Engineering Evaluation
Hanson Aggregates, Mid-Pacific, Inc.
Pier 94, San Francisco, CA 94124
Plant No. 23564; Application No. 27982

Site Background

Hanson Aggregates, Mid-Pacific, Inc. (Hanson) has applied for an Authority to Construct and Permit to Operate for the following:

S-1 Receiving Hopper to Feed Belt Conveyor (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-2 Feed Belt Conveyor to Boom Stacking Conveyor (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-3 Boom Stacking Conveyor to Stockpiles (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-4 Sand and Aggregate Stockpiles;
Abated by A-1 Water Spray System
Maximum Stockpile Size: Six acres
Includes Road Dust Emissions

Hanson operates a sand and aggregate import terminal located at Pier 94 (at Cargo Way and Jennings Street), in the Port of San Francisco. Concrete sand and various aggregates are imported from off-site mines to Plant# 23564.

Sand and aggregate (i.e., sand, 1" and ½" construction aggregates) are transported by ship to Pier 94. The ship will come alongside Pier 94 with the assistance of two tugboats. Once alongside and ready to offload, the material is unloaded from the ship's holds to the receiving hopper at the facility via the ship's covered enclosed conveyor belts.

The receiving hopper transfers (S-1) the material to a feed belt conveyor, which transfers (S-2) the material to a boom stacking conveyor. Material is then dropped (S-3) into a designated stockpile (S-4), depending on the material's size. Emissions of particulate matter (PM) occur at each transfer point. There is a water spray at the transfer from the feed belt conveyor to the boom stacking conveyor, with moisture control continuing through to the transfer to the stockpile. An on-site water truck sprays water on the material stockpiles to limit fugitive emissions. The conveyors are powered electrically.

Customer trucks are loaded from the stockpiles using front end loaders. Customer loading typically can occur from 5am to 4pm; however operating hours are dependent on customer demands so the site may load trucks outside these hours occasionally. Customers may be loaded with sand or different types of aggregate.

Material is brought to the facility by ship one to three times a month. On days that material is not offloaded from ship, the throughput at S-1, S-2, and S-3 is zero.

Current Site Conditions and Permit Application Criteria

In the original application submittal, the Applicant maintained that the imported sand unloaded and conveyed at the facility has a moisture content above 5%, making it exempt from permits per the District's Regulation 2-1-115.1.4. Hanson Aggregates submitted supporting document that shows the sand moisture content is about 7%.

During a 2016 site visit, an Air District Inspector determined that the moisture content of the sand stored at the facility was 0.2 to 0.5 percent by weight in 2016. The Inspector visited once again on June 20, 2018 and confirmed that the moisture content of the sand was not above 5%. The aggregates that are unloaded also had a moisture content below 5%.

This application is for an Authority to Construct and Permit to Operate for the sand and aggregate loading and unloading operation. Also, Regulation 2-1-115.1.4 does not apply to stockpiles. Therefore, the emissions from stockpiles at the facility will also be evaluated in this application.

Overview of Facility Operations

Material unloading typically occurs one to three times per month. Cargo is unloaded from the ship at a rate of 2,500 tons per hour (TPH); depending on the cargo size, an unloading event can last between 8 to 20 hours. Material is unloaded in a segregated fashion; all sand is unloaded prior to unloading aggregates, or vice versa. Sand is typically approximately 35-45% of the overall cargo and unloading can take approximately 3 to 8 hours. The remainder of the cargo would be aggregates.

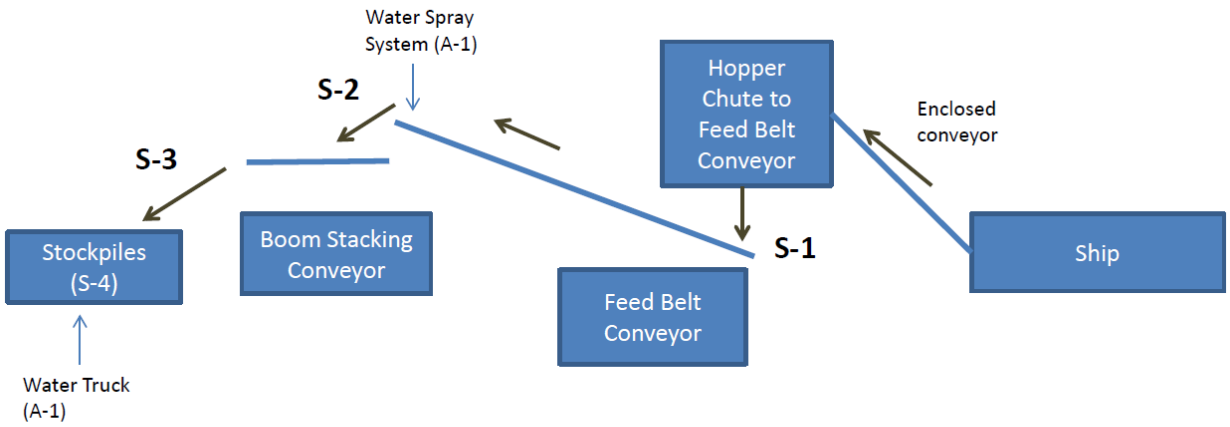
The current operating throughputs for the last three years are presented in the following table:

Year	Throughput [tons/year]
2019	363,309
2018	523,645
2017	431,136
Average	439,363

(Throughput information provided on 3/13/2020)

In this application, the plant is proposing the throughput limit of 1,500,000 TPY of combined sand and aggregates.

PROCESS FLOW DIAGRAM



Legend

Material Flow

Water Suppressant

Hanson Aggregates, Mid-Pacific, Inc.
SF Pier 94 Sand Yard
Pier 94
Port of San Francisco
San Francisco, CA 94124

Emission Calculations

Sand and aggregate will be transferred from ship into Pier 94 via an enclosed conveyor. PM emissions are generated during the drop from the receiving hopper to the feed belt conveyor, the drop from the feed belt conveyor to the boom stacking conveyor, the drop to the stockpiles, wind erosion at the stockpiles, road dust, and the operation of ships to transport materials.

The applicant requested a combined annual sand and aggregate limit of 1,500,000 tons per year in email dated May 21, 2019. The facility requested to retain operational flexibility by not having individual limits for sand and aggregate in the permit conditions. As a result, emissions in this evaluation will be calculated in two ways to ensure a conservative estimate is made for both criteria pollutants and toxic air contaminants.

It is expected that emissions resulting from the transfer of aggregate will be greater than emissions resulting from the transfer of sand (based on the emission factors for each material which is discussed in more detail below). Therefore, for the purposes of Regulation 2, Rule 2, New Source Review, emissions will be based on the conservative assumption that all material processed in Sources 1 through 4 is aggregate.

There are no toxic air contaminants (TACs) in aggregate. Sand, however, contains respirable crystalline silica, which is a TAC. For the purposes of Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants, emissions will be based on the conservative assumption that all material processed in Sources 1 through 4 is sand.

Criteria Pollutant Emissions

The applicant provided the maximum hourly (lb/hr) and daily (lb/day) throughput of combined sand and aggregate for Pier 94:

- 2,500 tons/hour for off-loading from ship
- 60,000 tons/day for off-loading from ship

Table 1 represents the criteria pollutant emission summary as a result of this project. Detailed emission calculations are presented in Appendix A at the end of this evaluation report.

Table 1: Summarized Maximum Criteria Pollutants Emissions in tons per year (TPY)

Sources	$PM_{2.5}$ [TPY]	PM_{10} [TPY]	NO_x [TPY]	CO [TPY]	POC [TPY]	SO_2 [TPY]
S-1	0.375	0.743	-	-	-	-
S-2	0.375	0.743	-	-	-	-
S-3	0.375	0.743	-	-	-	-
S-4	0.084	0.558	-	-	-	-
Road Dust	0.858	3.498	-	-	-	-
Ship Emissions[1]	0.332	0.332	14.261	1.731	0.728	0.246
Total	2.399	6.616	14.261	1.731	0.728	0.246

1 Ocean-Going Vessel (OGV) emissions are included here pursuant to Regulation 2-2-610 for the purpose of assessing the cumulative increase and offset requirements of Regulations 2-2-302 and 2-2-303. These OGV engine emissions are not subject to BACT, PSD, or toxic NSR requirements of Regulation 2, Rule 5. Therefore, OGV engine emissions are not included in the subsequent summary tables. For the purposes of calculating PM emissions from the ship, it is assumed that emissions of $PM_{2.5}$ equal emissions of PM_{10}.

Table 2: Summarized Maximum Criteria Pollutants Emissions in pounds per day (lb/day)

Sources	$PM_{2.5}$ [lb/day]	PM_{10} [lb/day]	BACT Trigger PM_{10} [lb/day]	Is Source Subject to BACT? [Yes/No]
S-1	30.00	59.40	10.0	Yes
S-2	30.00	59.40	10.0	Yes
S-3	30.00	59.40	10.0	Yes
S-4	0.46	3.06	10.0	No
Road Dust	4.70	19.16	10.0	Yes

Toxic Air Contaminant (TAC) Emissions

Respirable crystalline silica is a TAC that is often found in sand. Emissions of respirable crystalline silica at this facility are expected from sand conveying, wind erosion, and dust entrainment. The facility was unable to provide a Material Safety Data Sheet (MSDS) for the sand processed at the facility. Therefore, to estimate respirable crystalline silica, an emission factor obtained from the Journal of the Air & Waste Management Association article, "PM_4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California" was used. This emission factor is based on an average of source test results. As stated before, for a conservative estimate, for the purposes of determining compliance with Regulation 2, Rule 5, the emissions estimate assumes this site processes entirely sand. Emissions resulting from the processing of sand are presented in Appendix A.

A Health Risk Assessment (HRA) was conducted on March 9, 2021 using the estimated respirable crystalline silica emissions presented in Table 3 for emissions from sources S-1 to S-4 and paved roads at Pier 94.

Table 3: Comparison of TAC Emissions to HRA Trigger Levels

TAC	Annual Emission [lb/year]		Trigger Level Table 2-5-1 [lb/year]	Trigger HRA (Yes/ No)
Respirable Crystalline Silica (CAS #7631-86-9)	S-1	29.29	120	Yes
	S-2	29.29		
	S-3	29.29		
	S4	43.78		
	Paved Road	459.98		
	Total	591.64		

Respirable crystalline silica is not carcinogenic and there is no acute health value for this TAC. The project will result in an increase of respirable crystalline silica greater than the chronic trigger level of Regulation 2-5, Table 2-5-1. Therefore, a HRA is required. The results of the HRA are discussed in the Statement of Compliance Section below.

PLANT CUMULATIVE EMISSIONS

Hanson Aggregates, Mid-Pacific, Inc. – SF Pier 94 Sand Yard is located at Pier 94, San Francisco, CA 94124 is an existing unpermitted facility. Therefore, there are no existing emissions at this plant. The cumulative increase will be based on the potential to emit (PTE) for each compound listed in Table 4. Again, as a conservative approach, emissions of PM will be based on the assumption that all material processed in Sources 1 through 4 is aggregate.

Table 4: Cumulative Emissions Increase in tons/year for P# 23564

Pollutant	Existing Emissions [TPY]	New Emissions [TPY]	Total Emissions [TPY]
NOx	0.00	14.261	14.261
CO	0.00	1.731	1.731
POC	0.00	0.728	0.728
PM2.5	0.00	2.399	2.399
PM10	0.00	6.616	6.616
SO2	0.00	0.246	0.246

Statement of Compliance

Regulation 1: General Provisions and Definitions

Regulation 1, Section 301, Public Nuisance, states the following:

"No person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or the public; or which endangers the comfort, repose, health or safety of any such persons or the public, or which causes, or has a natural tendency to cause, injury or damage to business or property. For purposes of this section, three or more violation notices validly issued in a 30-day period to a facility for public nuisance shall give rise to a rebuttable presumption that the violations resulted from negligent conduct."

The facility has not received any public nuisance violations in the past five years and is expected to meet the requirement of Regulation 1-301.

Regulation 2, Rule 1: General Requirements

Regulation 2, Rule 1: California Environmental Quality Act (CEQA) Requirements

Regulation 2, Rule 1, Section 310, Applicability of California Environmental Quality Act (CEQA), specifies that all proposed new and modified sources subject to District permit requirements must be reviewed in accordance with CEQA requirements, except for ministerial projects meeting the requirements of Regulation 2-1-311 or projects exempt from CEQA under Regulation 2-1-312.

The engineering review for this project used standard emission factors and procedures to estimate emissions from this project as described in Permit Handbook Chapter 11.5 Concrete Batch Plants. The decision to approve the permit for this project does not involve any element of discretion. Therefore, this project is ministerial.

In addition, this application is categorically exempt from CEQA review pursuant to Regulations 2-1-312.2 and 2-1-312.11. This project involves the permitting of air pollution control measures, which are exempt from CEQA review pursuant to Regulation 2-1-312.2. This project is also exempt from CEQA review because it involves the permitting of new sources that satisfy the "No Net Emissions Increase" provisions

of Regulation 2, Rule 2, and there is no possibility that the project will have any significant environmental effect in connection with resources other than air quality. The new sources in this application meet the no net emission increase provisions of Regulation 2, Rule 2 by satisfying BACT for each source that triggers BACT using standard BACT evaluation procedures and by meeting Air District offset requirements. Since this facility is not major for particulate matter (PM_{10} or $PM_{2.5}$) or sulfur dioxide (SO_2), offsets are not required for these pollutants. This facility is a small facility for POC and NOx emissions. This facility does not trigger offsets for POC emissions. This facility triggers offsets for NOx emissions, but full NOx emission offsets will be provided from the small facility banking account. Therefore, this project meets the requirements of Regulation 2-1-312.11.3. This project involves the permitting of new sources that result in some toxic emission increases, but the Air District's health risk assessment found that the chronic hazard index is less than 0.2 and the project has no cancer risk. Therefore, this project meets the requirements of Regulation 2-1-312.11.4. This project has no other potentially significant environmental impacts. Therefore, this permitting action is categorically exempt, and no CEQA review is required.

This facility is not within 1,000 feet from the nearest K-12 school and is therefore, not subject to the public notification requirements of Regulation 2-1-412.

Regulation 2-2-301 Best Available Control Technology (BACT)

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with a PTE of 10 pounds or more per highest day of precursor organic compound (POC), non-precursor organic compound (NPOC), nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), or particulate matter (PM_{10} and $PM_{2.5}$). Although NO_x, CO, and POC emissions exceed 10 pounds per day, these emissions are all due to cargo carrier engines. The Air District is restricted from imposing emission standards on cargo carrier engines that are more stringent than the applicable federal standards for these engines. Therefore, no additional BACT review is necessary for these OGV emissions.

Based on the emissions calculations in Table 2 above, emissions from S-1, S-2, S-3, and road dust from paved roads are subject to BACT for the following pollutant(s): PM_{10} inclusive of $PM_{2.5}$. BACT Guidelines for these sources are presented in the Air District's BACT/TBACT Workbook for Solid Material Handling (Conveying, Size, Reduction, Classification) – Wet, Document #156.1, Revision 1, dated 10/18/91.

BACT 1, the most stringent, technologically feasible and cost-effective category: Enclosure and vent to venturi scrubber; or water spray with chemical suppressants.

BACT 2, the achieved in practice category, requires no such cost-effectiveness evaluation:
Water spray or adequate material moisture.

The facility will be required to either 1) enclose and vent to a venturi scrubber or 2) water spray with chemical suppressants unless it is determined that these technologies are not cost effective.

The facility provided a detailed cost effectiveness analysis for both BACT requirements (venturi scrubber and chemical suppressants). The facility was unable to obtain additional engineering/equipment costs, however even with the incomplete costs, the analysis shows that implementing the BACT 1 controls are not cost effective.

Cost Effectiveness Calculation for enclosure:
A venturi scrubber system costs would be $30,000 to $50,000/ unit. Hanson will need two units at Pier 94. Additional operational and labor costs will be included in the cost effectiveness table in Appendix A.

Cost Effectiveness Calculations for use of chemical suppressants:
The baseline annual cost for chemical suppressant would be about $54,000.
Additional operational and labor costs will be included in the cost effectiveness table in Appendix A.

Control Type	Control Efficiency
Watering (Base Case)	70%
Chemical Suppressant	80%
Wet Scrubber	95%

Control Technology Used	Pollutant	Pollutant Maximum Cost ($/ton)	Annual Emissions (tpy)	Annual Emissions Reduction (tpy)
Watering (Base Case)	PM_{10}	5,300	2.23	--
Chemical Suppressant			1.49	0.74
Wet Scrubber			0.37	1.86

The District has adopted guidelines for the maximum cost per ton of air pollutants controlled that would be considered cost-effective. These maximum cost guidelines are consistent with the broad guidelines provided by the California Air Resources Board's Office of Air Quality Planning and Liaison. The Air District's cost effectiveness threshold is $5,300/ ton for PM10.

Control Technology Used	Pollutant	Pollutant Maximum Cost ($/ton)	Annual Emissions (tpy)	Annual Emissions Reduction (tpy)	Total Annualized Operating Cost of BACT Control Technology ($/yr)	Control Implementation Cost ($/ton)
Watering (Base Case)	PM_{10}	5,300	2.23	--	--	--
Chemical Suppressant			1.49	0.74	$79,997	$107,740
Wet Scrubber			0.37	1.86	$58,790	$31,671

Control Technology Used	Pollutant	Pollutant Maximum Cost ($/ton) [1]	Control Implementation Cost ($/ton)	Cost Effective? (Yes/No)
Watering (Base Case)	PM_{10}	5,300	--	--
Chemical Suppressant			$107,740	No
Wet Scrubber			$31,671	No

The cost of implementing the BACT1 control technologies exceeds the Cost-Effective threshold ($5,300/ton) calculated per BAAQMD's BACT/TBACT workbook. Therefore, the facility will be required to meet the BACT2 standard of water spray to meet BACT.

The facility has all paved roadways. The facility will be required to use water spray systems in the permit conditions to meet BACT.

Regulation 2-2-302 Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/year of POC or NO_x per Regulation 2, Rule 2, Section 302.

Regulation 2, Rule 1-213 defines a Facility as:

Any source, building, structure or installation that emits or may emit any air pollutant; or any aggregation of such sources, buildings, structures or installations that re (i) located on one or more contiguous or adjacent properties; (ii) are under common ownership or control' and (iii) are considered to be in the same major industrial grouping (identified by the first two digits of the applicable code in The Standard Industrial Classification Manual).

The Hanson owned Pier 92 facility (Plant #13407) is adjacent to Pier 94 and under common ownership. However, Pier 92's SIC code is 1442 (construction sand and gravel) while Pier 94's SIC code is 4491 (marine cargo handling).

Pier 92 receives sand off-loaded from a domestic barge that mines aggregate from the San Francisco Bay. After off-loading, the facility screens and washes the sand before stockpiling and loading it into customer trucks. Pier 92 is considered a mine site, and as such is regulated by the Mine Safety and Health Administration (MSHA) for safety matters.

Pier 94 is an international maritime cargo terminal. Cargo (sand and gravel) is unloaded in bulk from international ocean-going vessels into stockpiles which is loaded into customer trucks with no processing onsite. Furthermore, employees at Pier 94 are stevedores employed by Pacific Warehouse, not Hanson. Pier 94 is not considered a mine site.

Because the two facilities do not share the first two digits of the SIC code and have different operations, they are not considered the same facility per the definition. As a result, offsets for both facilities will not be combined.

Regulation 2-2-610 for emission calculation procedures from cargo carries states:

"For the purposes of applying the offset requirements of Section 2-2-302 and 2-2-303, a facility's potential to emit and cumulative increase shall be calculated including emissions from cargo carriers (other than motor vehicles) associated with the sources at the facility. When applying these offset requirements, facilities that include cargo loading or unloading from cargo carriers other than motor vehicles shall include the cargo carriers as part of the source that receives or loads the cargo.

All emissions from such cargo carriers while operating in the District, or within California Coastal Waters up to 11 nautical miles from the Golden Gate Bridge, shall be included as part of the source's emissions."

Pier 94 (Plant #23564) has a PTE of 14.26 TPY of NOx from the operation of 14 Ocean Going Vessels (OGVs). Offsets are required for this application because NOx is more than 10 TPY but less than 35 TPY. The emission offsets will be provided by the District's Small Facility Banking Account.

The emissions of POC from the facility are less than 10 tons per year and no POC offsets are required.

<u>Regulation 2-2-303 Offset Requirements, $PM_{2.5}$, PM_{10} and Sulfur Dioxide</u>

Regulation 2-2-303 requires offsets for any new or modified source at a major facility with a potential to emit 100 tons per year or more of PM_{10}, $PM_{2.5}$, or sulfur dioxide (SO_2). As shown in Table 1, emissions are: 6.62 tons per year of PM_{10}, 2.40 tons per year of $PM_{2.5}$, and 0.25 tons per year of SO_2. Since this facility has a potential to emit that is less than 100 tons per year for each of these pollutants, this facility is not a major facility. Therefore, the offset requirements of Regulation 2-2-303 do not apply to this facility.

<u>Regulation 2-2-304 Prevention of Significant Deterioration (PSD)</u>

The operation of the proposed sources will not trigger a PSD review because the facility is not a major facility per District's Regulation 2-2-304.

Regulation 2, Rule 5 New Source Review for Toxic Air Contaminants

Since respirable crystalline silica emissions are greater than the chronic risk screen trigger level of 120 pounds per year, a HRA is required.

A HRA for this application was completed and approved by the Air District Toxicologist on March 9, 2021. Results from this HRA indicated that the maximum chronic HI was 0.031. Respirable crystalline silica is the only TAC in this analysis. Since crystalline silica has no cancer potency value or acute reference exposure level, this HRA has no cancer risk or acute hazard index. In accordance with the District's Regulation 2-5-301, this project does not require TBACT because the estimated source chronic hazard index is less than 0.2. This project complies with the Regulation 2-5-302 project risk requirements because the chronic HI is less than 1.0.

HRA Results – Pier 94 (S1, S2, S3, S4 and Paved Road)

Receptor	NAD 83 UTM Coordinates (meters)		Cancer Risk (in a million)	Chronic HI	Acute HI
	Easting (x)	Northing (y)			
Resident	554,404.3	4,176,934.3	NA	0.0019	NA
Worker	555,100.0	4,177,340.0	NA	0.031	NA

Student risk values were not calculated because there are no K-12 schools within 1,000 feet of the source.

As mentioned above, Hanson Pier 92 and Hanson Pier 94 are considered adjacent facilities. However, since they operate as separate entities and there is no exchange of material between the two facilities unless one sells to another, TAC emissions are modeled separately for the facilities.

Regulation 2, Rule 6: Major Facility Review

The requirements of federal operating permit program have been codified in District Regulation 2, Rule 6. This rule requires that major and designated facilities apply for and obtain a Title V federal operating permit. Since this facility will emit less than 100 tons/year each of NOx, CO, POC, PM_{10}, and SO_2, less 10 tons/year of any single Hazardous Air Pollutant (HAP), and less than 25 tons/year of all HAPs combined, it is not considered to be a major facility of regulated air pollutants. This facility is also not a designated facility pursuant to any federal NSPS or NESHAP requirements. Therefore, Regulation 2, Rule 6 does not apply to this site.

NEW SOURCES PERFORMANCE STANDARDS (NSPS)

40 CFR Part 60 Subpart OOO
Pursuant to §60.670, affected facilities are subject to the provisions of this subpart. Affected facilities are the following process units at a fixed or portable nonmetallic mineral processing plant:

- Crusher
- Grinding Mill
- Screening Operation
- Bucket Elevator
- Belt Conveyor
- Bagging Operation
- Storage Bin
- Enclosed Truck or Railcar Loading Station

Hanson Aggregates is proposing to operate a sand and aggregates import terminal at 94.

However, this standard does not apply to this facility because Section 60.670 (a)(2) states that the standard does not apply to facilities that do not have crusher or grinding mills.

Regulation 6, Rule 1 Particulate Matter

The proposed sources are subject to Regulation 6, Rule 1.

Pursuant to Regulation 6-1-301, a person shall not emit from any source for a period or aggregate periods of more than 3 minutes in any hour, a visible emission that is as dark or darker than No. 1 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree.

A person shall not emit from any source for a period of more than three minutes in any hour an emission equal to greater than 20% opacity per Regulation 6-1-302.

Regulation 6-1-305, Visible Particles, prohibits a public nuisance caused by the fallout of visible particulate emissions. This Section only applies if such particles fall on real property other than the property of the person responsible for the emissions.

This facility is expected to comply with these requirements since each source is abated by water spray. The limited to these requirements are listed in the permit conditions.

Regulation 6-1-310 Total Suspended Particulate (TSP) Concentration Limits, limits the concentration of TSP in the exhaust from devices such as baghouses and stacks. The sources are this facility are controlled by water spray and do not exhaust to any baghouse or stack. Therefore, this Section does not apply.

Regulation 6-1-311 limits the Total Suspended Particulate (TSP) Weight Limits.

For S-1, S-2, and S-3 the maximum processing rates are 2,500 tons/hour (5,000,000 lb/hour) each for off-loading material from ships. Each source has a PTE of greater than 1,000 kg (2,204 lbs) of TSP, therefore the limits in Section 311.2 apply. The operating rate for each source exceeds 881,849 lb/hour; therefore, TSP is limited to 30.0 lb/hour per source.

From Table 11-12-2 of AP-42 Chapter 11.12 Concrete Batching, the total PM (which is also considered to be TSP) emission factor for uncontrolled sand transfer operations is 0.0021 pounds of TSP per tons of material transferred. The emission factor for uncontrolled aggregate transfer is 0.0069 pounds of TSP per tons of material transferred. Based on the emission factors for sand and aggregate, an assumption that all material processed is aggregate will result in maximum TSP emissions. Therefore, based on the assumption that all the material is aggregate, maximum hourly uncontrolled TSP emissions are 17.25 lb/hour per source. After control by water sprays, TSP emissions will be reduced to 5.18 lbs/hour per source. Therefore, these sources are expected to comply with the 30 lb/hour limit.

Regulation 6, Rule 6 – Particulate Matter Prohibition of Track-out

All proposed sources (S-1, S-2, S-3, S-4) and road dust are subject to Regulation 6, Rule 6. Regulation 6-6 shall only apply to limit the quantity of particulate matter in the atmosphere through control of track-out of solid materials onto paved public roads outside the boundaries of large bulk material sites, large construction sites, and large disturbed surface sites including landfills.

This site has one or more stockpiles of bulk material greater than five feet high or with a footprint greater than 100 square feet. Therefore, this site is considered a bulk material site, and Regulation 6, Rule 6 applies to this facility.

Pursuant to Regulation 6-6-301, the owner/operator shall not cause or allow track-out at any active exit from such site onto an adjacent paved public roadway or shoulder of a paved public roadway that exceeds cumulative 25 linear feet and creates fugitive dust visible emissions without cleaning up such track-out within four hours of when the owner/operator identifies such excessive track-out; and shall not cause or allow more than one quart of track-out to remain on the adjacent paved public roadway or the paved shoulder of the paved public roadway at the end of any workday.

Pursuant to Regulation 6-6-302, the owner/operator shall not cause or allow a fugitive dust visible emission during cleanup of any track-out that exceeds 20 percent opacity as determined by EPA Method 203B or as dark in shade as that designated as Number 1 on the Ringelmann Chart, for a period or aggregate periods of more than three minutes in any 60-minute period.

Hanson will be required to maintain the recordkeeping requirements of Regulation 6-6-501 in the permit conditions.

Permit Conditions for Pier 94 Sand and Aggregate Import Terminal [Condition # 27397]

1. The owner/operator shall not exceed a total of 14 ocean-going vessels to deliver sand and aggregate to the facility in any consecutive 12-month period. To demonstrate compliance with this permit condition the owner/operator shall maintain records in a District-approved log. All records shall be retained on site for at least two years from the date of entry and be made available for inspection by District staff on request. [Basis: Cumulative Increase, Regulation 2-2-302, Recordkeeping]

2. The owner/operator shall not exceed the following throughputs of sand and aggregate at each source:
   a. S-1, S-2, and S-3: 60,000 tons during any day and 1,500,000 tons during any consecutive 12-month period of sand and aggregate combined.
   b. S-4: 6.0 acres of sand and aggregate combined at any time.
   [Basis: Regulation 2-1-403, Cumulative Increase]

3. Visible dust emission from S-1, S-2, S-3 and S-4 shall not exceed Ringelmann 1.0 or result in fallout on adjacent properties in such quantities as to cause a public nuisance per Regulation 1-301. To ensure compliance with this Part and with Regulation 6-1-301 and 6-1-305, the owner/operator shall visually observe all material handling operations associated with S-1, S-2, S-3 and S-4 shall immediately initiate corrective actions, if any visible dust emissions are detected that persist for longer than 3 minutes in any hour.
   [Basis: Regulation 1-301, BACT, 6-1-301, and 6-1-305]

4. The owner/operator shall abate emissions from S-1, S-2, S-3, S-4 and paved roads with A-1 Water Spray System, or other appropriate measures, as necessary, to maintain compliance with Part 3 of this condition, Regulations 6-1-305, 6-1-311, 6-6-301 and 6-6-302. The owner/operator shall ensure water sprays are at each drop point at the conveyor for S-1, S-2, and S-3. For the stockpile area, S-4, the owner/operator shall ensure the water spray reaches the entire surface area of the stockpile and the entire surface area remains wet at all times. The owner/operator is required to maintain compliance with the facility's Dust Control Plan at all times.
   [Basis: Cumulative Increase, Regulations 1-301, BACT, 6-1-305, 6-1-311, 6-6-301, 6-6-302 and Dust Control Plan]

5. To verify compliance with Regulation 2, Rule 5, the owner/operator shall conduct the following testing:
   a. Within 60 days of issuance of this Authority to Construct and at least once every 3 years after issuance of the Permit to Operate, the owner/operator shall collect three (3) representative samples of the sand handled at this facility.
   b. The owner/operator shall have these representative samples of sand analyzed for crystalline silica using NIOSH Method 7500 or other District-approved methods. The owner/operator shall consult with the Engineering Division of the Air District prior to conducting the testing to obtain approval of all collection and analysis methods used.
   c. The owner/operator shall submit the results of the crystalline silica analyses to the Engineering Division of the Air District within 30 days of receiving the results.
   [Basis: Regulation 2-5]

6. In the event the District's Compliance and Enforcement staff issues the facility two or more Notices of Violation citing "Regulation 1-301: Public Nuisance" related to dust in any consecutive, rolling, 12-month period, the owner/operator shall implement one or more of following control measures (as applicable),

or shall implement any other measures that the District deems necessary and appropriate, within a time period mutually agreeable to the facility and the District:

a. Initiate use of dust suppressants on paved roadways.
b. Initiate high power water flushing on roadways.
c. Reduce the permitted sand and aggregate throughput at S-1, S-2, S-3 and S-4 in Part 2 of this Permit Condition.
d. Enclose or otherwise control dust nuisance operations in a mutually agreed upon manner.

Within 30-days of receiving a second Notice of Violation, the owner/ operator shall submit a Permit Application to the District to modify these Permit Conditions in order to memorialize the applicable control measures.
[Basis: Regulation 1-301]

7. To demonstrate compliance with this Permit Condition, the owner/operator shall maintain dated records of the following:

a. Record the date and amount of sand and aggregate offloaded by ocean-going vessel to S-1 and the total number of ocean-going vessels deliveries per month.
b. Record the sand and aggregate throughput at each source, S-1, S-2, S-3 and S-4, on a daily and monthly basis.
c. The owner/operator shall use the monthly records to calculate and record sand and aggregate throughput at each source, S-1, S-2, S-3 and S-4, on a consecutive, rolling 12-month basis.
d. Maintain written procedures describing events or observations of emissions that shall trigger the use of A-1 Water Sprays at S-1, S-2, S-3, S-4 and paved roads. These procedures shall include descriptions of when, where, at what frequency, and at what amount water shall be applied to S-1, S-2, S-3, S-4 and paved roads. Maintain checklists or other records to demonstrate that these water application procedures are followed.
[Basis: Cumulative Increase, Recordkeeping]

8. The owner/operator of Hanson (Pier 94) shall:

a. Monitor the extent of the trackout at each active exit from the site onto a paved public road at least twice during each workday, at times when vehicle traffic exiting the site is most likely to create an accumulation of trackout, or as otherwise specified by the APCO;
b. Document the active exit locations monitored each workday;
c. Document each occasion when the trackout exceeds cumulative 25 linear feet and all trackout control and cleanup actions initiated as a result of monitoring Part a of this condition; and
d. Maintain the records required by Part b and Part c of this condition for two years, in electronic, paper hard copy or log book format, and make them available to the APCO upon request.
[Basis: Regulation 6-6-501]

The owner/operator shall maintain these records and any related correspondence with any division of the District in a District-approved log and shall retain the records on-site for at least two years from the date of entry and shall make the records available to District staff for review upon request.
[Basis: Cumulative increase, Regulation 2-1-403]

9. The owner/operator of this facility shall limit the trips of the front loader and transfer trucks on paved road to:

a. 20,440 trips during any consecutive 12-month period.

To demonstrate compliance with this permit condition, the owner/operator shall maintain records in a District-approved log of the vehicle trips per month and per rolling 12-month period for each type of

vehicle traveling on roadways at this facility. All records shall be retained on site for at least two years from the date of entry and be made available for inspection by District staff on request. [Basis: Cumulative Increase, Recordkeeping]

RECOMMENDATION

It is recommended that an Authority to Construct be issued to Hanson Aggregates, Mid-Pacific, Inc. for the following:

S-1 Receiving Hopper to Feed Belt Conveyor (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-2 Feed Belt Conveyor to Boom Stacking Conveyor (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-3 Boom Stacking Conveyor to Stockpiles (One Transfer Point)
Abated by A-1 Water Spray System
Maximum Yearly Sand and Aggregates Throughput: 1,500,000 tons per year
Maximum Daily Sand and Aggregates Throughput: 60,000 tons per day
Maximum Hourly Sand and Aggregates Throughput: 2,500 tons per hour

S-4 Sand and Aggregate Stockpiles;
Abated by A-1 Water Spray System
Maximum Stockpile Size: Six acres
Includes Road Dust Emissions

by_____date_____
Flora Chan
Senior Air Quality Engineer

Appendix A

This Appendix includes:

1. Particulate emissions from the Hopper Chute to Feed Belt Conveyor (S-1), Feed Belt Conveyor to Boom Stacking Conveyor (S-2), Boom Stacking Conveyor to Stockpile (S-3) for each of the following assumptions:
    - All material conveyed through S-1, S-2, and S-3 is aggregate
    - All material conveyed through S-1, S-2, and S-3 is sand
2. Particulate emissions from Sand Stockpiles (S-4) for each of the following assumptions:
    - All material in the stockpile is aggregate
    - All material in the stockpile is sand. Sand stockpile emissions are calculated using two methods:
        - From EPA document “Control of Open Fugitive Dust Sources”, dated 9/1988;
        - From AP-42 Chapter 13.2.5, dated 11/2006;
3. Particulate emissions from vehicles traveling on roadways; and
4. Ocean-going vessel emissions.
5. Detailed cost effectiveness analysis for BACT1 options (chemical suppressants or a venturi scrubber)

Emission Calculations at S-1, S-2, and S-3

PM Emissions:
PM emissions are generated from sand and aggregates at the proposed sources:

S-1 Hopper to Feed Belt Conveyor
S-2 Feed Belt Conveyor to Boom Stacking Conveyor
S-3 Boom Stacking Conveyor to Stockpile

The estimated maximum material throughput rates to the plant are: 2500 tons/hour, 60,000 tons/day and 1,500,000 tons/year.[1]

PM_{10} emissions from three drops is calculated using EPA's AP-42, Chapter 11.12 Concrete Batching, Table 11.12-2. According to the Air District's Permit Handbook Chapter 11.5 for Concrete Batch Plants, $PM_{2.5}$ is equal to 15% of PM_{10} emissions. An abatement efficiency of 70% is used for PM_{10} emissions for water spray. There is no data for abated $PM_{2.5}$; therefore, an unabated $PM_{2.5}$ emission factor is used.

PM_4 Crystalline Silica
PM_{10} is converted to PM_4 crystalline silica using the ratio of conveyor transfer point emission factors presented in the Journal of the Air & Waste Management Association "PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California – Table 5" This technical paper is available in the folder and at this website: https://doi.org/10.3155/1047-3289.59.11.1287

As mentioned previously, the respirable crystalline silica emission factor is obtained from the Journal of the Air & Waste Management Association article, "PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California" was used. The emission factor is based on averaged source test results.

[1] Applicant proposed 1,500,000 tons/year throughput in email, dated on 5/22/2019. Applicant confirmed the hourly and daily and hourly throughputs in email, dated 1/28/2019.

Application No. 27982; Plant No. 23564
Hanson Aggregates, Mid-Pacific, Inc. – SF Pier 94
March 2021

Hourly Emissions from S-1, S-2, and S-3 – All Aggregate

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Hourly Aggregate Throughput [tons/hour]	Emissions [lbs/hour]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	2,500	2.48E+00
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		1.25E+00
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		2.48E+00
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		1.25E+00
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
3	**Boom Stacking Conveyor to Stockpile**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		2.48E+00
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		1.25E+00
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
		PM10				**7.43E+00**
		PM2.5				**3.75E+00**
		Crystalline Silica				--

Daily Emissions from S-1, S-2, and S-3 – All Aggregate

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Hourly Aggregate Throughput [tons/day]	Emissions [lbs/day]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	60,000	5.94E+01
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.00E+01
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		5.94E+01
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.00E+01
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
3	**Boom Stacking Conveyor to Stockpile**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		5.94E+01
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.00E+01
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
		PM10				**1.78E+02**
		PM2.5				**9.00E+01**
		Crystalline Silica				--

Annual Emissions from S-1, S-2, and S-3 – All Aggregate

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Annual Aggregate Throughput [tons/year]	Emissions [lbs/year]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	1,500,000	1.49E+03
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		7.50E+02
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		1.49E+03
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		7.50E+02
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
3	**Boom Stacking Conveyor to Stockpile**	PM10	9.90E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Aggregate Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		1.49E+03
		PM2.5	0.00050	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		7.50E+02
		Crystalline Silica	--	No Crystalline Silica in Aggregate		--
		PM10				**4.46E+03**
		PM2.5				**2.25E+03**
		Crystalline Silica				--

Hourly Emissions from S-1, S-2, and S-3 – All Sand

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Hourly Sand Throughput [tons/hour]	Emissions [lbs/hour]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	2,500	7.43E-01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.75E-01
		Crystalline Silica	1.95E-05	Technical paper		4.88E-02
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		7.43E-01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.75E-01
		Crystalline Silica	1.95E-05	Technical paper		4.88E-02
3	**Boom Stacking Conveyor to Stockpile**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		7.43E-01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		3.75E-01
		Crystalline Silica	1.95E-05	Technical paper		4.88E-02
		PM10				**2.23E+00**
		PM2.5				**1.13E+00**
		Crystalline Silica				**1.46E-01**

Daily Emissions from S-1, S-2, and S-3 – All Sand

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Hourly Sand Throughput [tons/day]	Emissions [lbs/day]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	60,000	1.78E+01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		9.00E+00
		Crystalline Silica	1.95E-05	Technical paper		1.17E+00
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		1.78E+01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		9.00E+00
		Crystalline Silica	1.95E-05	Technical paper		1.17E+00
3	**Boom Stacking Conveyor to Stockpile**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		1.78E+01
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		9.00E+00
		Crystalline Silica	1.95E-05	Technical paper		1.17E+00
		PM10				**5.35E+01**
		PM2.5				**2.70E+01**
		Crystalline Silica				**3.52E+00**

Annual Emissions from S-1, S-2, and S-3 – All Sand

Source #	Source Description	Pollutant	Emissions Factor [lb/ton]	Reference	Maximum Annual Sand Throughput [tons/year]	Emissions [lbs/year]
1	**Ship through Hopper Chute to Feed Belt Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.	1,500,000	4.46E+02
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		2.25E+02
		Crystalline Silica	1.95E-05	Technical paper		2.93E+01
2	**Feed Belt Conveyor to Boom Stacking Conveyor**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		4.46E+02
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		2.25E+02
		Crystalline Silica	1.95E-05	Technical paper		2.93E+01
3	**Boom Stacking Conveyor to Stockpile**	PM10	2.97E-04	AP 42 Chapter 11.12-2 Concrete Batching for Unabated Sand Transfer *If watering is used to suppress dust, 70% abatement efficiency is used.		4.46E+02
		PM2.5	0.00015	Emission factors obtained by referencing speciation profile in PM3431 which states PM2.5 = 15% of PM10		2.25E+02
		Crystalline Silica	1.95E-05	Technical paper		2.93E+01
		PM10				**1.34E+03**
		PM2.5				**6.75E+02**
		Crystalline Silica				**8.79E+01**

S-4 Emission Calculations

PM emissions at the stockpile are due to wind erosion. PM emissions at the stockpile will be calculated using two scenarios: 1) all of the stockpile is aggregate and 2) all of the stockpile is sand. The most conservative emissions will be used.

Aggregate Stockpile:

Emission factors for storage piles at concrete batch plans are taken from Air District's Permit Handbook Chapter 11.5. The emission factor for PM_{10} is:

E_{PM10} = 1.7 lb/acre/day
Abated E_{PM10} = 0.51 lb/acre/day

Using the assumption that $PM_{2.5}$ is 15% of PM_{10}, the emission factor for $PM_{2.5}$ is:

Abated $E_{PM2.5}$ = 0.08 lb/acre/day

Provided that the stockpile size is six (6) acres and the stockpile is expected to be onsite for 365 days per year, the emissions due to wind erosion are:

Emissions from S-4 – All Aggregate

Pollutant	Emission Factor [lb/acre-day]	Reference	Emissions [lb/day]	Emissions [lb/year]	Emissions [TPY]
PM10 [abated]	0.51	70% control efficiency	3.060	1116.90	0.558
PM2.5	0.08	15% of PM10	0.459	167.54	0.084

Sand Stockpile:

There are two different procedures to estimate sand stockpile emissions:
1) EPA document "Control of Open Fugitive Dust Sources", dated 9/1988
2) AP-42 Chapter 13.2.5 Industrial Wind Erosion, dated 11/2006

Emission estimates were calculated using both procedures to determine the most conservative approach, which will be used in this application.

Also, to be conservative, emissions of PM_{10} and $PM_{2.5}$ from wind erosion will be calculated as if the entire stockpile is sand.

Emission Calculations at S-4 (Wind Erosion at Sand Stockpiles) using EPA document "Control of Open Fugitive Dust Sources", dated 1988

The PM_{10} emission factor for S-4 was calculated using Equation 4-9 from the EPA document "Control of Open Fugitive Dust Sources", dated 9/1988:

$$E_{30} = (1.7)\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\left(\frac{f}{15}\right) \text{ (lb/acre-day)} = 2.027$$

where:

E_{30} = PM_{30} emission factor, lb/acre-day
s = 1.58% = silt content of sand. Material passing the 200 mesh: average 0.5% and range of 0.2-1.58%
p = 65 = number of days with at least 0.01 in of precipitation per year, based on AP-42 Figure 13.2.2-1.

f^1 = 13.3% = percentage of time that the unobstructed wind speed exceeds 12 mph., based on Mojave Desert Air Quality Management District (MDAQMD) Emissions Inventory Guidance for Mineral Handling and Processing Industries, Wind Erosion from Stockpiles section (page 18/31)

The PM_{10} fraction is estimated as 0.5 E_{30} from EPA document "Control of Open Fugitive Dust Sources", dated 9/1988. The document is available at this website: https://www3.epa.gov/ttn/chief/old/ap42/ch13/s025/reference/ref_10c13s025_1995.pdf

Therefore, the PM_{10} emission factor = 1.014 lb/acre-day

The PM_{10} emission factor with a wet spray system is 1.014 * (1-70%) = 0.304. Storage piles are wetted by water truck and 70% control efficiency is assumed.

The respirable crystalline silica emission factor was obtained from the Journal of the Air & Waste Management Association article, "PM_4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California." The emission factor for crystalline silica is 0.020 lb/acre-day.

Annual emissions calculated by multiplying the emission factor (lb/acre-day) by the acres of exposed area and 365 days/year.

Annual Emissions from S-4 – All Sand

Source #	Source Description	Pollutant	Emission Factor [lb/acres/day]	Reference	Maximum Stockpile Area [acres]	PM Emissions [lbs/year]
4	Sand and Aggregate Stockpiles	PM10	0.304	EPA Document - "Control of Open Fugitive Dust Sources"	6	665.83
		PM2.5	0.046	15% of PM10	6	99.87
		Crystalline Silica	0.020	Technical Paper	6	43.78

Daily Emissions from S-4 – All Sand

Source #	Source Description	Pollutant	Emission Factor [lb/acres/day]	Reference	Maximum Stockpile Area [acres]	PM Emissions [lbs/day]
4	Sand and Aggregate Stockpiles	PM10	0.304	EPA Document - "Control of Open Fugitive Dust Sources"	6	1.82
		PM2.5	0.046	15% of PM10	6	0.27
		Crystalline Silica	0.020	Technical Paper	6	0.12

[1] A draft Environmental Impact Report from the San Francisco Planning Department indicates that the percentage of time wind speed exceeds 12 mph in San Francisco is 10% (Source: https://sfmea.sfplanning.org/CentralSoMaPlanDEIR_13-iv-g-wind.pdf). For a more conservative estimate of emissions, data from MDAQMD was used.

Emission Calculations at S-4 (Wind Erosion from Sand and Aggregate Stockpiles) using AP-42 Chapter 13,2.5 Industrial Wind Erosion, dated 2006

There are approximately 6 acres of total stockpiles at Pier 94 (P# 23564).

AP-42 procedure for calculating wind erosion from stockpiles:
Chapter 13.2.5 Industrial Wind Erosion, dated 11/2006.
(Website: https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0205.pdf)

EF =	emission factor, g/m^2 (EF_c is for chronic conditions, EF_a is for acute conditions)
k =	particle size multiplier, dimensionless
N =	number of days of disturbances per year
P_i =	erosion potential for disturbed area, g/m^2 (Per AP-42, erosion potential is assumed to be 0 between disturbances and for undisturbed areas.)
u* =	fiction velocity, m/s
u_t* =	threshold friction velocity, m/s
u_{10}^+ =	fastest mile of wind, m/s, at reference anemometer height of 10 m.
A =	disturbed area, m^2
E =	emissions, grams/year

If $u^* < u_t^*$, $P_i = 0$

Equation (1):	$u^* = 0.053 * u_{10}^+$		
Equation (2):	$P_i = 58*(u^* - u_t^*)^2 + 25*(u^* - u_t^*)$		
	N		
Equation (3):	$EF = k * \sum_{i=1} P_i$		
Equation (4):	$E = EF * A$		

Variables for Conditions at Pier 94:
For Pier 94, CA u_{10}^+ = 14.0 mph (6.26 m/s) at reference height 10 m from weather underground webpage
Assume u_t^* = 1.02 m/s for overburden at a coal mine (from Table 13.2.5-2). The typical roughness height z = 0.005 m

	Working Face		Daily Cover Stockpile	
Variable	Annual	Daily	Annual	Daily
u_{10}^+	6.26	6.26	6.26	6.26
u*	0.332	0.332	0.332	0.332
u_t*	1.02	1.02	1.02	1.02
P_i	0.00	0.00	0.00	0.00
N	365	1	365	1

Calculated using Equation (2): $P_i = 0$. Therefore, there will be no wind erosion emissions from the sand and aggregate stockpiles using Method 2.

As noted above, there are two potential calculations methods for emissions from stockpiles. The second method resulted in zero emissions. The Air District used the more conservative method for the sand stockpile for purposes of calculating crystalline silica in this evaluation.

Emissions from S-4 assuming that the entire stockpile is aggregate were used for purposes of offsets and BACT in this evaluation since these emissions are conservative.

Fugitive Dust from Paved Road at P23564 (Pier 94)

Emission calculations for vehicle travel on paved roads at Pier 94 were calculated based on AP-42 Chapter 13.2.1, updated January 2011, Equation 2:
(Website: https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s0201.pdf)

$$E = k(sL)^{0.91} \times (W)^{1.02} \times (1 - \frac{P}{4N})$$

The silt loading (sL) values for paved roads at concrete batching facilities and sand/gravel processing facilities were obtained from Table 13.2.1-3. The sL value of 12.0 g/m^2 at concrete batching facilities was chosen because it more accurately reflects the operations at this facility than the other factors presented in the table. The facility does not process gravel, therefore the sL value for sand and gravel processing should not apply.

E = size-specific emission factor, pounds per vehicle miles traveled (lbs/VMT)
k = particulate size multiplier (lbs/VMT) = 0.0022 for PM_{10} and 0.00054 for $PM_{2.5}$ from Table 13.2.1-1
sL = road surface silt loading (g/m2) = 12 from Table 13.2.1-3
P = number of wet days with at least 0.01" of precipitation (60 for Bay Area)
N = number of days in the averaging period (365 for annual)
W = mean vehicle weight of entire fleet traveling the road (tons) = 27.48 tons (Pier 94)

Control efficiency for watering = 70%

Using the same values for VMT and the average weight of the vehicles used to calculate emissions from paved roadways, the emissions from paved roads at the facility are:

Paved Road Emission Factors and Emissions

	Emission Factor (Pounds/VMT)		
	PM-2.5	PM-10	PM-30
Uncontrolled	0.152	0.620	3.099
With Natural Rainfall Only	0.146	0.594	2.972
After Sweeping/Washing	0.046	0.186	0.930
	Daily Emissions (Pounds/Day)		
	PM-2.5	PM-10	PM-30
Uncontrolled	15.68	63.87	319.33
After Sweeping/Watering	4.70	19.16	95.80
	Annual Emissions (Tons/Year)		
	PM-2.5	PM-10	PM-30
Uncontrolled	2.861	11.656	58.278
Natural Rainfall Mitigation	2.743	11.177	55.883
With Sweeping/Watering	0.858	3.497	17.483

Paved Road Emission Factors

	Pollutant	**Emission Factor [Pounds/VMT]**	Abated Emission Factor [Pounds/VMT]
Paved Road	PM10	0.620	0.186
	PM2.5	0.152	0.046
	Crystalline Silica	0.041	0.012

Annual Emissions from Paved Road

Sources	**Pollutants**	**Emissions [lb/year]**	**Emissions [TPY]**
Paved Road	PM10	6995.46	3.498
	PM2.5	1715.02	0.858
	Crystalline Silica	459.98	0.230

Oceangoing Vessel (OGVs) and Tug Emissions

OGVs and tugboats are used to transport material to the facility. They are sources of NO_x, CO, POC, SO_2, and PM. In accordance with Regulation 2-2-610, emissions of cargo carrier shall be included in this analysis for the purpose of assessing offset requirements. Emissions from cargo carrier shall not be included for purposes of applying any other provisions of Regulation 2-2.

The plant proposed to have 14 OGV trips per year. The applicant estimated the ship emissions and the calculation of ship transport emission will be based on sand and aggregates deliveries. Calculations were based on the new fuel 0.1% sulfur limit effective January 1, 2014. OGVs emissions were estimated in several operating modes: cruising, cruising in the reduced speed zone (RSZ) inside the Bay, maneuvering with lower speed operation directly in front of the berths, and hoteling at the berth with main engines off and operating on auxiliary engines/boilers. Emission sources included the vessels' main propulsion engines, auxiliary engines, and boilers and tug boats main engines, auxiliary engines.

	Ship Emissions for P23564						
	Annual [tons]						
Ocean-Going Vessel Operations	**CO**	**NO_x**	**SO_2**	**HC**	**PM_{10}**	**CO2**	**CH4**
Main Engine Transit Leg 1 (and out)	0.27	4.24	0.09	0.19	0.06	146.78	0.02
Main Engine Transit Leg 2 (and out)	0.14	2.12	0.04	0.10	0.03	73.39	0.01
Main Engine Transit RSZ Leg 3 (and out)	0.02	0.28	0.01	0.01	0.00	9.79	0.00
Main Engine Maneuvering Leg 4 (and out)	0.04	0.68	0.01	0.03	0.01	23.49	0.00
Auxiliary Engine Transit	0.04	0.55	0.02	0.02	0.01	27.15	0.00
Auxiliary Engine RSZ	0.00	0.06	0.00	0.00	0.00	3.02	0.00
Auxiliary Engine Maneuvering	0.02	0.31	0.01	0.01	0.01	15.17	0.00
Auxiliary Engine Hoteling at berth	0.11	1.34	0.04	0.05	0.02	66.55	0.01
Auxiliary Boiler Manuevering	0.00	0.01	0.00	0.00	0.00	2.45	0.00
Auxiliary Boiler Hoteling	0.01	0.08	0.02	0.00	0.01	40.79	0.00
Tugboat Operations*							
Main Engine Idle (to meet ship)	0.28	1.20	0.00013	0.08	0.05		
Main Engine Running Light (escort ship inbound)	0.00	0.00	0.00000	0.00	0.00		
Main Engine Idle (maneuver ship to berth)	0.42	1.80	0.00010	0.12	0.07		
Main Engine Idle (maneuver ship out from berth)	0.21	0.90	0.00005	0.06	0.03		
Main Engine Assist Pushing Full (escort ship outbound)	0.00	0.00	0.00000	0.00	0.00		
Main Engine Idle (tug return to base)	0.14	0.60	0.00007	0.04	0.02		
Auxiliary Engine	0.03	0.08	0.00000	0.01	0.00		
TOTAL EMISSIONS (OGVs and Tugs)	1.73	14.26	0.25	0.73	0.33	408.58	0.05

Ship Emissions based on the information provided by the applicant

The facility provided a detailed cost effectiveness analysis for both BACT requirements (venturi scrubber and chemical suppressants).

Equipment Information	Chemical Suppressant	Wet Scrubber
Capital Cost (CC)		
Total Capital Cost $ (TCC)	**$25,000**	**$75,000**
Direct Operating Costs		
Labor	$12,000	$20,000
Utilities	$0	$0
Disposal costs	$0.00	$9,600.00
Chemical suppressant costs	$54,000.00	
Total Direct Operating Cost, $/yr	**$66,000**	**$29,600**
Indirect Operating Cost		
Overhead		
80% of operators, supervisors, maintenance labor, and material	$9,600	$16,000
General & Administrative Charges	$500	$1,500
Property Taxes	$250	$750
Insurance	$250	$750
Capital Recovery Factor	0.136	0.136
Remaining Useful Life of Source	10	10
Interest Rate	6%	6%
Capital Recovery Cost	$3,397	$10,190
Total Indirect Operating Cost, $/yr	**$13,997**	**$29,190**
Total Annualized Operating Cost - 2021 Dollars ($/yr)	**$79,997**	**$58,790**
Pollutant Reduction (ton/year)		
PM_{10}	0.74	1.86
Detailed Cost of Control ($/ton pollutant)		
PM_{10}	$107,740	$31,671