 kW (174 hp) < 560 kW (751 hp). Emission factors used are from 40 CFR 1039 , Appendix I, Table 3, Emission Standards for Tier 3 engines >560 kW. Assume Total PM=PM_{10}=$PM_{2.5}$
6. The nitrogen oxide limit from Table 3 of Appendix I of 40 CFR 1039 for Tier 3 engines is 4 grams NOx+NMHC/kW-hr. Since the limit is for NOx + NMHC, the NOx and VOC limits were calculated using a ratio of 67.8%- NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.
7. SO_2 emission factor from AP-4 Section 3.4 - Large Stationary Diesel and All Stationary Duel-fuel Engines Table 3.4-1 and a sulfur content of 0.015%.
8. Emission factor from 40 CFR 98 Table C-1 to Subpart C for petroleum fuel (kg pollutant/MMBtu). Converted kg/MMBtu to lb/MMBtu by (2.205 lb/kg).
9. Emission factor from 40 CFR 98 Table C-2 to Subpart C for petroleum fuel (kg pollutant/MMBtu). Converted tokg/MMBtu to lb/MMBtu by (2.205 lb/kg).
10 Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.
11. Emission factors from AP-42 Section 3.3 - Gasoline and Disel Industrial Engines, Table 3.3-2 (lb/MMBtu).

Emergency Generator 3

EG03

Aurubis
Augusta, GA

Inputs

Description	Value	Units	Notes
Annual Operating Hours	500	hrs/yr	1
Engine Rating	1,360	hp	2
Engine Rating	11.00	MMBtu/hr	3
Piston Displacement per Cylinder	3.1	liters	2
Sulfur Content in Diesel Fuel	15	ppm	4

Notes:

1. Emergency generators PTE is based on 100 hours of non-emergency usage.

2. Engine manufacturer has not been determined at this time.

Estimation Methodologies for the Oil and Natural Gas Industry",

4. Per 40 CFR 80.3510(b)(1)(i), represents maximum sulfur content for nonroad diesel fuel.

Emissions Summary

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Total PM	0.45	0.112
PM_{10}	0.45	0.112
$PM_{2.5}$	0.45	0.112
NO_x	6.06	1.52
CO	7.83	1.96
SO_2	1.65E-02	4.1E-03
VOC	2.88	0.72
CO_2e	1,799.92	449.98
Total HAPs	0.02	4.3E-03

Emission Calculation Equations

Criteria pollutant emission calculations based on lb/hp-hr emission factor:

$$\frac{\text{lb pollutant}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

HAP emission calculations based on lb/million Btu emission factor:

$$\frac{\text{lb pollutant}}{10^6 Btu} \text{ x } \frac{7{,}000 \text{ Btu}}{\text{hp}-\text{hr}} \text{ x engine power output (hp)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{500 \text{ hour}}{\text{year}} \text{ x } \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{\text{ton pollutant}}{\text{year}}$$

Emissions Calculations

Pollutant	Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)	Notes
Total PM	--	3.29E-04	0.45	0.112	5
PM_{10}	--	3.29E-04	0.45	0.112	5
$PM_{2.5}$	--	3.29E-04	0.45	0.112	5
NO_X	--	4.5E-03	6.06	1.52	5,6
CO	--	5.75E-03	7.83	1.96	5
SO_2		1.2E-05	1.65E-02	4.1E-03	7
VOC	--	2.12E-03	2.880	7.20E-01	5,6
CO_2	163		1,794	448	8
N_2O	1.32E-03		1.46E-02	3.6E-03	9
CH_4	6.61E-03		7.28E-02	1.82E-02	9
CO_2e	--	--	1,800	450	10
Benzene	7.76E-04		8.54E-03	2.13E-03	11
Toluene	2.81E-04		3.1E-03	7.73E-04	11
Xylenes	1.93E-04		2.1E-03	5.31E-04	11
Formaldehyde	7.89E-05		8.7E-04	2.17E-04	11
Acetaldehyde	2.52E-05		2.8E-04	6.93E-05	11
Acrolein	7.88E-06		8.7E-05	2.17E-05	11
Polycylic aromatic hydrocarbons (I	2.12E-04		2.3E-03	5.83E-04	11
Total HAPs	--	--	0.02	4.3E-03	

Notes:

5. Engine is subject to NSPS IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Must meet the emission limits in 40 CFR 60.4202(a)(2) for 2007 model year emergency engines and later with a maximum power >130 kW (174 hp) < 560 kW (751 hp). Emission factors used are from 40 CFR 1039 , Appendix I, Table 3, Emission Standards for Tier 3 engines >560 kW. Assume Total PM=PM_{10}=$PM_{2.5}$

6. The nitrogen oxide limit from Table 3 of Appendix I of 40 CFR 1039 for Tier 3 engines is 4 grams NOx+NMHC/kW-hr. Since the limit is for NOx + NMHC, the NOx and VOC limits were calculated using a ratio of 67.8%- NOx to 32.2% VOC. This ratio is based upon the linear relationship of NOx to NMHC from Table 1 of 40 CFR 1039.101 for Tier 4 emission limits of 0.19 g/kW-hr for VOC and 0.40 g/kW-hr for NOx.

7. SO_2 emission factor from AP-4 Section 3.4 - Large Stationary Diesel and All Stationary Duel-

8. Emission factor from 40 CFR 98 Table C-1 to Subpart C for petroleum fuel (kg

9. Emission factor from 40 CFR 98 Table C-2 to Subpart C for petroleum fuel (kg pollutant/MMBtu). Converted tokg/MMBtu to lb/MMBtu by (2.205 lb/kg).

10 Global Warming Potentials from 40 CFR 98 Subpart A Table A-1.

11. Emission factors from AP-42 Section 3.3 - Gasoline and Disel Industrial Engines, Table 3.3-

Paved Roads

Aurubis
Augusta, GA

Paved Road Inputs

Description	Value	Units	Notes
Annual Hours of Operation	8,760	hrs/yr	
Days of Operation per Year	365	days/yr	
Average road surface silt loading *(sL)*	4.0	g/m^2	1
Number of Days with > 0.01 Inches of Rain	105	days/yr	2
Paved Road Control Efficiency	90%	%	3

Particle Size Range[4]	k (lb/VMT)
< 30 μm	0.011
< 15 μm	0.0027
< 10 μm	0.0022
< 2.5 μm	0.00054

Notes:

1. From AP-42, Section 13.2.1, Table 13.2.1-3, updated January 2011
2. Based on average preciipation for Bush Field Airport, Augusta, Georgia (1981 through 2010).
3. From EPA document: *Control of Open Fugitive Dust Sources,* published September 1988.
4. Per AP-42 (Table 13.2.2-2), PM_{30} is assumed equivalent to total suspended particulate matter (TSP).

Paved Roads - Calculation Basis

Calculation methodology derived from AP-42 Section 13.2.1, "*Paved Roads,*" 01/11

$$Emission\ Factor\ (lb/VMT) = k \cdot sL^{0.91} \cdot W^{1.02}$$

$$Emission\ Factor(lb/VMT)\ Extrapolated\ for\ Natural\ Mitigation\ (E_{ext}) = \mathrm{E} \cdot \left(1 - \frac{P}{4N}\right)$$

where: sL = Road surface silt loading, g/m^2
W = Average vehicle weight, tons
k = Particle size multiplier, lb/VMT [1]
1. From AP-42, Section 13.2.1, Table 13.2.1-1, updated January 2011

where: E = Uncontrolled emission factor
P = Number of days with > 0.01 inches of precipitation
N = Number of days in the averaging period (365 for annual)

PM ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Trucks	Vehicle Miles Traveled	Average Vehicle Weight	PM Emission Factor	PM Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(tons/yr)	(lb/hr)	(ton/yr)
Road 01&2	0.16	2,272	374	30.00	1.25	1.16	0.22	4.94E-03	2.17E-02
Road 3, 4, 5, 6	0.16	3,937	648	30.00	1.25	1.16	0.38	8.57E-03	3.75E-02
Road 7	0.33	299	99	30.00	1.25	1.16	0.06	1.31E-03	5.76E-03
Road 8&9	0.49	1,258	614	30.00	1.25	1.16	0.36	8.11E-03	3.55E-02
Road 10&11	0.56	2,309	1,284	30.00	1.25	1.16	0.74	1.70E-02	7.43E-02
Road 12	0.49	2,928	1,437	30.00	1.25	1.16	0.83	1.90E-02	8.32E-02
Road 13	0.37	30	11	30.00	1.25	1.16	0.006	1.48E-04	6.49E-04
Road 14	0.57	373	211	30.00	1.25	1.16	0.12	2.79E-03	1.22E-02
				TOTAL PAVED ROAD PM EMISSIONS			2.71	0.06	0.27

PM10 ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Trucks	Vehicle Miles Traveled	Average Vehicle Weight	PM10 Emission Factor	PM10 Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM10 Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(tons/yr)	(lb/hr)	(ton/yr)
Road 01&2	0.16	2,272	374	30.00	0.249	0.232	0.04	9.89E-04	4.33E-03
Road 3, 4, 5, 6	0.16	3,937	648	30.00	0.249	0.232	0.08	1.71E-03	7.51E-03
Road 7	0.33	299	99	30.00	0.249	0.232	0.01	2.63E-04	1.15E-03
Road 8&9	0.49	1,258	614	30.00	0.249	0.232	0.07	1.62E-03	7.11E-03
Road 10&11	0.56	2,309	1,284	30.00	0.249	0.232	0.15	3.39E-03	1.49E-02
Road 12	0.49	2,928	1,437	30.00	0.249	0.232	0.17	3.80E-03	1.66E-02
Road 13	0.37	30	11	30.00	0.249	0.232	0.00	2.96E-05	1.30E-04
Road 14	0.57	373	211	30.00	0.249	0.232	0.02	5.58E-04	2.44E-03
				TOTAL PAVED ROAD PM EMISSIONS			0.54	0.01	0.05

PM2.5 ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Trucks	Vehicle Miles Traveled	Average Vehicle Weight	PM2.5 Emission Factor	PM2.5 Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM2.5 Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(lb/day)	(lb/hr)	(ton/yr)
Road 01&2	0.16	2272.12	374.13	30.00	0.061	0.057	0.01	2.43E-04	1.06E-03
Road 3, 4, 5, 6	0.16	3937.47	648.36	30.00	0.061	0.057	0.02	4.21E-04	1.84E-03
Road 7	0.33	299.19	99.46	30.00	0.061	0.057	0.00	6.45E-05	2.83E-04
Road 8&9	0.49	1258.38	613.81	30.00	0.061	0.057	0.02	3.98E-04	1.74E-03
Road 10&11	0.56	2309.04	1284.12	30.00	0.061	0.057	0.04	8.33E-04	3.65E-03
Road 12	0.49	2928.29	1437.45	30.00	0.061	0.057	0.04	9.33E-04	4.08E-03
Road 13	0.37	30.31	11.21	30.00	0.061	0.057	0.00	7.27E-06	3.18E-05
Road 14	0.57	373.28	211.07	30.00	0.061	0.057	0.01	1.37E-04	6.00E-04
			TOTAL PAVED ROAD PM EMISSIONS				0.13	0.00	0.01

SUMMARY

Road Segment	Controlled PM		Controlled PM10		Controlled PM2.5	
	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)
PAVED ROAD EMISSIONS						
Road 01&2	0.00	2.17E-02	9.89E-04	4.33E-03	2.43E-04	1.06E-03
Road 3, 4, 5, 6	0.01	3.75E-02	1.71E-03	7.51E-03	4.21E-04	1.84E-03
Road 7	0.00	5.76E-03	2.63E-04	1.15E-03	6.45E-05	2.83E-04
Road 8&9	0.01	3.55E-02	1.62E-03	7.11E-03	3.98E-04	1.74E-03
Road 10&11	0.02	7.43E-02	3.39E-03	1.49E-02	8.33E-04	3.65E-03
Road 12	0.02	8.32E-02	3.80E-03	1.66E-02	9.33E-04	4.08E-03
Road 13	0.00	6.49E-04	2.96E-05	1.30E-04	7.27E-06	3.18E-05
Road 14	0.00	1.22E-02	5.58E-04	2.44E-03	1.37E-04	6.00E-04

Front End Loaders

Aurubis
Augusta, GA

Paved Road Inputs

Description	Value	Units	Notes
Annual Hours of Operation	8,760	hrs/yr	
Days of Operation per Year	365	days/yr	
Average road surface silt loading *(sL)*	4.0	g/m^2	1
Number of Days with > 0.01 Inches of Rain	105	days/yr	2
Paved Road Control Efficiency	0%	%	3

Particle Size Range[4]	k (lb/VMT)
< 30 μm	0.011
< 15 μm	0.0027
< 10 μm	0.0022
< 2.5 μm	0.00054

Notes:

1. From AP-42, Section 13.2.1, Table 13.2.1-3, updated January 2011
2. Based on average preciipation for Bush Field Airport, Augusta, Georgia (1981 through 2010).
3. From EPA document: *Control of Open Fugitive Dust Sources*, published September 1988.
4. Per AP-42 (Table 13.2.2-2), PM_{30} is assumed equivalent to total suspended particulate matter (TSP).

Paved Roads - Calculation Basis

Calculation methodology derived from AP-42 Section 13.2.1, "*Paved Roads*," 01/11

$$Emission\ Factor\ (lb/VMT) = k \cdot sL^{0.91} \cdot W^{1.02}$$

where: sL = Road surface silt loading, g/m^2
W = Average vehicle weight, tons
k = Particle size multiplier, lb/VMT[1]

where: E = Uncontrolled emission factor
P = Number of days with > 0.01 inches of precipitation
N = Number of days in the averaging period (365 for annual)

1. From AP-42, Section 13.2.1, Table 13.2.1-1, updated January 2011

PM ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Front Loaders per Year	Vehicle Miles Traveled	Average Vehicle Weight	PM Emission Factor	PM Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(tons/yr)	(lb/hr)	(ton/yr)
A	0.14	8,245	1,153	19.25	0.79	0.74	0.42	0.097	0.42
B	0.071	10,626	759	19.25	0.79	0.74	0.28	0.064	0.28
				AL FRONT END LOADERS PM EMISSI			0.70	0.161	0.70

PM_{10} ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Front Loaders per Year	Vehicle Miles Traveled	Average Vehicle Weight	PM10 Emission Factor	PM10 Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM10 Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(tons/yr)	(lb/hr)	(ton/yr)
A	0.14	8,245	1,153	19.25	0.159	0.147	0.085	0.019	0.085
B	0.071	10,626	759	19.25	0.159	0.147	0.056	0.013	0.056
				TOTAL PAVED ROAD PM EMISSIONS			0.14	0.032	0.14

$PM_{2.5}$ ROADWAY EMISSIONS

Road Segment	Road Segment Distance	Number of Front Loaders per Year	Vehicle Miles Traveled	Average Vehicle Weight	PM2.5 Emission Factor	PM2.5 Extrapolated Emission Factor	Uncontrolled Emission Rate	Controlled PM2.5 Emission Rate	
	(miles)	(Turcks/yr)	(VMT/yr)	(tons)	(lb/VMT)	(lb/VMT_{ext})	(lb/day)	(lb/hr)	(ton/yr)
A	0.14	8244.94	1152.71	19.25	0.039	0.036	0.021	4.76E-03	0.021
B	0.071	10626.00	759.31	19.25	0.039	0.036	0.014	3.13E-03	0.014
				AL FRONT END LOADERS PM EMISSI			0.035	7.89E-03	0.035

SUMMARY

Road Segment	Controlled PM		Controlled PM10		Controlled PM2.5	
	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)	(lb/hr)	(ton/yr)
PAVED ROAD EMISSIONS						
A	0.10	0.42	0.019	0.085	4.76E-03	0.021
B	0.064	0.28	0.013	0.056	3.13E-03	0.014

ICW Cooling Tower

CT01

Aurubis

Augusta, Georgia

Inputs

Description	Value	Units	Notes
Annual Operating Hours	8,760	hrs/yr	
Cooling Tower Circulating Water Rate	3,085.00	gal/min	1
Percent Drift	0.001%	%	2
Total Dissolved Solids (TDS) Content	1,365	ppm	
Percent of Filterable PM that is PM_{10}	74.68%	%	3
Percent of Filterable PM that is $PM_{2.5}$	0.22%	%	3

Notes:

1. Cooling tower vendor rated cooling capacity.
2. Based on BACT requirements for High Efficiency Drift Eliminator.
3. Conservatively based on an expanded Reisman-Frisbie method.

Emissions Summary

Pollutant	Hourly Emission Rate	Annual Emission Rate
	(lb/hr)	(tpy)
Filterable PM	2.11E-02	9.23E-02
PM_{10}	1.57E-02	6.89E-02
$PM_{2.5}$	4.7E-05	2.07E-04

Emission Calculation Equations

Particulate emission calculations based on percent drift and TDS content:

$$\text{Cooling Water Circulating Rate}\left(\frac{\text{gal}}{\text{min}}\right) \text{ x \% Drift x} \frac{\text{TDS Content (ppm)}}{1{,}000{,}000} \text{ x } \frac{\text{60 min}}{\text{hour}} \text{ x } \frac{\text{8.34 lb}}{\text{gal}} \times \text{Particle Size Distribution (\%)} = \frac{\text{lb pollutant}}{\text{hour}}$$

$$\frac{\text{lb pollutant}}{\text{hour}} \text{ x } \frac{\text{8,760 hours}}{\text{year}} \text{ x } \frac{\text{ton}}{\text{2,000 lbs}} = \frac{\text{ton pollutant}}{\text{year}}$$

Emission Calculations

Pollutant	Cooling Tower Circulating Water Rate	% Drift	Drift Rate	Total Dissolved Solids Content	Particle Size Distribution[(5)]	Hourly Emission Rate	Annual Emission Rate
	(gal/min)	%	(gal/min)	(ppm)	%	(lb/hr)	(tpy)
Filterable PM	3,085	0.001%	0.03	1,365	100%	2.11E-02	9.23E-02
PM_{10}	3,085	0.001%	0.03	1,365	74.68%	1.57E-02	6.89E-02
$PM_{2.5}$	3,085	0.001%	0.03	1,365	0.22%	4.72E-05	2.07E-04

Notes:

5. Particulate size distribution is based on the a geometric relationship between the aerodynamic diameter of the water droplets and the aerodynamic diameter of the particulate contained inside the droplet and an emission rate using data from a test conducted by Environmental Systems Corporation at the Electric Power Research Institute (EPRI). Please see "Calculating Realistic PM_{10} Emissions From Cooling Towers." Reisman-Frisbie. Environmental Progress 21 (July 2002): Pages 127-130 for more details.

APPENDIX C GEORGIA SIP AIR PERMIT APPLICATION FORM

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

EXPEDITED PERMITTING PROGRAM – APPLICATION FOR ENTRY TO PROGRAM FOR AIR PERMITS

EPD Use Only

Date Received: _____ Application No. _____

To be eligible for expedited review, this application form must be accompanied by the complete permit application for the type of air permit being requested.

1. Contact Information

Facility Name: *Aurubis Richmond LLC*

AIRS No. (if known): 04-13- -

Contact Person: *Dr. Hans L. Rosenstock* Title: *President*

Telephone No.: *49-40-78832123* Alternate Phone No.: *49-173-8696175*

Email Address: *H.Rosenstock@aurubis.com*

If EPD is unable to contact me, please contact the alternate contact person:

Contact Person: *Jan Drzymalla* Title: *Senior Environmental Manager*

Telephone No.: *49-40-7883-3623* Alternate Phone No.: *49-173-7145094*

Email Address: *J.Drzymalla@aurubis.com*

On Page 2 of this form, please check the appropriate box for which type of air permit you are requesting expedited review.

I have read the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I have participated in the required pre-application meeting with EPD. I understand that it is my responsibility to ensure an application of the highest quality is submitted and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.

Signature: _____ Date: 31-03-2022

2. Applying For Which Type Of Permit: (Please Check Appropriate Box)

Expedited Review Fees for Air Permits	
Permit Type – Please Check One	**Expedited Review Fee* as of March 1, 2021**
☐ Generic Permit: Concrete Batch Plant – Minor Source	$1,250
☐ Generic Permit: Concrete Batch Plant – Synthetic Minor Source	$1,875
☐ Generic Permit: Hot Mix Asphalt Plant – Synthetic Minor Source	$2,500
☐ Minor Source Permit (or Amendment)	$3,750
☒ Synthetic Minor Permit (or Amendment)	$5,000
☐ Major Source SIP Permit not subject to PSD or 112(g)	$7,500
☐ Title V 502(b)(10) Permit Amendment	$5,000
☐ Title V Minor Modification with Construction	$5,000
☐ Title V Significant Modification	$7,500
☐ Major Source SIP Permit subject to 112(g) but not subject to PSD	$18,750
☐ PSD Permit (or Amendment) not subject to NAAQS and/or PSD Increment Modeling	$18,750
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling but not subject to Modeling for $PM_{2.5}$, NO_2, or SO_2	$25,000
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2	$31,250
☐ PSD Permit (or Amendment) subject to NAAQS and/or PSD Increment Modeling for $PM_{2.5}$, NO_2, or SO_2 and also impacting a Class I Area	$37,500
☐ Nonattainment NSR Review Permit (or Amendment)	$50,000
* Do not send fee payment with this form. Upon acceptance of application for the expedited permit program, EPD will notify you and an invoice will appear on GECO. Fees must be paid via check to “Georgia Department of Natural Resources” within ten (10) business days of acceptance.	

3. Comments.

This section is optional. Applicants may use this field to include specific comments or requests for EPD consideration. For example, the applicant may use this field to request a public hearing or to remind EPD of review time needs and/or expectations that may differ from the time frames in the procedures.

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

EPD Use Only

Date Received: _____ Application No. _____

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: *Aurubis Richmond LLC*

AIRS No. (if known): 04-13- -

Facility Location: Street: *Valencia Way (Augusta Corporate Park)*

City: *Augusta* Georgia Zip: _____ County: *Richmond*

Is this facility a "small business" as defined in the instructions? Yes: ☐ No: ☒

2. Facility Coordinates

Latitude: *33°16'09.3"* **NORTH** Longitude: *81°55'52.4"* **WEST**

UTM Coordinates: *413,254* **EAST** *3,681,660* **NORTH** **ZONE** *17*

3. Facility Owner

Name of Owner: *Aurubis Richmond LLC*

Owner Address Street: *1105 W Peachtree Street NE STE 1000*

City: *Atlanta* State: *GA* Zip: *30309*

4. Permitting Contact and Mailing Address

Contact Person: *Jeff Twaddle* Title: *Partner, Engineer*

Telephone No.: *615 - 656 - 4636* Ext. _____ Fax No.: _____

Email Address: *Jeff.Twaddle@erm.com*

Mailing Address: Same as: Facility Location: ☐ Owner Address: ☐ Other: ☒

If Other: Street Address: *5000 Meridian Blvd*

City: *Franklin* State: *TN* Zip: *37067*

5. Authorized Official

Name: *Hans Rosenstock* Title: *President*

Address of Official Street: *1105 W Peachtree Street NE STE 1000*

City: *Atlanta* State: *GA* Zip: *30309*

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature: _____ Date: 31·03·2022

6. Reason for Application: (Check all that apply)

☒ New Facility (to be constructed)

☐ Existing Facility (initial or modification application)

☒ Permit to Construct

☐ Permit to Operate

☐ Change of Location

☐ Permit to Modify Existing Equipment: Affected Permit No.: _____

☐ Revision of Data Submitted in an Earlier Application

Application No.: _____

Date of Original Submittal: _____

7. Permitting Exemption Activities (for permitted facilities only):

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☒ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. Has assistance been provided to you for any part of this application?

☐ **No** ☐ **Yes, SBAP** ☒ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: *ERM*

Name of Contact: *Jeffrey H. Twaddle*

Telephone No.: *615.656.4636* Fax No.: _____

Email Address: *Jeff.Twaddle@erm.com*

Mailing Address: Street: *5000 Meridian Blvd, Suite 300*

City: *Franklin* State: *TN* Zip: *37067*

Describe the Consultant's Involvement:

Prepared permit application, completed the EPD forms, calculated project emissions, conducted a regulatory review and conducted air quality modeling.

9. Submitted Application Forms: Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
2	2.00 Emission Unit List
1	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
1	2.06 Manufacturing and Operational Data
1	3.00 Air Pollution Control Devices (APCD)
1	3.01 Scrubbers
1	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
1	5.00 Monitoring Information
1	6.00 Fugitive Emission Sources
1	7.00 Air Modeling Information

10. Construction or Modification Date

Estimated Start Date: **2022/2023**

11. If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?

☐ No ☐ Yes Not confidential

12. New Facility Emissions Summary **Actual emissions based on estimated 4 weeks of down-time per year.**

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	67.32	62.16
Nitrogen oxides (NOx)	81.19	74.97
Particulate Matter (PM) (filterable only)	65.97	60.91
PM <10 microns (PM10)	64.35	59.41
PM <2.5 microns (PM2.5)	63.96	59.05
Sulfur dioxide (SO_2)	21.27	19.64
Volatile Organic Compounds (VOC)	10.11	9.33
Greenhouse Gases (GHGs) (in CO2e)	38,273	35,337
Total Hazardous Air Pollutants (HAPs)	2.01	1.86
Individual HAPs Listed Below:		
See accompanying Report and Appendix B of the report for detailed descriptions of HAP emissions.		

13. Existing Facility Emissions Summary

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)				
Nitrogen oxides (NOx)				
Particulate Matter (PM) (filterable only)				
PM <10 microns (PM10)				
PM <2.5 microns (PM2.5)				
Sulfur dioxide (SO_2)				
Volatile Organic Compounds (VOC)				
Greenhouse Gases (GHGs) (in CO2e)				
Total Hazardous Air Pollutants (HAPs)				
Individual HAPs Listed Below:				

14. 4-Digit Facility Identification Code:

SIC Code: *3341* SIC Description: *Secondary Smelting and Refining of Nonferrous Metals*

NAICS Code: *331423* NAICS Description: *Secondary Smelting, Refining and Alloying of Copper*

15. Description of general production process and operation for which a permit is being requested. If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

Aurubis plans to construct a facility in Augusta, Georgia to reprocess scrap material (circuit boards, cables, metal fractions) into blister copper ingots for further refining at other smelters.

16. Additional information provided in attachments as listed below:

Attachment A - ***Report (Project Description, Emissions Summary, Regulatory Analysis, Process Flow Diagram, and Site Layout))***

Attachment B -

Attachment C -

Attachment D -

Attachment E -

Attachment F -

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal:

☒ Flow Diagram or date of previous submittal:

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☐ **No** ☒ **Yes, please list below:**

19. List requested permit limits including synthetic minor (SM) limits.

<100 tpy NO_X, CO, VOC, SO_2. PM, PM_{10}, and $PM_{2.5}$
<25 tpy total HAPs
<10 tpy single HAP

20. Effective March 1, 2019, permit application fees will be assessed. The fee amount varies based on type of permit application. Application acknowledgement emails will be sent to the current registered fee contact in the GECO system. If fee contacts have changed, please list that below:

Fee Contact name:

Fee Contact email address:

Fee Contact phone number:

Fee invoices will be created through the GECO system shortly after the application is received. It is the applicant's responsibility to access the facility GECO account, generate the fee invoice, and submit payment within 10 days after notification.

Facility Name: *Richmond LLC* **Date of Application:** *11 April 2022*

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
TBRC 1&2	Top Blown Rotary Converter – 1&2 and Operational Heaters and Preheaters	SMS	12 m^3 rotary tilt-able furnace for smelting copper
COMB01	Combustor 01	SMS	Combustor to control CO and VOC and NOX
TBRC 3&4	Top Blown Rotary Converter – 3&4 and Operational Heaters and Preheaters	SMS	12 m^3 rotary tilt-able furnace for smelting copper
COMB02	Combustor 02	SMS	Combustor to control CO and VOC and NO_X
LH	Ladle Heater	SMS	Ladle Heater
LTAF/LTS	Lead Tin Alloy Furnace, Heater and Ladle Treatment Stand	SMS	5.5 m^3 Lead Tin Alloy Furnace
SHF / CCU / DSG	Slag Handling Furnace/ Copper Casting Copper Casting Unit and Dry Slag Granulation	SMS	37 m^3 Slag Holding Furnace. Includes the Copper Casting Unit and Slag Granulation
RMS	Raw Material Storage and Handling	NA	Outside Material Storage and Handling
SAMPFs	Sampling Furnaces	SMS	6 Electric Sampling Furnaces
SLAG	Slag Storage and Handling	NA	Slag Storage and Handling
FDS01	Flue Dust Silo 01	SMS	80 m^3 Flue Dust Silo with Bin Vent for BH01 Flue Dust
FDS02	Flue Dust Silo 02	SMS	80 m^3 Flue Dust Silo with Bin Vent for BH05 Flue Dust

Emission Unit ID	Name	Manufacturer and Model	Description
CS01	Carbon Silo 01	SMS	30 m^3 Carbon Silo with Bin Vent for use in BH01
CS02	Carbon Silo 02	SMS	30 m^3 Carbon Silo with Bin Vent for use in BH05
CT01	Cooling Tower 01	SMS	3,085 gal/min Indirect Contact Cooling Tower
EG01	Emergency Generator 01	TBD	2,720 hp Diesel Fired Emergency Generator
EG02	Emergency Generator 02	TBD	2,720 hp Diesel Fired Emergency Generator
EG03	Emergency Generator 03	TBD	1,360 hp Diesel Fired Emergency Generator
SP	Slag Pile	TBD	Slag Storage and Handling
RV01-06	6 Roof Vents	TBD	6 Roof Ventilations (filtered) to Exchange Air in Bunker Bay of the Melt-shops

Facility Name: Aurubis Richmond LLC **Date of Application:** 11 April 2022

FORM 2.01 – BOILERS AND FUEL BURNING EQUIPMENT

Emission Unit ID	Type of Burner	Type of Draft[1]	Design Capacity of Unit (MMBtu/hr Input)	Percent Excess Air	Dates		Date & Description of Last Modification
					Construction	Installation	
TBRC 1&2 Heaters	Low NO_X	Natural gas	68.24		2022/2023	2022/2023	New
TBRC 1&2 Preheaters	Low NO_X	Natural gas	13.64		2022/2023	2022/2023	New, do not operate at the same time as the TBRC heaters
LTAF	Low NO_X	Natural gas	13.65		2022/2023	2022/2023	New
Ladle Heater	Low NO_X	Natural gas	17.06		2022/2023	2022/2023	New
SHF	Low NO_X	Natural gas	14.33		2022/2023	2022/2023	New
Comb01	Low NO_X	Natural gas	6.82		2022/2023	2022/2023	New
TBRC 3&4 Heaters	Low NO_X	Natural gas	68.24		2025/2026	2025/2026	New
TBRC 3&4 Preheaters	Low NO_X	Natural gas	13.64		2025/2026	2025/2026	New, do not operate at the same time as the TBRC heaters
Comb02	Low NO_X	Natural gas	6.82		2025/2026	2025/2026	New
Launders	Low NO_X	Natural gas	3.75		2022/2023	2022/2023	New
EG01	NA	Internal Combustion	22.00		2022/2023	2022/2023	New
EG02	NA	Internal Combustion	22.00		2022/2023	2022/2023	New
EG03	NA		11.00		2022/2023	2022/2023	New

[1] This column does not have to be completed for natural gas only fired equipment.

Facility Name: Aurubis Richmond LLC **Date of Application:** 11 April 2022

FUEL DATA

Emission Unit ID	Fuel Type	Potential Annual Consumption				Hourly Consumption		Heat Content		Percent Sulfur		Percent Ash in Solid Fuel	
		Total Quantity		Percent Use by Season									
		Amount	Units	Ozone Season May 1 - Sept 30	Non-ozone Season Oct 1 - Apr 30	Max.	Avg.	Min.	Avg.	Max.	Avg.	Max.	Avg.
TBRC 1&2 Heaters and Preheaters	Natural Gas	222.79	$MMft^3$	50%	50%	0.067	0.067	1,020	1,020	Nil	Nil	NA	NA
LTAF	Natural Gas	47.17	$MMft^3$	50%	50%	0.013	0.013	1,020	1,020	Nil	Nil	NA	NA
Ladle Heater	Natural Gas	61.15	$MMft^3$	50%	50%	0.0067	0.0067	1,020	1,020	Nil	Nil	NA	NA
SHF	Natural Gas	44.76	$MMft^3$	50%	50%	0.014	0.014	1,020	1,020	Nil	Nil	NA	NA
Comb01	Natural Gas	0.67	$MMft^3$	50%	50%	0.0067	0.0067	1,020	1,020	Nil	Nil	NA	NA
TBRC 3&4 Heater and Preheaters	Natural Gas	222.79	$MMft^3$	50%	50%	0.067	0.067	1,020	1,020	Nil	Nil	NA	NA
Comb02	Natural Gas	0.67	$MMft^3$	50%	50%	0.0067	0.0067	1,020	1,020	Nil	Nil	NA	NA
Launders	Natural Gas	3.31	$MMft^3$	50%	50%	0.0037	0.0037	1,020	1,020	Nil	Nil	NA	NA
EG01	Diesel	31,200	gal	50%	50%	156	156	141,000	141,000	15 ppm	15 ppm	NA	NA
EG02	Diesel	31,200	gal	50%	50%	156	156	141,000	141,000	15 ppm	15 ppm	NA	NA
EG03	Diesel	7,801	gal	50%	50%	78	78	141,000	141,000	15 ppm	15 ppm	NA	NA

Fuel Supplier Information

Fuel Type	Name of Supplier	Phone Number	Supplier Location

			Address	City	State	Zip
Natural Gas	Atlanta Gas Light	800.427.5463	1450 Greens St. Suite 3500	Augusta	GA	30901
Diesel	TBD					

Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 2.06 – MANUFACTURING AND OPERATIONAL DATA

Normal Operating Schedule: 24 hours/day 7 days/week 52 weeks/yr

Additional Data Attached? ☐ - No ☒ - Yes, please include the attachment in list on Form 1.00, Item 16.

Seasonal and/or Peak Operating Periods: NA

Dates of Annually Occurring Shutdowns: TBD

PRODUCTION INPUT FACTORS

Emission Unit ID	Emission Unit Name	Const. Date	Input Raw Material(s)	Annual Input	Hourly Process Input Rate		
					Design	Normal	Maximum
TBRC 1&2	*Top Blown Rotary Converters 1&2*	*2022/ 2023*	*Copper bearing raw materials*	*101,764 tons/yr*	*18,2 tons/hr Average input rate*		
			Flux materials (Iron oxide, silica, limestone)	*28,319 tons/yr*			
TBRC 3&4	*Top Blown Rotary Converters 3&4*	*2025/ 2026*	*Copper bearing raw materials*	*101,764 tons/yr*	*18,2 tons/hr Average input rate*		
			Flux materials (Iron oxide, silica, limestone)	*28,319 tons/yr*			

PRODUCTS OF MANUFACTURING

Emission Unit ID	Description of Product	Production Schedule		Hourly Production Rate (Give units: e.g. lb/hr, ton/hr)			
		Tons/yr	Hr/yr	Design	Normal	Maximum	Units
SHF/CCU/ DSG	*Copper Ingots*	*79,944*	*1,800*	*55.1*	*44,4*	*55.1*	*ton/hr*
	Slag	*106,484*	*1,800*	*71.7*	*59,1*	*71.7*	*ton/hr*

Facility Name: Aurubis Richmond LLC **Date of Application:** 11 April 2022

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
BH01	TBRC 1 & 2	Baghouse	2022/2023	SMS	NO	390	390	146,800
BH03	Secondary 01	Baghouse	2022/2023	SMS	NO	105	105	311,100
BH05	TBRC 3 & 4	Baghouse	2025/2026	SMS	NO	390	390	146,800
SC01	TBRC 1 & 2	Scrubber	2022/2023	SMS	NO	390	170	117,400
SC02	TBRC 3 & 4	Scrubber	2025/2026	SMS	NO	390	170	117,400
COMB01	TBRC 1 & 2	Combustor	2022/2023	SMS	NO	1,840	1,765	256,400
COMB02	TBRC 3 & 4	Combustor	2025/2026	SMS	NO	1,840	1,765	256,400
BH06	Secondary 02	Baghouse	2025/2026	SMS	NO	105	105	234,900
SNCR 01	TBRC 1&2	SNCR	2022/2023	SMS	NO	1,815	1,765	256,400
SNCR 02	TBRC 3&4	SNCR	2025/2026	SMS	NO	1,815	1,765	256,400
BH02	LTAF/LTS	Baghouse	2022/2023	SMS	NO	220	220	48,900
BH04	SHF / CCU / DSG	Baghouse	2022/2023	SMS	NO	280	280	282,600
QC01	QC01	Quench 01	2022/2023	SMS	NO	1,765	390	146,800
QC02	QC02	Quench 02	2025/2026	SMS	NO	1,765	390	146,800
BV01	Carbon Silo 1	Filter	2022/2023	TBD	NO	125	125	50
BV02	Dust silo 1	Filter	2022/2023	TBD	NO	80	80	300
BV03	Urea silo 1	Filter	2022/2023	TBD	NO	80	80	80

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
BV04	Carbon Silo 2	Filter	2025/2026	TBD	NO	80	80	50
BV05	Dust silo 2	Filter	2025/2026	TBD	NO	80	80	300
BV06	Urea silo 2	Filter	2025/2026	TBD	NO	80	80	70
RV01	Roof Vent	Filter	2022/2023	TBD	NO	125	125	41,800
RV02	Roof Vent	Filter	2022/2023	TBD	NO	125	125	41,800
RV03	Roof Vent	Filter	2022/2023	TBD	NO	125	125	41,800
RV04	Roof Vent	Filter	2022/2023	TBD	NO	125	125	41,800
RV05	Roof Vent	Filter	2025/2026	TBD	NO	125	125	41,800
RV06	Roof Vent	Filter	2025/2026	TBD	NO	125	125	41,800

Facility Name: Aurubis Richmond LLC **Date of Application:** 11 April 2022

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
BH01	Particulate matter	99%	99%	See Emission Calculations				<8.0
BH02	Particulate matter	99%	99%					<8.0
BH03	Particulate matter	99%	99%					<8.0
BH04	Particulate matter	99%	99%					<8.0
BH05	Particulate matter	99%	99%					<8.0
BH06	Particulate Matter	99%	99%					<8.0
SC01	HBr, HCl, HF	90%	90%					NA
SC02	HBr, HCl, HF	90%	90%					NA
NSCR01	NOx	65%	65%					NA
NSCR01	NOx	65%	65%					NA
Comb 01	Dioxins, VOC, CO	NA	NA					NA
Comb 02	Dioxins, VOC, CO	NA	NA					NA

Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 3.01 – SCRUBBERS

APCD Unit ID	Scrubber Type	Materials of Construction (Plastic, 1040 steel, etc.)	Scrubbant	pH Range	Pressure Drop Range (inches of H2O)	Minimum Scrubbant Flow Rate (Gal/min)	Is Scrubbant Recirculated?	Minimum Makeup Rate (Gal/min)	Size of Pond or Holding Tank (Acre-ft or gal)
SC01	*Integrated Packed Bed Column*	*E-CTFE / FRP or Equivalent*	*Sodium Hydroxide* *Sodium Bisulfite*	*6.0 – 9.0*	*TBD*	*TBD*	*Yes*	*1.3* *0.3*	*Tank under the scrubber in front of the pumps*
SC02	*Integrated Packed Bed Column*	*E-CTFE / FRP or Equivalent*	*Sodium Hydroxide* *Sodium Bisulfite*	*6.0 – 9.0*	*TBD*	*TBD*	*Yes*	*1.3* *0.3*	*Tank under the scrubber in front of the pumps*
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Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 3.02 – BAGHOUSES & OTHER FILTER COLLECTORS

APCD ID	Filter Surface Area (ft^2)	No. of Bags	Inlet Gas Dew Point Temp. (°F)	Inlet Gas Temp. (°F)	Bag or Filter Material	Pressure Drop (inches of water)	Cleaning Method	Gas Cooling Method	Leak Detection System Type
BH01	53,150	TBD	TBD	390	PI/PTFE	< 8.0	Pulse Jet	Pre-Quenched	Bag Leak Detection System
BH02	20,000	TBD	TBD	220	NOMEX	< 8.0	Pulse Jet	False Air Cooling	Bag Leak Detection System
BH03	119,650	TBD	TBD	105	Polyester	< 8.0	Pulse Jet	No	Bag Leak Detection System
BH04	79,750	TBD	TBD	280	NOMEX	< 8.0	Pulse Jet	False Air Cooling	Bag Leak Detection System
BH05	53,150	TBD	TBD	390	PI/PTFE	< 8.0	Pulse Jet	Pre-Quenched	Bag Leak Detection System
BH06	75,200	TBD	TBD	105	Polyester	< 8.0	Pulse Jet	No	Bag Leak Detection System

Attach a physical description, dimensions and drawings for each baghouse and any additional information available such as particle size, maintenance schedules, monitoring procedures and breakdown/by-pass procedures. Explain how collected material is disposed of or utilized. Include the attachment in the list on Form 1.00 *General Information*, Item 16

Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
See detailed emission calculations contained in the Appendix B to the report.								

Facility Name: *Aurubis Richmond* LLC **Date of Application:** *11 April 2022*

FORM 5.00 MONITORING INFORMATION

Emission Unit ID/ APCD ID	Emission Unit/APCD Name	Monitored Parameter		Monitoring Frequency
		Parameter	Units	
TBRC 1&2/BH01	TBRC 1&2/Baghouse 01	Bag Leak Detection System	NA	Continuous
LATF / BH02	LATF / Baghouse 02	Bag Leak Detection System	NA	Continuous
Secondary 01 / BH03	Secondary 01 / Baghouse 03	Bag Leak Detection System	NA	Continuous
SHF / BH04	SHF / Baghouse 04	Bag Leak Detection System	NA	Continuous
TBRC 3&4 / BH05	TBRC 3&4 / Baghouse 05	Bag Leak Detection System	NA	Continuous
Secondary 02 / BH06	Secondary 02 / Baghouse 06	Bag Leak Detection System	NA	Continuous
TBRC 1&2 / Comb 01	TBRC 1&2 / Combustor 01	Temperature	^{o}C	Continuous
TBRC 3&4 / Comb 02	TBRC 3&4 /Combustor 02	Temperature	^{o}C	Continuous
TBRC 1&2 / SNRC	TBRC 1&2 / SNCR	NOx, Air Flow, Urea Flow	ppm, ft^3 per minute, gal/min	Continuous
TBRC 3&4 / SNRC	TBRC 3&4 / SNRC	NOx, Air Flow, Urea Flow	ppm, ft^3 per minute, gal/min	Continuous
TBRC 1&2 / Scr 01	TBRC 1&2 / Scrubber 01	Liquor Flow, pH	gal/min, pH	Continuous
TBRC 3&4 / Scr 02	TBRC 3&4 / Scrubber 02	Liquor Flow, pH	gal/min, pH	Continuous

Comments:

Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 6.00 – FUGITIVE EMISSION SOURCES

Fugitive Emission Source ID	Description of Source	Emission Reduction Precautions	Pot. Fugitive Emissions	
			Amount (tpy)	Pollutant
PR	Onsite Paved Roads	Paved Roads	0.54	PM
PR	Onsite Paved Roads	Paved Roads	0.11	PM_{10}
PR	Onsite Paved Roads	Paved Roads	0.027	$PM_{2.5}$
FEL	Front End Loader Activities	Paved Working Areas	1.41	PM
FEL	Front End Loader Activities	Paved Working Areas	0.28	PM_{10}
FEL	Front End Loader Activities	Paved Working Areas	0.069	$PM_{2.5}$
SCRP	Scrap Piles	None	0.073	PM
SCRP	Scrap Piles	None	0.034	PM_{10}
SCRP	Scrap Piles	None	0.0052	$PM_{2.5}$
SP	Slag Pile (including wind erosion)	None	0.42	PM
SP	Slag Pile (including wind erosion	None	0.42	PM_{10}
SP	Slag Pile (including wind erosion	None	0.42	$PM_{2.5}$

Facility Name: *Aurubis Richmond LLC* **Date of Application:** *11 April 2022*

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	Inside Diameter (ft)	Exhaust Direction	Height (ft)	Longest Side (ft)	Velocity (ft/sec)	Temperature (°F)	Flow Rate (acfm)	
									Average	Maximum
EP01A	TBRC 1&2	147.64	8.53	Up	125	427	46.52	160	159,500	159,500
EP01B	TBRC 3&4	147.64	6.56	Up	125	427	56.73	160	115,100	115,100
EP2A	Secondary 01	147.64	12.14	Up	125	427	44.80	105	311,100	311,100
EP2B	Secondary 02	147.64	10.50	Up	125	427	45.22	105	234,900	234,900
EP3	SHF/, CCU/DSG	147.64	10.50	Up	125	427	54.43	280	282,700	282,700
FDS01	FDS1	50.00	0.50	Horizontal	125	427	26.28	Ambient	300	300
FDS02	FDS2	50.00	0.50	Horizontal	125	427	26.28	Ambient	300	300
Slag Storage[a]	Fugitive									

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

[a] **The slag pile is modeled as an aarea source.**

Facility Name: Aurubis Richmond LLC **Date of Application:** *11 April 2022*

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
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APPENDIX D EMMISSION FACTOR SUPORT INFORMATION

Type		Value	Value	Unit	Basis for determination
NOx	Source A	Concentration	62	mg/Nm³	Continuous measurement
	Source B	Concentration	18.55	mg/Nm³	Continuous measurement
CO	Source A	Concentration	13	mg/Nm³	Continuous measurement
	Source B	Hourly load	0.00	kg/h	Regular measurement
HF	Source A	Concentration	0.184	mg/Nm³	Continuous measurement
	Source B	Concentration	0.56	mg/Nm³	Continuous measurement
HCl	Source A	Concentration	0.376	mg/Nm³	Continuous measurement
	Source B	Concentration	0.66	mg/Nm³	Continuous measurement
Dioxin	Source A	Hourly load	0.43	µg/h	Regular measurement
	Source B	Hourly load	0.72	µg/h	Regular measurement
Cd	Source A	Hourly load	0.05	g/h	Regular measurement
	Source B	Hourly load	0.00	g/h	Regular measurement
	Source C	Hourly load	0.00	g/h	Regular measurement
Hg	Source A	Concentration	13	µg/Nm³	Continuous measurement
	Source B	Hourly load	0.82	g/h	Regular measurement
	Source C	Hourly load	6.72	mg/h	Regular measurement
Cr	Source A	Concentration	0.0009	mg/Nm³	Regular measurement
	Source B	Concentration	0.0016	µg/Nm³	Regular measurement
	Source C	Concentration	2.3	µg/Nm³	Regular measurement
Mn	Source A	Concentration	0.0022	mg/Nm³	Regular measurement
	Source B	Concentration	0.0016	µg/Nm³	Regular measurement
	Source C	Concentration	2.3	µg/Nm³	Regular measurement
Sb	Source A	Concentration	0.0009	mg/Nm³	Regular measurement
	Source B	Concentration	0.0016	µg/Nm³	Regular measurement
	Source C	Concentration	2.3	µg/Nm³	Regular measurement
Co	Source A	Concentration	0.0009	mg/Nm³	Regular measurement
	Source B	Concentration	0.0016	µg/Nm³	Regular measurement
	Source C	Concentration	2.3	µg/Nm³	Regular measurement
HBr	Source A	Concentration	0.2	mg/Nm³	Regular measurement
	Source B	Concentration	0.3	mg/Nm³	Regular measurement
Pb	Source A	Concentration	0.01687	mg/Nm³	Regular measurement
	Source B	Hourly load	0.00	g/h	Regular measurement
	Source C	Hourly load	0.00	g/h	Regular measurement
SO2		Concentration			OEM values
NH3		Concentration			OEM values
VOC		Concentration			OEM values