Mail Application To:		For Department use only:
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		AIRS No.:

Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. For NOI applications, submit the entire UA1, UA2, and UA3 applications on a single CD (no copies are needed). For NOIs, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required.

This application is submitted as (check all that apply)**:** ☐ Request for a No Permit Required Determination (no fee)
☐ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
Construction Status: **X** Not Constructed ☐ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC **X** 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application
Title V Source: ☐ Title V (new) ☐ Title V renewal ☐ TV minor mod. ☐ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal
PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

Acknowledgements:

X I acknowledge that a pre-application meeting is available to me upon request. ☐ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
X $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).
X Check No.: 2765 in the amount of $500.00
X I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.
☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.200.A(1) NMAC**
(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

Section 1 – Facility Information

Section 1-A: Company Information

		AI # if known (see 1st 3 to 5 #s of permit IDEA ID No.):		Updating Permit/NOI #:
1	Facility Name: Kirtland Sand and Gravel Plant	Plant primary SIC Code (4 digits):	HMA – 2951 Crusher – 1429, 1442 Wash - 1442	
		Plant NAIC code (6 digits):	HMA – 324121 Crusher – 212319, 212321 Wash - 212321	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): 32 Road 6210, Kirtland, NM, 87417			

2	Plant Operator Company Name: Elam Construction	Phone/Fax: (970) 242-5370/(970) 255-2199
a	Plant Operator Address: 556 Struthers Avenue, Grand Junction CO 81501	
b	Plant Operator's New Mexico Corporate ID or Tax ID: 03-349493-002	
3	Plant Owner(s) name(s): Elam Construction	Phone/Fax: (970) 242-5370/(970) 255-2199
a	Plant Owner(s) Mailing Address(s): 556 Struthers Avenue, Grand Junction CO 81501	
4	Bill To (Company): Elam Construction	Phone/Fax: (970) 242-5370/(970) 255-2199
a	Mailing Address: 556 Struthers Avenue, Grand Junction CO 81501	E-mail: russ.larsen@elamconstruction.com
5	☐ Preparer: **X** Consultant: Paul Wade, Montrose Air Quality Services	Phone/Fax: (505) 830-9680x6/(505) 830-9678
a	Mailing Address: 3500G Comanche Rd NE, Albuquerque, NM 87107	E-mail: pwade@montrose-env.com
6	Plant Operator Contact: Russell A Larsen	Phone/Fax: (970) 242-5370/(970) 255-2199
a	Address: 556 Struthers Avenue, Grand Junction CO 81501	E-mail: russ.larsen@elamconstruction.com
7	Air Permit Contact: Jon Mueller	Title: Environmental Compliance Coordinator
a	E-mail: jon.mueller@kilgorecompanies.com	Phone/Fax: (970) 255-2098/(970) 255-2199
b	Mailing Address: 556 Struthers Avenue, Grand Junction CO 81501	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? ☐ Yes ☒ No	1.b If yes to question 1.a, is it currently operating in New Mexico? ☐ Yes ☒ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? ☐ Yes ☒ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? ☐ Yes ☒ No
3	Is the facility currently shut down? ☐ Yes ☐ No ☒NA	If yes, give month and year of shut down (MM/YY):
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? ☐ Yes ☒ No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐Yes ☐No ☒N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? ☐ Yes ☒ No	If yes, the permit No. is: P-
7	Has this facility been issued a No Permit Required (NPR)? ☐ Yes ☒ No	If yes, the NPR No. is:
8	Has this facility been issued a Notice of Intent (NOI)? ☐ Yes ☒ No	If yes, the NOI No. is:
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? ☐ Yes ☒ No	If yes, the permit No. is:
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? ☒ Yes ☐ No	If yes, the register No. is: GCP-2-7409

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: N/A	Daily: N/A	Annually: N/A
b	Proposed	Hourly: HMA – 400 tph Crusher – 500 tph Wash – 500 tph	Daily: HMA – 4000 tpd Crusher – 5500 tpd Wash –7250 tpd	Annually: HMA – 400,000 tpy Crusher – 1,000,000 tpy Wash – 1,000,000 tpy
2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: N/A	Daily: N/A	Annually: N/A

b	Proposed	Hourly: HMA – 400 tph Crusher – 500 tph Wash – 500 tph	Daily: HMA – 4000 tpd Crusher – 5500 tpd Wash –7250 tpd	Annually: HMA – 400,000 tpy Crusher – 1,000,000 tpy Wash – 1,000,000 tpy

Section 1-D: Facility Location Information

1	Section: 8	Range: 14W	Township: 29N	County: San Juan	Elevation (ft): 5295
2	UTM Zone: ☒ 12 or ☐ 13			Datum: ☐ NAD 27 ☒ NAD 83 ☐ WGS 84	
a	UTM E (in meters, to nearest 10 meters): 738,100			UTM N (in meters, to nearest 10 meters): 4,069,700	
b	AND Latitude (deg., min., sec.): 36°, 44', 35.5" N			Longitude (deg., min., sec.): 108°, 19', 59.6" W	
3	Name and zip code of nearest New Mexico town: Kirtland 87417				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): From the intersection of Highway 64 and County Road 6500 in Kirtland travel east on Highway 64 for 1.65 miles. Turn north on unmarked road and follow to site entrance.				
5	The facility is located within Kirtland NM.				
6	Status of land at facility (check one): ☒Private ☐ Indian/Pueblo ☐ Federal BLM ☐ Federal Forest Service ☐ Other (specify)				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: Town of Kirtland, City of Farmington, Navajo Nation, San Juan County				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? ☒ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: Colorado, 28 km; Mesa Verde National Park, 47 km				
9	Name nearest Class I area: Mesa Verde National Park				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 47.03				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: 90 meters				
12	Method(s) used to delineate the Restricted Area: Fencing and Gate "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☒ Yes ☐ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☐ No ☒ Yes If yes, what is the name and permit number (if known) of the other facility? Elam GCP5 No. 1, Permit GCP-5-7410				

Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

1	Facility **maximum** operating ($\frac{hours}{day}$): 24	($\frac{days}{week}$): 7	($\frac{weeks}{year}$): 52	($\frac{hours}{year}$): 6321		
2	Facility's maximum daily operating schedule (if less than 24 $\frac{hours}{day}$)?	Start:	☐AM ☐PM	End:	☐AM ☐PM	
3	Month and year of anticipated start of construction: Upon issuance of permit					
4	Month and year of anticipated construction completion: 1 month after issuance of permit					
5	Month and year of anticipated startup of new or modified facility: 1 month after issuance of permit					
6	Will this facility operate at this site for more than one year? ☒ Yes ☐ No					

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? ☐ Yes ☒ No If yes, specify:		
a	If yes, NOV date or description of issue:		NOV Tracking No:
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes ☒ No If Yes, provide the 1c & 1d info below:		
c	Document Title:	Date:	Requirement # (or page # and paragraph #):
d	Provide the required text to be inserted in this permit:		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? ☒ Yes ☐ No		
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? ☐ Yes ☒ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? ☒ Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ $\geq$10 tpy of any single HAP **OR** ☐ $\geq$25 tpy of any combination of HAPS) **OR** ☒ **Minor** (☐ <10 tpy of any single HAP **AND** ☒ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? ☒ Yes ☐ No		
a	If yes, include the name of company providing commercial electric power to the facility: _______________ Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.		

Section 1-G: Streamline Application **(This section applies to 20.2.72.300 NMAC Streamline applications only)**

1	☐ I have filled out Section 18, "Addendum for Streamline Applications."	☐ N/A (This is not a Streamline application.)

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (R.O.) (20.2.70.300.D.2 NMAC):	Phone:
a	R.O. Title:	R.O. e-mail:
b	R. O. Address:	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC):	Phone:
a	A. R.O. Title:	A. R.O. e-mail:
b	A. R. O. Address:	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship):	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.):	
a	Address of Parent Company:	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.):	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations:	

7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers:

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (**NOI**), a 20.2.70 NMAC (**Title V**), a 20.2.72 NMAC (**NSR** minor source), or 20.2.74 NMAC (**PSD**) application package shall consist of the following:

Hard Copy Submittal Requirements:

1) One hard copy **original signed and notarized application package printed double sided 'head-to-toe' 2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be head-to-head. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. Please include a copy of the check on a separate page.
2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This copy does not need to be 2-hole punched, but **must be double sided**. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.
3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically on compact disk(s) (CD). For permit application submittals, two CD copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a single CD submittal.
4) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver OR** one additional electronic copy of the air dispersion modeling including the input and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau. The complete dispersion modeling study, including all input/output files, should be submitted electronically as part of the electronic submittal.
5) If subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
   a. one additional CD copy for US EPA,
   b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
   c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

1) All required electronic documents shall be submitted in duplicate (2 separate CDs). A single PDF document of the entire application as submitted and the individual documents comprising the application.
2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc,), submit these items in hard copy format with the number of additional hard copies corresponding to the number of CD copies required. We must be able to review the formulas and inputs that calculated the emissions.
3) It is preferred that this application form be submitted as 3 electronic files (2 MSWord docs: Universal Application section 1 and Universal Application section 3-19) and 1 Excel file of the tables (Universal Application section 2) on the CD(s). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.
4) The electronic file names shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the core permit number (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the section # (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the header information throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision # (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. The footer information should not be modified by the applicant.

Table of Contents

Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2]	Date of Construction/ Reconstruction[2]	Controlled by Unit #	Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
1	Feeder	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	NONE	N/A	30502031	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
2	Jaw Crusher	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C2	N/A	30502001	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
3	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
4	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
5	Screen	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C3	N/A	30502015	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
6	Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
7	Under Screen Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
8	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
9	Secondary Cone Crusher	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C2	N/A	30502001	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
10	Secondary Cone Crusher Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
11	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
12	Under Screen Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
13	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
14	Secondary Cone Crusher	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C2	N/A	30502001	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
15	Secondary Cone Crusher Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD	N/A	C1	N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
16	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
17	Screen	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C3 / N/A	30502015	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
18	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
19	Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
20	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
21	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
22	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
23	Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
24	Under Screen Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
25	Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
26	Screen	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C3 / N/A	30502015	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
27	Under Screen Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
28	Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
29	Under Screen Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
30	Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD / N/A	C1 / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
31	Stacker Conveyor Drop to Pile	NA	NA	NA	500 TPH	500 TPH	N/A / N/A	NONE / N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
32	Finish Product Storage Pile	NA	NA	NA	500 TPH	500 TPH	N/A N/A	NONE N/A	30502007	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
33	Product Truck Load - Finish Pile	NA	NA	NA	500 TPH	500 TPH	N/A N/A	NONE N/A	30502007	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
34	Crusher Plant Main Generator	Caterpiller	3512	24Z09564	1429 HP	1429 HP	2000 N/A	NONE S1	30502099	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	
35	Crusher Plant Standby Generator	John Deere	4045TF	27003	113 HP	113 HP	2006 N/A	NONE S2	30502099	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	
36	Wet Plant Feeder	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	NONE N/A	30502031	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
37	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C1 N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
38	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C1 N/A	30502006	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
39	Twin Screw Wash Plant	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
40	Wet Plant Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
41	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
42	Wet Plant Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
43	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
44	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
45	Wet Plant Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
46	Wet Plant Transfer Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
47	Wet Plant Stacker Conveyor	TBD	TBD	TBD	500 TPH	500 TPH	TBD N/A	C7 N/A	30503834	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] / Date of Construction/ Reconstruction[2]	Controlled by Unit # / Emissions vented to Stack #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
48	Wet Plant Finish Product Storage Piles	NA	NA	NA	NA	500 TPH	N/A N/A	NONE N/A	30502007	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
49	Wet Plant Product Truck Load - Finish Pile	NA	NA	NA	NA	500 TPH	N/A N/A	NONE N/A	30502007	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
50	Wash Plant Generator	Caterpiller	3406	1LS01691	519 HP	519 HP	2001 N/A	NONE S3	30502099	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	
51	Aggregate Haul Roads	NA	NA	NA	NA	330 truck/day	N/A N/A	C5 N/A	30502011	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
52	Cold Aggregate/RAP Storage Pile	NA	NA	NA	NA	370TPH	N/A N/A	NONE N/A	3-05-002-03	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
53	Cold Feed Bin	TBD	TBD	TBD	370 TPH	230 TPH	TBD N/A	NONE N/A	3-05-002-16	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
54	Cold Feed Bin Conveyor	TBD	TBD	TBD	370 TPH	230 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
55	Scalping Screen	TBD	TBD	TBD	370 TPH	230 TPH	TBD N/A	C3 N/A	3-05-002-04	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
56	Scalping Screen Conveyor	TBD	TBD	TBD	370 TPH	230 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
57	Pug Mill	TBD	TBD	TBD	376 TPH	236 TPH	TBD N/A	C1 N/A	3-05-002-04	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
58	Pug Mill Conveyor	TBD	TBD	TBD	376 TPH	236 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
59	Sling Conveyor	TBD	TBD	TBD	376 TPH	236 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
60	RAP Bin	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	N/A N/A	3-05-002-16	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
61	RAP Bin Conveyor	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
62	RAP Screen	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	C3 N/A	3-05-002-04	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
63	RAP Screen Conveyor	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
64	RAP Transfer Conveyor	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
65	RAP Transfer Conveyor	TBD	TBD	TBD	140 TPH	140 TPH	TBD N/A	C1 N/A	3-05-002-17	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
66	Mineral Filler Silo	Cedarapids	50 Magnum	G98130	6 TPH	6 TPH	2010 N/A	C8 S4	3-05-002-13	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
67	Mineral Filler Silo Baghouse	Cedarapids	50 Magnum	G98130	99% Control	99% Control	2010 N/A	NONE N/A	3-05-002-13	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
68	Drum Dryer	Cedarapids	E400P	CX2109	400 TPH	400 TPH	2010 N/A	C9 S5	3-05-002-1	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
69	Drum Dryer Baghouse	Cedarapids	E400P	CX2109	60,000 ACFM	60,000 ACFM	2010 N/A	NONE N/A	3-05-002-1	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
70	Incline Conveyor	TBD	TBD	TBD	400 TPH	400 TPH	TBD N/A	NONE N/A	3-05-002-21	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
71	Asphalt Silo	TBD	TBD	TBD	400 TPH	400 TPH	TBD N/A	NONE N/A	3-05-002-13	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
72	Asphalt Heater	TBD	TBD	TBD	1 MMBtu/ hr	1 MMBtu/ hr	TBD N/A	NONE S6	3-05-002-08	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
73	Asphalt Cement Storage Tank (2)	TBD	TBD	TBD	10,000 gal each	10,000 gal each	TBD N/A	NONE N/A	3-05-002-12	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
74	HMA Main Plant Generator	Caterpillar	3512/ 1000	24Z09714	1000 kW	1429 HP	2000 N/A	NONE S7	305020 99	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	
75	HMA Standby Generator	John Deere	4045TF2 50	138553-04/07	158 HP	158 HP	2007 N/A	NONE S8	305020 99	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	CI	
76	HMA Haul Roads	N/A	N/A	N/A	N/A	228 Truck/Day	N/A N/A	C10 N/A	305020 11	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
77	Yard	N/A	N/A	N/A	N/A	400 TPH	N/A N/A	NONE N/A	3-05-002-14	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
[2] Specify dates required to determine regulatory applicability.
[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.
[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Table 2-B: Insignificant Activities[1] (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at http://www.env.nm.gov/aqb/forms/InsignificantListTitleV.pdf . TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

Unit Number	Source Description	Manufacturer	Model No. / Serial No.	Max Capacity / Capacity Units	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5) / Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Manufacture /Reconstruction[2] / Date of Installation /Construction[2]	For Each Piece of Equipment, Check Onc
T3	Burner Fuel Tank	N/A	N/A	10,000 Gallons	20.2.72.202.B.2.a	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	10,000 Gallons	NA	TBD	
T4	Diesel Fuel Tank	N/A	N/A	10,000 Gallons	20.2.72.202.B.2.a	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	10,000 Gallons	NA	TBD	
T5	Water Storage Tank - Aggregate Crusher Plant	N/A	N/A	5,000 Gallons	NA	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	5,000 Gallons	1.a	TBD	
T6	Water Storage Tank - Wash Plant	N/A	N/A	5,000 Gallons	NA	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	5,000 Gallons	1.a	TBD	
T7	Water Storage Tank - HMA Plant	N/A	N/A	5,000 Gallons	NA	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	5,000 Gallons	1.a	TBD	
T8	Diesel Fuel Tank	N/A	N/A	2,000 Gallons	20.2.72.202.B.2.a	TBD	☐ Existing (unchanged) ☐ To be Removed X New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			N/A	2,000 Gallons	NA	TBD	
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

[1] Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

[2] Specify date(s) required to determine regulatory applicability.

Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
C1	Conveyor Transfer Points - Wet Dust Suppression System	TBD	Particulate	3, 4, 6, 7, 8, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 37, 38, 54, 56, 58, 59, 61, 63, 64, 65	TSP - 95.33%	AP-42 11.19.2 Emission Factors
C2	Crushers - Wet Dust Suppression System	TBD	Particulate	2, 9, 14	TSP - 77.78%	AP-42 11.19.2 Emission Factors
C3	Screen - Wet Dust Suppression System	TBD	Particulate	5, 17, 26, 55, 62	TSP - 91.20%	AP-42 11.19.2 Emission Factors
C4	Conveyor Transfer to Storage Piles - Soil Moisture Content	TBD	Particulate	31	2.88% Soil Moisture Content	High Range AP-42 11.19.2
C5	Unpaved Roads - Surfactant, Chip Seal	TBD	Particulate	Crusher to HMA, Crusher to Exit, Crusher to Wash Plant, Wash Plant to Exit - Unit 51	90%	NMED Policy
C6	Unpaved Roads - Base Course and Watering	TBD	Particulate	Rock Truck Quarry Haul Road	80%	NMED Policy
C7	Wash Plant - Material Saturation with Water	TBD	Particulate	39 - 47	100%	NSPS Subpart OOO
C8	Silo Baghouse - Unit 67	TBD	Particulate	66	99%	Low End of Filter Control Efficiency
C9	Drum Mixer Baghouse - Unit 69	TBD	Particulate	68	99.88%	AP-42 11.1 Emission Factors
C10	Unpaved Roads - Surfactant, Chip Seal	TBD	Particulate	HMA to Exit - Unit 71	90%	NMED Policy

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

Table 2-D: Maximum Emissions (under normal operating conditions)

☐ **This Table was intentionally left blank because it would be identical to Table 2-E.**

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Aggregate Crusher and Wash Plants																		
Quarry	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
1	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
2	-	-	-	-	-	-	-	-	2.70	5.91	1.20	2.63	0.22	0.49	-	-	-	-
3	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
4	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
5	-	-	-	-	-	-	-	-	12.5	27.4	4.35	9.53	0.29	0.64	-	-	-	-
6	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
7	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
8	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
9	-	-	-	-	-	-	-	-	2.70	5.91	1.20	2.63	0.22	0.49	-	-	-	-
10	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
11	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
12	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
13	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
14	-	-	-	-	-	-	-	-	2.70	5.91	1.20	2.63	0.22	0.49	-	-	-	-
15	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
16	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
17	-	-	-	-	-	-	-	-	12.5	27.4	4.35	9.53	0.29	0.64	-	-	-	-
18	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
19	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
20	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
21	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
22	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
23	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
24	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
25	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
26	-	-	-	-	-	-	-	-	12.5	27.4	4.35	9.53	0.29	0.64	-	-	-	-
27	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
28	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
29	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
30	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.20	0.16	0.36	-	-	-	-
31	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
32	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
33	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
34	33.3	72.9	5.00	11.0	1.10	2.41	0.51	1.11	0.31	0.68	0.31	0.68	0.31	0.68	-	-	8.4E-05	0.00016
35	3.31	8.07	0.55	1.34	0.25	0.61	0.039	0.094	0.25	0.61	0.25	0.61	0.25	0.61	-	-	6E-06	1.5E-05
36	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
37	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.2	0.16	0.36	-	-	-	-
38	-	-	-	-	-	-	-	-	1.50	3.29	0.55	1.2	0.16	0.36	-	-	-	-
39	-	-	-	-	-	-	-	-	Material is saturated when processed. No emissions are estimated for these regulated units.						-	-	-	-
40	-	-	-	-	-	-	-	-							-	-	-	-
41	-	-	-	-	-	-	-	-							-	-	-	-
42	-	-	-	-	-	-	-	-							-	-	-	-
43	-	-	-	-	-	-	-	-							-	-	-	-
44	-	-	-	-	-	-	-	-							-	-	-	-
45	-	-	-	-	-	-	-	-							-	-	-	-
46	-	-	-	-	-	-	-	-							-	-	-	-
47	-	-	-	-	-	-	-	-							-	-	-	-
48	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
49	-	-	-	-	-	-	-	-	3.30	5.09	1.56	2.41	0.24	0.36	-	-	-	-
50	7.74	17.7	1.47	3.36	0.09	0.21	0.16	0.37	0.16	0.37	0.16	0.37	0.16	0.37	-	-	2.6E-05	6.1E-05
51	-	-	-	-	-	-	-	-	249	439	63	112	6.34	11.2	-	-	-	-
Subtotal	**44.4**	**98.7**	**7.02**	**15.7**	**1.44**	**3.22**	**0.71**	**1.57**	**359**	**664**	**107**	**199**	**14.6**	**28.1**	-	-	**0.00012**	**0.00024**
HMA Plant																		
52	-	-	-	-	-	-	-	-	2.44	7.53	1.15	3.56	0.17	0.54	-	-	-	-
53	-	-	-	-	-	-	-	-	1.52	4.68	0.72	2.21	0.11	0.34	-	-	-	-
54	-	-	-	-	-	-	-	-	0.69	3.02	0.25	1.11	0.04	0.17	-	-	-	-
55	-	-	-	-	-	-	-	-	5.75	25.2	2.00	8.76	0.30	1.33	-	-	-	-
56	-	-	-	-	-	-	-	-	0.69	3.02	0.25	1.11	0.039	0.17	-	-	-	-
57	-	-	-	-	-	-	-	-	0.71	3.10	0.26	1.14	0.040	0.18	-	-	-	-
58	-	-	-	-	-	-	-	-	0.71	3.10	0.26	1.14	0.040	0.18	-	-	-	-
59	-	-	-	-	-	-	-	-	0.71	3.10	0.26	1.14	0.040	0.18	-	-	-	-
60	-	-	-	-	-	-	-	-	0.28	0.86	0.13	0.40	0.020	0.061	-	-	-	-
61	-	-	-	-	-	-	-	-	0.42	1.84	0.15	0.67	0.024	0.10	-	-	-	-
62	-	-	-	-	-	-	-	-	3.50	15.33	1.22	5.33	0.18	0.81	-	-	-	-
63	-	-	-	-	-	-	-	-	0.42	1.84	0.15	0.67	0.024	0.10	-	-	-	-
64	-	-	-	-	-	-	-	-	0.42	1.84	0.15	0.67	0.024	0.10	-	-	-	-
65	-	-	-	-	-	-	-	-	0.42	1.84	0.15	0.67	0.024	0.10	-	-	-	-
66	-	-	-	-	-	-	-	-	18.0	18.9	11.5	12.1	0.90	0.95	-	-	-	-
68	22.0	96.4	52.0	227.8	23.2	101.6	12.8	56.1	11200	49056	2600	11388	626	2742	-	-	0.0060	0.0030
70	-	-	0.47	2.07	-	-	4.87	21.4	0.23	1.03	0.23	1.03	0.23	1.03	-	-	-	-

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**	**lb/hr**	**ton/yr**
71	-	-	0.54	2.36	-	-	1.66	7.29	0.21	0.91	0.21	0.91	0.21	0.91	-	-	-	-
72	0.16	0.68	0.082	0.36	0.055	0.24	0.011	0.048	0.016	0.068	0.016	0.068	0.016	0.068	-	-	9E-06	3.9E-05
73	-	-	-	-	-	-	0.014	0.062	-	-	-	-	-	-	-	-	-	-
74	33.3	145.9	5.00	21.9	0.52	2.26	1.10	4.82	0.31	1.36	0.31	1.36	0.31	1.36	-	-	8.4E-05	0.00020
75	1.04	4.56	1.30	5.70	0.043	0.19	0.10	0.46	0.078	0.34	0.078	0.34	0.078	0.34	-	-	7E-06	1.4E-05
76	-	-	-	-	-	-	-	-	152.5	61.6	38.9	15.7	3.89	1.57	-	-	-	-
77	-	-	0.14	0.62	-	-	0.44	1.93	-	-	-	-	-	-	-	-	-	-
Subtotal	**56.5**	**247**	**59.5**	**261**	**21**	**92.1**	**23.8**	**104**	**11390**	**49217**	**2658**	**11448**	**633**	**2752**	**-**	**-**	**0.0061**	**0.0033**
Totals	**100.8**	**346**	**66.6**	**276**	**22.5**	**95.3**	**24.5**	**106**	**11749**	**49880**	**2765**	**11648**	**647**	**2781**	**-**	**-**	**0.0062**	**0.0035**

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5.

Table 2-E: Requested Allowable Emissions

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A “-“ symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E^{-4}).

Unit No.	NOx		CO		VOC		SOx		TSP[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Aggregate Crusher and Wash Plants																		
Quarry	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
1	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
2	-	-	-	-	-	-	-	-	0.60	0.60	0.27	0.27	0.050	0.050	-	-	-	-
3	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
4	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
5	-	-	-	-	-	-	-	-	1.10	1.10	0.37	0.37	0.025	0.025	-	-	-	-
6	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
7	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
8	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
9	-	-	-	-	-	-	-	-	0.60	0.60	0.27	0.27	0.050	0.050	-	-	-	-
10	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
11	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
12	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
13	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
14	-	-	-	-	-	-	-	-	0.60	0.60	0.27	0.27	0.050	0.050	-	-	-	-
15	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
16	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
17	-	-	-	-	-	-	-	-	1.10	1.10	0.37	0.37	0.025	0.025	-	-	-	-
18	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
19	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
20	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
21	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
22	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
23	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
24	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
25	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
26	-	-	-	-	-	-	-	-	1.10	1.10	0.37	0.37	0.025	0.025	-	-	-	-
27	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
28	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
29	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
30	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
31	-	-	-	-	-	-	-	-	1.98	1.39	0.94	0.66	0.14	0.10	-	-	-	-

Unit No.	NOx		CO		VOC		SOx		TSP[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
32	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
33	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
34	33.3	65.0	5.00	9.8	1.10	2.15	0.51	0.99	0.31	0.61	0.31	0.61	0.31	0.61			8.4E-05	0.00016
35	3.31	8.07	0.55	1.34	0.25	0.61	0.039	0.094	0.25	0.61	0.25	0.61	0.25	0.61			6E-06	1.5E-05
36	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
37	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
38	-	-	-	-	-	-	-	-	0.070	0.070	0.023	0.023	0.0065	0.0065	-	-	-	-
39	-	-	-	-	-	-	-	-							-	-	-	-
40	-	-	-	-	-	-	-	-							-	-	-	-
41	-	-	-	-	-	-	-	-							-	-	-	-
42	-	-	-	-	-	-	-	-	Material is saturated when processed. No emissions are estimated for these regulated units.						-	-	-	-
43	-	-	-	-	-	-	-	-							-	-	-	-
44	-	-	-	-	-	-	-	-							-	-	-	-
45	-	-	-	-	-	-	-	-							-	-	-	-
46	-	-	-	-	-	-	-	-							-	-	-	-
47	-	-	-	-	-	-	-	-							-	-	-	-
48	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
49	-	-	-	-	-	-	-	-	3.30	2.32	1.56	1.10	0.24	0.17	-	-	-	-
50	7.74	17.7	1.47	3.36	0.09	0.21	0.16	0.37	0.16	0.37	0.16	0.37	0.16	0.37	-	-	2.6E-05	6.1E-05
51	-	-	-	-	-	-	-	-	26.1	21.0	6.64	5.35	0.66	0.54	-	-	-	-
Subtotal	**44.3**	**90.8**	**7.02**	**14.5**	**1.44**	**2.96**	**0.71**	**1.45**	**58.7**	**47.1**	**21.7**	**17.8**	**3.57**	**3.77**			**0.00012**	**0.00024**
HMA Plant																		
52	-	-	-	-	-	-	-	-	2.44	0.86	1.15	0.41	0.17	0.062	-	-	-	-
53	-	-	-	-	-	-	-	-	1.52	0.53	0.72	0.25	0.11	0.038	-	-	-	-
54	-	-	-	-	-	-	-	-	0.032	0.016	0.011	0.0053	0.0030	0.0015	-	-	-	-
55	-	-	-	-	-	-	-	-	0.51	0.25	0.17	0.085	0.012	0.0058	-	-	-	-
56	-	-	-	-	-	-	-	-	0.032	0.016	0.011	0.0053	0.0030	0.0015	-	-	-	-
57	-	-	-	-	-	-	-	-	0.033	0.017	0.011	0.0054	0.0031	0.0015	-	-	-	-
58	-	-	-	-	-	-	-	-	0.033	0.017	0.011	0.0054	0.0031	0.0015	-	-	-	-
59	-	-	-	-	-	-	-	-	0.033	0.017	0.011	0.0054	0.0031	0.0015	-	-	-	-
60	-	-	-	-	-	-	-	-	0.28	0.10	0.13	0.046	0.020	0.0070	-	-	-	-
61	-	-	-	-	-	-	-	-	0.020	0.010	0.0064	0.0032	0.0018	0.00091	-	-	-	-
62	-	-	-	-	-	-	-	-	0.31	0.15	0.10	0.052	0.0070	0.0035	-	-	-	-
63	-	-	-	-	-	-	-	-	0.020	0.010	0.0064	0.0032	0.0018	0.00091	-	-	-	-
64	-	-	-	-	-	-	-	-	0.020	0.010	0.0064	0.0032	0.0018	0.00091	-	-	-	-
65	-	-	-	-	-	-	-	-	0.020	0.010	0.0064	0.0032	0.0018	0.00091	-	-	-	-
67	-	-	-	-	-	-	-	-	0.18	0.022	0.12	0.014	0.0090	0.0011	-	-	-	-
69	22.0	11.0	52.0	26.0	23.2	11.6	12.8	6.40	13.2	6.60	9.20	4.60	9.20	4.60	-	-	0.0060	0.0030

Unit No.	NOx		CO		VOC		SOx		TSP[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
70	-	-	0.47	0.24	-	-	4.87	2.44	0.23	0.12	0.23	0.12	0.23	0.12	-	-	-	-
71	-	-	0.54	0.27	-	-	1.66	0.83	0.21	0.10	0.21	0.10	0.21	0.10	-	-	-	-
72	0.16	0.68	0.082	0.36	0.055	0.24	0.011	0.05	0.016	0.068	0.016	0.068	0.016	0.068	-	-	9E-06	3.9E-05
73	-	-	***	***	-	-	0.014	0.06	-	-	-	-	-	-	-	-	-	-
74	33.3	79.9	5.00	12.0	0.52	1.24	1.10	2.64	0.31	0.74	0.31	0.74	0.31	0.74	-	-	8.4E-05	0.00020
75	1.04	2.06	1.30	2.58	0.043	0.09	0.104	0.21	0.08	0.15	0.08	0.15	0.08	0.15	-	-	7E-06	1.4E-05
76	-	-	-	-	-	-	-	-	15.2	6.16	3.89	1.57	0.39	0.16	-	-	-	-
77	-	-	0.14	0.070	-	-	0.44	0.22	-	-	-	-	-	-	-	-	-	-
Subtotal	**56.5**	**93.7**	**59.5**	**41.5**	**21.0**	**12.9**	**23.8**	**13.2**	**34.8**	**16.0**	**16.4**	**8.26**	**10.8**	**6.07**	-	-	**0.0061**	**0.0033**
Totals	**100.8**	**184.4**	**66.6**	**56.0**	**22.5**	**15.9**	**24.5**	**14.5**	**93.5**	**63.1**	**38.1**	**26.0**	**14.4**	**9.84**	-	-	**0.0062**	**0.0035**

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5.

Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)

X This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scehduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine our predictable startup, shutdown or scheduled maintenance (SSM)[1], including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (https://www.env.nm.gov/aqb/permit/aqb_pol.html) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals																		

[1] **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5.

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

X I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol and on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		TSP		PM10		PM2.5		☐ H_2S or ☐ Lead	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals:																	

Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
S1	34	V	Yes	12	970.0	8569			262.1	0.83
S2	35	V	Yes	12	1000.0	523			130.2	0.29
S3	50	V	Yes	12	1011.2	2533			216.4	0.50
S4	66, 67	V	No	30	Ambient	497			42.4	0.50
S5	68, 69	V	No	25	250.0	60000			73.4	4.17
S6	72	V	No	14	600.0	976			20.7	1.00
S7	74	V	Yes	12	970.0	8569			262.1	0.83
S8	75	V	Yes	12	1076.0	804.8			200.8	0.29

Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

Stack No.	Unit No.(s)	Total HAPs		Provide Pollutant Asphalt Fumes ☐ HAP or X TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP		Provide Pollutant Name Here ☐ HAP or ☐ TAP	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
S1	34	0.06043	0.00911																
S2	35	0.00458	0.00086																
S3	50	0.01914	0.00338																
S5	68, 69	4.19	2.1	4.8	2.4														
S6	72	0.00112	0.00256																
S7	74	0.06043	0.0112																
S8	75	0.00508	0.00078																
	70			0.075	0.038														
	71			0.035	0.017														
	73			0.00018	0.0008														
	77			0.0066	0.0033														
Totals:		**4.34**	**2.13**	**4.92**	**2.46**														

Table 2-J: Fuel

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

Unit No.	Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, …)	Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other	Specify Units				
			Lower Heating Value	Hourly Usage	Annual Usage	% Sulfur	% Ash
34	No. 2 Diesel	purchased commerial diesel	128,000 Btu/Gallon	72.6 gallons	283,430 gallons	0.05	0
35	No. 2 Diesel	purchased commerial diesel	128,000 Btu/Gallon	5.5 gallons	26,840 gallons	0.05	0
50	No. 2 Diesel	purchased commerial diesel	128,000 Btu/Gallon	23 gallons	105,133 gallons	0.05	0
68	Burner Fuel Oil	purchased commerial	141,000 Btu/Gallon	600 gallons	600,000 gallons	0.5	0
72	No. 2 Diesel and/or	purchased commerial diesel	128,000 Btu/Gallon	7.8 gallons	68,328 gallons	0.05	0
	Propane	purchased commerial propane	91,500 Btu/Gallon	10.9 gallons	95,484 gallons	0.0018	0
74	No. 2 Diesel	purchased commerial diesel	128,000 Btu/Gallon	72.6 gallons	348,480 gallons	0.05	0
75	No. 2 Diesel	purchased commerial diesel	128,000 Btu/Gallon	6.1 gallons	24,156 gallons	0.05	0

Table 2-K: Liquid Data for Tanks Listed in Table 2-L

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

Tank No.	SCC Code	Material Name	Composition	Liquid Density (lb/gal)	Vapor Molecular Weight (lb/lb*mol)	Average Storage Conditions		Max Storage Conditions	
						Temperature (°F)	True Vapor Pressure (psia)	Temperature (°F)	True Vapor Pressure (psia)
T1	3-05-002-12	Hot Oil Asphalt Cement	Hot Oil Asphalt Cement	9.22	105	350	0.0347	350	0.0347
T2	3-05-002-12	Hot Oil Asphalt Cement	Hot Oil Asphalt Cement	9.22	105	350	0.0347	350	0.0347
T3	3-05-002-98	Burner Fuel Oil	Burner Fuel Oil	7.88	130	58.54	0.0062	65.66	0.0079
T4	3-05-002-98	Diesel Fuel	Diesel	7.05	130	58.54	0.0062	65.66	0.0079
T8	3-05-002-98	Diesel Fuel	Diesel	7.88	130	58.54	0.0062	65.66	0.0079

Table 2-L: Tank Data

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary. See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn-overs (per year)
					(bbl)	(M^3)			Roof	Shell			
T1	TBD	Hot Oil Asphalt Cement	NA	FX	238.10	37.85	2.44	1.95	OT (AS)	OT (AS)	Good	2,603,037	260.30
T2	TBD	Hot Oil Asphalt Cement	NA	FX	238.10	37.85	2.44	1.95	OT (AS)	OT (AS)	Good	2,603,037	260.30
T3	TBD	Burner Fuel Oil	NA	FX	238.10	37.85	2.44	1.95	OT (WH)	OT (WH)	Good	600,000	60.00
T4	TBD	Diesel Fuel	NA	FX	238.10	37.85	2.44	1.95	OT (WH)	OT (WH)	Good	441,000	44.10
T8	TBD	Diesel Fuel	NA	FX	47.62	7.57	1.22	1.5	OT (WH)	OT (WH)	Good	100,000	50.00

Table 2-L2: Liquid Storage Tank Data Codes Reference Table

Roof Type	Seal Type, Welded Tank Seal Type		Seal Type, Riveted Tank Seal Type		Roof, Shell Color	Paint Condition
FX: Fixed Roof	**Mechanical Shoe Seal**	**Liquid-mounted resilient seal**	**Vapor-mounted resilient seal**	**Seal Type**	**WH**: White	Good
IF: Internal Floating Roof	**A**: Primary only	**A**: Primary only	**A**: Primary only	**A**: Mechanical shoe, primary only	**AS**: Aluminum (specular)	Poor
EF: External Floating Roof	**B**: Shoe-mounted secondary	**B**: Weather shield	**B**: Weather shield	**B**: Shoe-mounted secondary	**AD**: Aluminum (diffuse)	
P: Pressure	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**LG**: Light Gray	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

Table 2-M: Materials Processed and Produced (Use additional sheets as necessary.)

Material Processed				Material Produced			
Description	**Chemical Composition**	**Phase (Gas, Liquid, or Solid)**	**Quantity (specify units)**	**Description**	**Chemical Composition**	**Phase**	**Quantity (specify units)**
HMA Plant							
Aggregate	Aggregate	Solid	230-370 TPH	Asphalt	Aggregate, RAP, Mineral Filler, Asphalt Cement	Solid	400 TPH
RAP	Recycled Asphalt Products	Solid	0-140 TPH				
Mineral Filler	Rock dust, Slag dust, Hydrated lime, Cement, Versabind, and/or Loess	Solid	6 TPH				
Asphalt Cement	Asphalt Cement	Heated Liquid	24 TPH				
Aggregate Crusher Plant							
Aggregate	Aggregate	Solid	500 TPH	Aggregate	Aggregate	Solid	500 TPH
Wash Plant							
Aggregate	Aggregate	Solid	500 TPH	Aggregate	Washed Aggregate	Solid	500 TPH

Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
NA									

Table 2-O: Parametric Emissions Measurement Equipment

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
NA								

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box **X** By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									Total GHG Mass Basis ton/yr[4]	Total CO_2e ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
34	**mass GHG**	3013		1.97												3015.0
	CO_2e	3013		49.3												3062.3
35	**mass GHG**	298		0.19												298.2
	CO_2e	298		4.8												302.8
50	**mass GHG**	1172		0.77												1172.8
	CO_2e	1172		19.3												1191.3
69	**mass GHG**	6600		2.4												6602.4
	CO_2e	6600		60.0												6660.0
72	**mass GHG**	763	0.0431	0.0096												763.1
	CO_2e	763	12.8	0.24												776.0
74	**mass GHG**	3839		2.4												3841.4
	CO_2e	3839		60.0												3899.0
75	**mass GHG**	747		0.22												747.2
	CO_2e	747		5.5												752.5
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO_2e															
	mass GHG															
	CO2e															
Total	**mass GHG**	16432	0.043	7.96												16440
	CO_2e	16432	12.8	199												16644

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[3] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

Routine or predictable emissions during Startup, Shutdown, and Maintenance (SSM): Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

Elam Construction (Elam) is applying for a new 20.2.72 NMAC air quality permit for a 500 ton per hour (TPH) aggregate crushing and screening plant, 500 TPH aggregate wash plant, and 400 TPH hot mix asphalt plant (HMA) to be operated within county of San Juan, state of New Mexico. Regulation governing this permit application is 20.2.72.200.A(1) NMAC.

Elam has retained Montrose Air Quality Services (Montrose) to assist with the permit application. The plant will be identified as Kirtland Sand & Gravel and is located at 32 Road 6210, Kirtland, NM, 87417. While facility-wide emission rates are greater than 100 tons per year for a single pollutant potentially making it a major source; the 2-digit SIC code are different for the HMA plant, and aggregate crushing/screening plant and aggregate wash plant. Since emission rates for each 2-digit SIC Code is less than 100 tons for a single pollutant, the facility will be permitted as a "synthetic minor source" for either Title V or PSD applicability.

The 500 tph aggregate quarry and crushing operations will include an aggregate quarry, feeder, primary jaw crusher, two (2) secondary cone crushers, three (3) 6' x 20' screens, eighteen (18) transfer conveyors, and five (5) stacker conveyors. The plant will be powered by a 1429 horsepower (hp) generator during hours of aggregate processing and a 113 hp standby generator at all other times. Aggregate from the quarry will be transported to the aggregate crushing plant by large rock trucks. Processed aggregate will be transported from the aggregate crushing plant to the HMA plant, aggregate wash plant, and off-site sales. The aggregate crushing plant will limit hourly processing rate to 500 tph and 1,000,000 tons per year (tpy). The hours of operation is presented below in Table 3-1, but the aggregate crushing plant will limit the daily throughput per season to the values listed in Table 3-2. The main plant generator will be limited to operating 3904 hours per year. The standby generator will be limited to operating 4880 hours per year.

TABLE 3-1: Aggregate Crusher Hours of Operation (MST)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	0	0	0	0	0	1	1	1	0	0	0	0
7:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
8:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
9:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
10:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
11:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
12:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
1:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
2:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
3:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
4:00 PM	0	1	1	1	1	1	1	1	1	1	1	0
5:00 PM	0	1	1	1	1	1	1	1	0	0	0	0
6:00 PM	0	0	0	0	0	1	1	1	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	10	11	11	11	13	13	13	10	10	10	8

TABLE 3-2: Aggregate Daily Production Rates

Season	Tons Per Day
Winter	4000
Spring	5500
Summer	5500
Fall	4500

Aggregate Wash Plant
The 500 tph aggregate wash plant will include a feeder, twin-screw wash plant, six (6) transfer conveyors, and four (4) stacker conveyors. The plant will be powered by a 475 horsepower (hp) generator. Processed aggregate will be transported from the aggregate wash plant to the HMA plant, concrete batch plant, and off-site sales. The aggregate wash plant will limit hourly processing rate to 500 tph and 1,000,000 tons per year (tpy). The hours of operation will be daylight hours and is presented below in Table 3-3. The main plant generator will be limited to operating 4571 hours per year.

TABLE 3-3: Wash Plant Modeled Hours of Operation (MST)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM	0	0	0	1	1	1	1	1	0.5	0	0	0
6:00 AM	0	0.5	1	1	1	1	1	1	1	1	0.5	0
7:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
8:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
9:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
10:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
11:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
12:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
1:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
2:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
3:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
4:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
5:00 PM	0.5	1	1	1	1	1	1	1	1	1	0	0
6:00 PM	0	0	0	1	1	1	1	1	0.5	0	0	0
7:00 PM	0	0	0	0	0	0.5	0.5	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	10.5	11.5	12	14	14	14.5	14.5	14	13	12	10.5	10

HMA Plant

The 400 tph hot mix asphalt plant will include a 5-bin cold aggregate feeder, scalping screen, pug mill, 2- bin RAP feeder , RAP scalping screen, mineral filler silo with baghouse, drum dryer with baghouse, incline conveyor, asphalt silo, asphalt heater, and eight (8) transfer conveyors. The plant will be powered by a 1429 horsepower (hp) generator during hours of asphalt processing and a 158 hp standby generator at all other times. Processed asphalt will be transported from the HMA plant to off-site sales. The HMA plant will limit hourly processing rate to 400 tph and 400,000 tons per year (tpy). The hours of operation is presented below in Table 3-4. Seasonal daily throughput is presented in Table 3-5. The main plant generator will be limited to operating 4800 hours per year. The standby generator will be limited to operating 3960 hours per year. Hot oil asphalt heaters will be permitted to operate 8760 hours per year.

TABLE 3-4: HMA Plant Hours of Operation (MST)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12:00 AM	0	0	0	0	0	1	1	1	0	0	0	0
1:00 AM	0	0	0	0	0	1	1	1	0	0	0	0
2:00 AM	0	0	0	0	0	1	1	1	0	0	0	0
3:00 AM	0	0	0	0	0	1	1	1	0	0	0	0
4:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
5:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
6:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
7:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
8:00 AM	0	0	1	1	1	1	1	1	1	1	1	0
9:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
10:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
11:00 AM	1	1	1	1	1	1	1	1	1	1	1	1
12:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
1:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
2:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
3:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
4:00 PM	1	1	1	1	1	1	1	1	1	1	1	1
5:00 PM	0	0	1	1	1	1	1	1	1	1	1	0
6:00 PM	0	0	1	1	1	1	1	1	1	1	1	0
7:00 PM	0	0	1	1	1	1	1	1	1	1	1	0
8:00 PM	0	0	1	1	1	1	1	1	0	0	0	0
9:00 PM	0	0	1	1	1	1	1	1	0	0	0	0
10:00 PM	0	0	0	0	0	1	1	1	0	0	0	0
11:00 PM	0	0	0	0	0	1	1	1	0	0	0	0
Total	8	8	18	18	18	24	24	24	16	16	16	8

TABLE 3-5: HMA Daily Production Rates and Corresponding Max Hours of Production

Season	Tons Per Day	At Max Hourly Throughput – Hours per Day
Winter	3200	8
Spring	4000	10
Summer	4000	10
Fall	4000	10

Nighttime operations will follow the guidelines issued by the department "Air Quality Permitting Guidelines for Night Operations of Crushing and Screening Plants, Hot Mix Asphalt Plants, and Concrete Batch Plants" (Ver.08/14/06). Nighttime conditions acceptable to Mountain States Constructors, Inc. include:

Construction and Operation
The permittee shall install data logger(s) capable of continuously recording differential pressure measured by magnahelic gauges or equivalent differential pressure gauges installed on the Drum Dryer/Mixer Baghouse (Unit 69).

Monitoring
The permittee shall, during nighttime loading of the Mineral Filler Silo (Unit 66), monitor the differential pressure across the Mineral Filler Silo Baghouse (Unit 67) by the use of a differential pressure gauge to ensure it is within the manufacturers or facility determined specified operating range. One reading shall be taken during the silo loading operation.

The permittee shall, during nighttime operation of the plant continuously monitor and record the differential pressure across the Drum Dryer/Mixer Baghouse (Unit 69) by the use of a differential pressure gauge with a data recording system to ensure it is within the manufacturers or facility determined specified operating range.

The permittee shall, during nighttime operating hours, ensure fugitive dust control systems are functioning correctly for Units 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, and 65 per {CONDITION X}.

Recordkeeping
During night operation the permittee shall record, by the use of a data logger, a continuous record of the differential pressure across Drum Dryer/Mixer Baghouse (Unit 69).

During silo loading of the Mineral Filler Silo (Unit 66), the differential pressure shall be recorded once.

RAP (recycled asphalt products) will be included in the asphalt production. The % weight of RAP used in asphalt production will range from 10 to 35%. To determine emission rates input into the model a RAP percentage of 35% was used as the worst-case scenario. This scenario allows for the most material to be processed through the most equipment generating the worst-case emissions..

Routine or predictable emissions during Startup, Shutdown, and Maintenance (SSM)

No SSM emissions are predicted for this permit application. All control systems will be operational prior to the start or shutdown of asphalt production. Maintenance will be performed during period with no production.

Section 4

Process Flow Sheet

A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

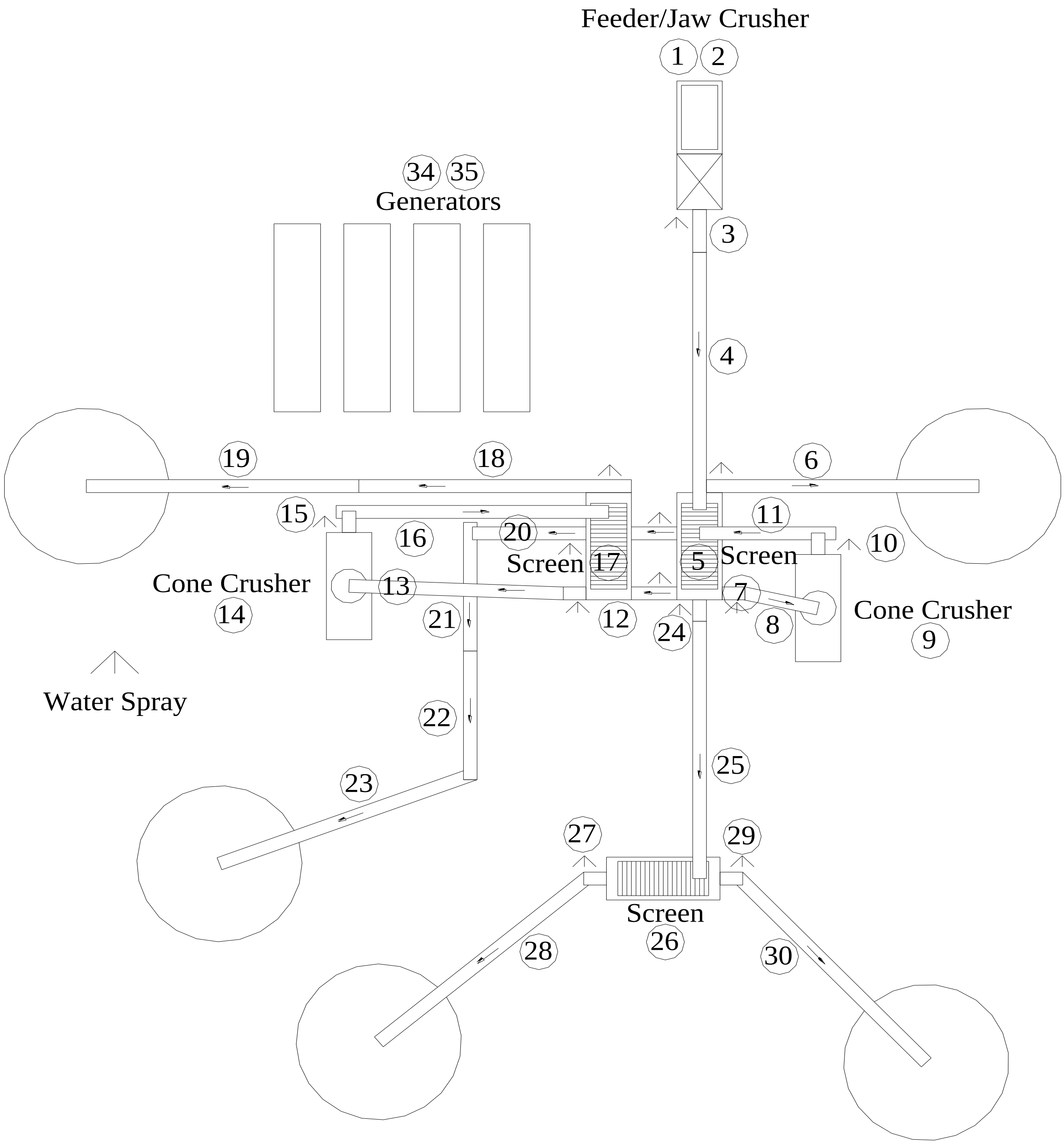

Figure 4-1: Aggregate Crushing and Screening Plant Process Flow

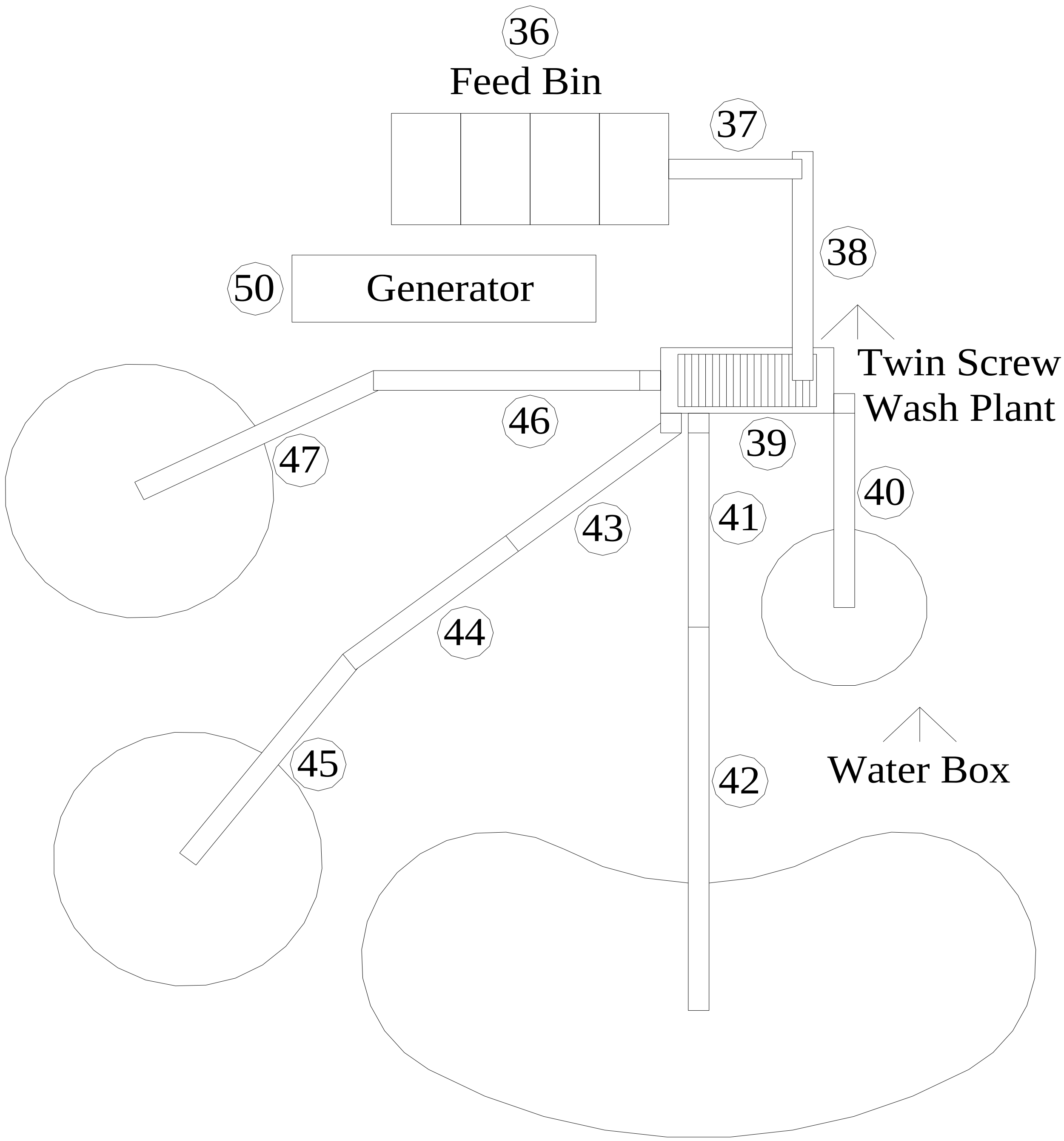

Figure 4-2: Aggregate Wash Plant Process Flow

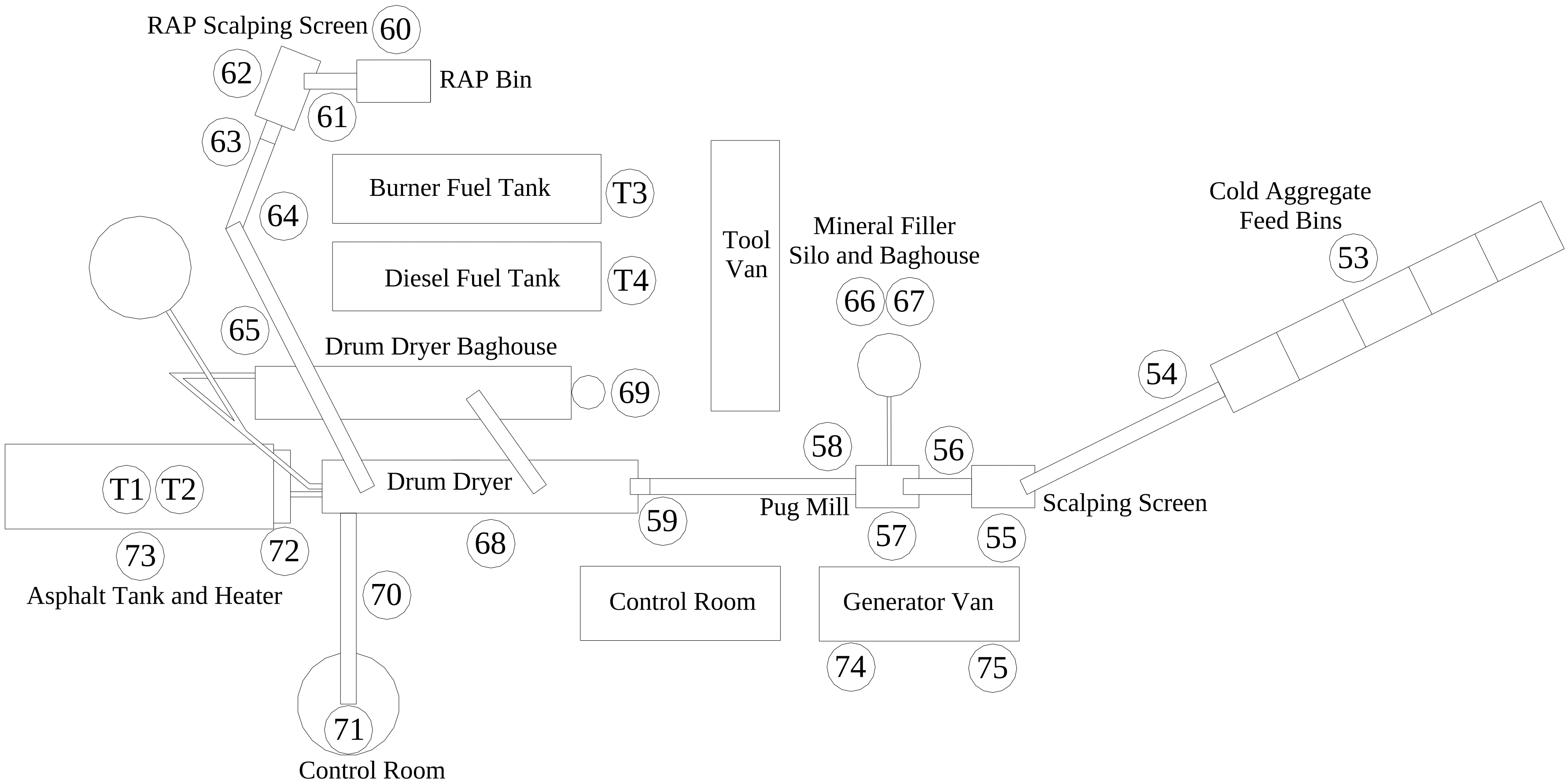

Figure 4-3: HMA Plant Process Flow

Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

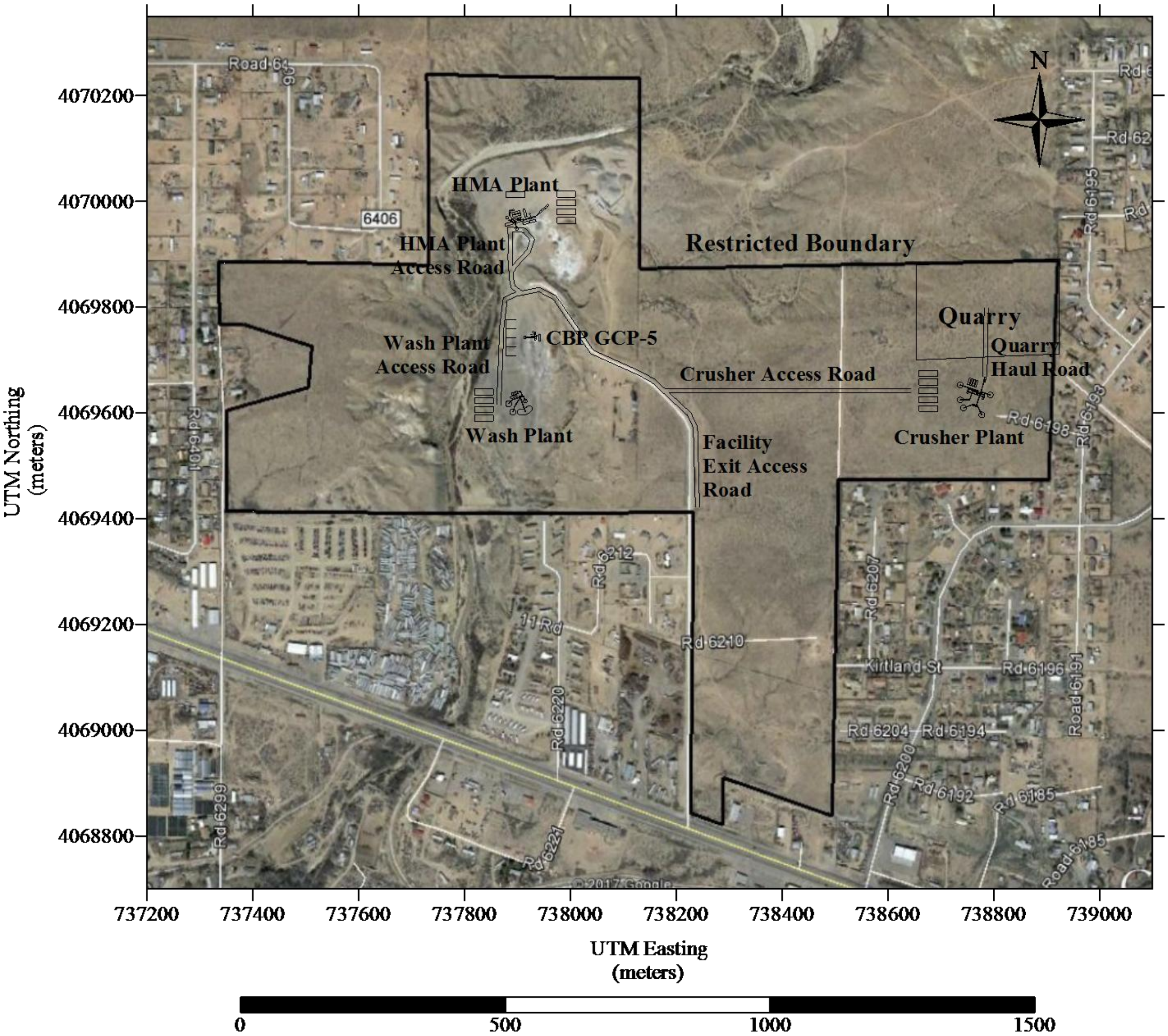

Figure 5-1: Facility Plot Plan

Section 6

All Calculations

Show all calculations used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:
A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.
B. At least 5 significant figures shall be retained in all intermediate calculations.
C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

- **(1)** If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;
- **(2)** If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**
- **(3)** If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.
- **(4)** The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

Aggregate Crusher and Wash Plants

Pre-Control Particulate Emission Rates

Material Handling ($PM_{2.5}$, PM_{10}, and TSP)

To estimate material handling pre-control particulate emissions rates for crushing, screening, and conveyor transfer operations, emission factors were obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Aug. 2004, Section 11.19.2, Table 11.19.2-2. To determine missing $PM_{2.5}$ emission factors the ratio of 0.35/0.053 from $PM_{10}/PM_{2.5}$ *k* factors found in AP-42 Section 13.2.4 (11/2006) were used.

To estimate material handling pre-control particulate emission rates for aggregate handling operations (mining/aggregate piles/ loading feed bins), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent.

Maximum hourly production for each plant is as follows:

Material Throughputs for Each Plant

Plant	Tons Per Hour
Aggregate Crusher Plant	500
Wash Plant	500

Uncontrolled annual emissions for tons per year (tpy) were calculated assuming operation for 4380 hours per year. This limit is based on the natural limitation of daylight hours for the safety of Elam personnel.

<u>Aggregate Material Handling – Mining, Storage Piles, and Feed Bin Loading Emission Equation:</u>

Maximum Hour Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3} / (M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(11/5)^{1.3} / (2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(11/5)^{1.3} / (2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(11/5)^{1.3} / (2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00660 lbs/ton;

E_{PM10} (lbs/ton) = 0.00312 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00047 lbs/ton

Annual Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00465 lbs/ton;

E_{PM10} (lbs/ton) = 0.00220 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00033 lbs/ton

AP-42 Section 11.19.2 Table 11.19.2-2 Emission Factors:

All Bin Unloading and Conveyor Transfers = Uncontrolled Conveyor Transfer Point Emission Factor
Crushing = Uncontrolled Tertiary Crushing Emission Factor
Screening = Uncontrolled Screening Emission Factor

Material Handling Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Uncontrolled Crushing	0.00540	0.00240	0.00036
Uncontrolled Screening	0.02500	0.00870	0.00132
Feed Bin Unloading, and Conveyor Transfers	0.00300	0.00110	0.00017
Uncontrolled Hourly Mining, Aggregate Storage Piles, Aggregate Feeder Loading	0.00660	0.00312	0.00047
Uncontrolled Annual Mining, Aggregate Storage Piles, Aggregate Feeder Loading	0.00465	0.00220	0.00033

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour) * Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-1 Pre-Controlled Regulated Process Equipment Emission Rates

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
2	Cedarapids Jaw Crusher	500	2.70	5.91	1.20	2.63	0.22	0.49
3	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
4	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
5	Cedarapids 6'x20' Screen	500	12.5	27.4	4.35	9.53	0.29	0.64
6	Stacker Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
7	Under Screen Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
8	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
9	Secondary Cone Crusher	500	2.70	5.91	1.20	2.63	0.22	0.49
10	Secondary Cone Crusher Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
11	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
12	Under Screen Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
13	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
14	Secondary Cone Crusher	500	2.70	5.91	1.20	2.63	0.22	0.49
15	Secondary Cone Crusher Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
16	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
17	Cedarapids 6'x20' Screen	500	12.5	27.4	4.35	9.53	0.29	0.64
18	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
19	Stacker Conveyor	800	1.50	3.29	0.55	1.20	0.16	0.36
20	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
21	Transfer Conveyor	800	1.50	3.29	0.55	1.20	0.16	0.36
22	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
23	Stacker Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
24	Under Screen Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
25	Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
26	Cedarapids 6'x20' Screen	500	12.5	27.4	4.35	9.53	0.29	0.64
27	Under Screen Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
28	Stacker Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
29	Under Screen Transfer Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
30	Stacker Conveyor	500	1.50	3.29	0.55	1.20	0.16	0.36
31	Stacker Conveyor Drop to Pile	500	3.30	5.09	1.56	2.41	0.24	0.36
37	Wet Plant Transfer Conveyor	500	1.50	3.29	0.55	1.2	0.16	0.36
38	Wet Plant Transfer Conveyor	500	1.50	3.29	0.55	1.2	0.16	0.36
39	Twin Screw Wash Plant	500	Wash Plant Sources Where the Material is Saturated by Water, Zero Emissions.					
40	Wet Plant Stacker Conveyor	500						
41	Wet Plant Transfer Conveyor	500						
42	Wet Plant Stacker Conveyor	500						
43	Wet Plant Transfer Conveyor	500						
44	Wet Plant Transfer Conveyor	500						
45	Wet Plant Stacker Conveyor	500						
46	Wet Plant Transfer Conveyor	500						
47	Wet Plant Stacker Conveyor	500						
		TOTALS	**86.4**	**187.1**	**32.0**	**69.0**	**5.85**	**12.7**

Table 6-2 Pre-Controlled Material Handling Fugitive Emission Rates

Emission Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Quarry	Quarry Mining	500	3.30	5.09	1.56	2.41	0.24	0.36
1	Feeder	500	3.30	5.09	1.56	2.41	0.24	0.36
32	Finish Product Storage Pile	500	3.30	5.09	1.56	2.41	0.24	0.36
33	Product Truck Loading - Finish Pile	500	3.30	5.09	1.56	2.41	0.24	0.36
36	Wet Plant Feeder	500	3.30	5.09	1.56	2.41	0.24	0.36
48	Wet Plant Finish Product Storage Pile	500	3.30	5.09	1.56	2.41	0.24	0.36
49	Wet Plant Product Truck Loading - Finish Pile	500	3.30	5.09	1.56	2.41	0.24	0.36
		TOTALS	**23.1**	**35.6**	**10.9**	**16.9**	**1.65**	**2.55**

Aggregate Haul Truck Travel

Haul truck travel emissions were estimated using AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads" emission equation. See Figure 5-1 for identification of haul roads. Table 6-3 summarizes the emission rate for each haul truck category.

Unpaved Roads
AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads"

$$E = k * (s/12)^a * (W/3)^b * [(365 - p)/365] * VMT$$

Where k = constant PM2.5 = 0.15
PM10 = 1.5
TSP = 4.9
s = % silt content (Table 13.2.2-1, "Sand and Gravel" 4.8%)
W = mean vehicle weight (26.5 tons – 15 tons truck, 23 tons load)
W = mean vehicle weight Quarry Trucks (26.5 tons – 31 tons truck, 70 tons load)
p = number of days with at least 0.01 in of precip. (70 days)
a = Constant PM2.5 = 0.9
PM10 = 0.9
TSP = 0.7
b = Constant PM2.5 = 0.45
PM10 = 0.45
TSP = 0.45
Trucks per Hour
Crusher Plant to HMA Plant = 10 truck per hour average
Crusher Plant to Exit = 5.4 truck per hour average
Crusher Plant to Wash Plant = 8.2 truck per hour average
Wash Plant to Exit = 8.2 truck per hour average
Quarry Trucks = 7.1 truck per hour average

VMT =Vehicle Miles Traveled
Crusher to HMA Unpaved – 1.23457 miles per vehicle
Crusher to Exit Unpaved – 0.87646 miles per vehicle
Crusher to Wash Unpaved – 1.30082 miles per vehicle
Wash to Exit Unpaved – 1.02277 miles per vehicle
Quarry Trucks Unpaved – 0.16159 miles per vehicle

Miles Traveled
Crusher to HMA Unpaved – 12.346 miles per hour; 54074.17 miles per year
Crusher to Exit Unpaved – 4.763 miles per hour; 15615.65 miles per year
Crusher to Wash Unpaved – 10.604 miles per hour; 46447.65 miles per year
Wash to Exit Unpaved – 8.338 miles per hour; 36519.42 miles per year
Quarry Trucks Unpaved – 1.154 miles per hour; 5055.49 miles per year

Reduction in emissions due to precipitation was only accounted for in the annual emission rate. Particulate emission rate per vehicle mile traveled for each particle size category is:

<u>Hourly Emission Rate Factor – 0% Control</u>
TSP = 6.87692 lbs/VMT
PM10 = 1.75267 lbs/VMT
PM2.5 = 0.17527 lbs/VMT

<u>Annual Emission Rate Factor – 0% Control</u>
TSP = 5.36965 lbs/VMT
PM10 = 1.36853 lbs/VMT
PM2.5 = 0.13685 lbs/VMT

Hourly Emission Rate Factor Quarry Trucks – 0% Control
TSP = 10.36879 lbs/VMT
PM10 = 2.64262 lbs/VMT
PM2.5 = 0.26426 lbs/VMT

Annual Emission Rate Factor Quarry Trucks – 0% Control
TSP = 8.09618 lbs/VMT
PM10 = 2.06342 lbs/VMT
PM2.5 = 0.20634 lbs/VMT

Table 6-3: Pre-Controlled Haul Road Fugitive Dust Emission Rates

Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Haul Road Crusher Plant to HMA Plant	12.346 miles/hr; 54074017 miles/yr	84.9	150.3	21.6	38.3	2.16	3.83
Haul Road Crusher Plant to Exit	4.763 miles/hr; 83453.91 miles/yr	21.5	38.0	5.48	9.7	0.55	0.97
Haul Road Crusher Plant to Wash Plant	10.604 miles/hr; 123860.41 miles/yr	72.9	129.1	18.6	32.9	1.86	3.29
Haul Road Wash Plant to Exit	8338 miles/hr; 97385.12 miles/yr	57.3	101.5	14.6	25.9	1.46	2.59
Haul Road Quarry Trucks to Crusher	1.154 miles/hr; 5055.49 miles/yr	12.0	20.5	3.05	5.22	0.31	0.52
	Total	**249**	**439**	**63**	**112**	**6.34**	**11.2**

Controlled Particulate Emission Rates

No controls or emission reductions for combustion emissions (NO_X, CO, SO_2, VOC, or PM) are proposed for the main crusher plant engine (Unit 34), crusher plant standby engine (Unit 35), or wash plant engine (Unit 50) with the exception of limiting annual hours of operation.

Controlled Material Handling ($PM_{2.5}$, PM_{10}, and TSP)

No fugitive dust controls or emission reductions are proposed for the quarry mining, aggregate storage piles, or loading of the aggregate feed bins with the exception of limiting annual production rates.

Fugitive dust control for unloading the aggregate feed bins onto conveyors will be controlled, as needed, with enclosures and/or water sprays at the exit of the feed bins. Fugitive dust control for the transfer conveyors will be controlled with material moisture content and/or enclosure. It is estimated that these methods will control to an efficiency of 95.3 percent per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for the plant crushers will be controlled, as needed, with enclosures and/or water sprays. It is estimated that these methods will control to an efficiency of 77.8 percent for crushing operations per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for the plant screens will be controlled, as needed, with enclosures and/or water sprays. It is estimated that these methods will control to an efficiency of 91.2 percent for screening operations per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for the stacker conveyor transfer to storage piles will be controlled with material moisture content and/or enclosure. It is estimated that the additional moisture during processing will increase the moisture content from the default of 2% to the high moisture content value found in footnote b of AP-42 Table 11.19.2-2. This will control fugitive emissions to an efficiency of 60 percent. Additional emission reductions include limiting annual production rates.

To estimate material handling control particulate emissions rates for crushing, screening, pug mill and conveyor transfer operations, emission factors were obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Aug. 2004, Section 11.19.2, Table 11.19.2-2.

To estimate material handling particulate emission rates for aggregate handling operations (mining/aggregate storage piles/ loading feed bins), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent.

Maximum hourly production for each plant is as follows:

Operational Conditions

Plant	Tons Per Hour	Tons per Year
Aggregate Crusher Plant	500	1,000,000
Wash Plant	500	1,000,000

Mining, Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Maximum Hour Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(11/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(11/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(11/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00660 lbs/ton;

E_{PM10} (lbs/ton) = 0.00312 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00047 lbs/ton

Aggregate Storage Pile Loading from Stacker Conveyor Emission Equation:

Maximum Hour Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(11/5)^{1.3}$ / $(2.88/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(11/5)^{1.3}$ / $(2.88/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(11/5)^{1.3}$ / $(2.88/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00396 lbs/ton;

E_{PM10} (lbs/ton) = 0.00187 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00028 lbs/ton

Mining, Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Annual Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00465 lbs/ton;

E_{PM10} (lbs/ton) = 0.00220 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00033 lbs/ton

Aggregate Storage Pile Loading from Stacker Conveyor Emission Equation:

Annual Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2.88/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2.88/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2.88/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00279 lbs/ton;

E_{PM10} (lbs/ton) = 0.00132 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00020 lbs/ton

AP-42 Emission Factors:

Feed Bin Unloading = Controlled Conveyor Transfer Point Emission Factor
Crusher = Controlled Tertiary Crusher Emission Factor
Screen = Controlled Screening Emission Factor
Transfer Conveyor = Controlled Conveyor Transfer Point Emission Factor

Material Handling Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Controlled Crushing	0.00120	0.00054	0.00010
Controlled Screening	0.00220	0.00074	0.00005
Controlled Feeder Unloading and Conveyor Transfers	0.00014	0.00005	0.000013
Mining, Aggregate Storage Piles, Feeder Loading Maximum Hourly	0.00660	0.00312	0.00047
Mining, Aggregate Storage Piles, Feeder Loading Annual Hourly	0.00465	0.00220	0.00033
Stacker Conveyor to Pile Maximum Hourly	0.00396	0.00187	0.00028
Stacker Conveyor to Pile Annual Hourly	0.00279	0.00132	0.00020

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Hourly Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-4 Allowable Regulated Process Equipment Emission Rates

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
2	Cedarapids Jaw Crusher	500	0.60	0.60	0.27	0.27	0.050	0.050
3	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
4	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
5	Cedarapids 6'x20' Screen	500	1.10	1.10	0.37	0.37	0.025	0.025
6	Stacker Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
7	Under Screen Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
8	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
9	Secondary Cone Crusher	500	0.60	0.60	0.27	0.27	0.050	0.050
10	Secondary Cone Crusher Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
11	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
12	Under Screen Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
13	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
14	Secondary Cone Crusher	500	0.60	0.60	0.27	0.27	0.050	0.050
15	Secondary Cone Crusher Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
16	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
17	Cedarapids 6'x20' Screen	500	1.10	1.10	0.37	0.37	0.025	0.025
18	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
19	Stacker Conveyor	800	0.070	0.070	0.023	0.023	0.0065	0.0065
20	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
21	Transfer Conveyor	800	0.070	0.070	0.023	0.023	0.0065	0.0065
22	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
23	Stacker Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
24	Under Screen Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
25	Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
26	Cedarapids 6'x20' Screen	500	1.10	1.10	0.37	0.37	0.025	0.025
27	Under Screen Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
28	Stacker Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
29	Under Screen Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
30	Stacker Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
31	Stacker Conveyor Drop to Pile	500	1.98	1.39	0.94	0.66	0.14	0.10
37	Wet Plant Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
38	Wet Plant Transfer Conveyor	500	0.070	0.070	0.023	0.023	0.0065	0.0065
39	Twin Screw Wash Plant	500	Wash Plant Sources Where the Material is Saturated by Water, Zero Emissions.					
40	Wet Plant Stacker Conveyor	500						
41	Wet Plant Transfer Conveyor	500						
42	Wet Plant Stacker Conveyor	500						
43	Wet Plant Transfer Conveyor	500						
44	Wet Plant Transfer Conveyor	500						
45	Wet Plant Stacker Conveyor	500						
46	Wet Plant Transfer Conveyor	500						
47	Wet Plant Stacker Conveyor	500						
		TOTALS	**8.83**	**8.24**	**3.43**	**3.15**	**0.53**	**0.49**

Table 6-5 Allowable Material Handling Fugitive Emission Rates

Emission Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Quarry	Quarry Mining	500	3.30	2.32	1.56	1.10	0.24	0.17
1	Feeder	500	3.30	2.32	1.56	1.10	0.24	0.17
32	Finish Product Storage Pile	500	3.30	2.32	1.56	1.10	0.24	0.17
33	Product Truck Loading - Finish Pile	500	3.30	2.32	1.56	1.10	0.24	0.17
36	Wet Plant Feeder	500	3.30	2.32	1.56	1.10	0.24	0.17
48	Wet Plant Finish Product Storage Pile	500	3.30	2.32	1.56	1.10	0.24	0.17
49	Wet Plant Product Truck Loading - Finish Pile	500	3.30	2.32	1.56	1.10	0.24	0.17
		TOTALS	**23.1**	**16.3**	**10.9**	**7.69**	**1.65**	**1.17**

Controlled Aggregate Haul Truck Travel

Haul truck travel emissions were estimated using AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads" emission equation. Rock truck travel on haul roads from the quarry to the crusher plant will be controlled with base course and watering for a 80% control efficiency. All other haul roads throughout the plant are unpaved that will be controlled with surfactants, millings, and water. Haul road traffic emission rates controlled by surfactants, millings, and/or water have applied a control efficiency of 90%. Table B-5 summarizes the emission rate for each haul truck category.

Unpaved Roads

AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads"

$$E = k * (s/12)^a * (W/3)^b * [(365 - p)/365] * VMT$$

Where k = constant PM2.5 = 0.15
PM10 = 1.5
TSP = 4.9

s = % silt content (Table 13.2.2-1, "Sand and Gravel" 4.8%)
W = mean vehicle weight (26.5 tons – 15 tons truck, 23 tons load)
W = mean vehicle weight Quarry Trucks (26.5 tons – 31 tons truck, 70 tons load)
p = number of days with at least 0.01 in of precip. (70 days)
a = Constant PM2.5 = 0.9
PM10 = 0.9
TSP = 0.7
b = Constant PM2.5 = 0.45
PM10 = 0.45
TSP = 0.45

Trucks per Hour
Crusher Plant to HMA Plant = 10 truck per hour average
Crusher Plant to Exit = 5.4 truck per hour average
Crusher Plant to Wash Plant = 8.2 truck per hour average
Wash Plant to Exit = 8.2 truck per hour average
Quarry Trucks = 7.1 truck per hour average

VMT =Vehicle Miles Traveled
Crusher to HMA Unpaved – 1.23457 miles per vehicle
Crusher to Exit Unpaved – 0.87646 miles per vehicle
Crusher to Wash Unpaved – 1.30082 miles per vehicle
Wash to Exit Unpaved – 1.02277 miles per vehicle
Quarry Trucks Unpaved – 0.16159 miles per vehicle

Miles Traveled
Crusher to HMA Unpaved – 12.346 miles per hour; 24691.40 miles per year
Crusher to Exit Unpaved – 4.763 miles per hour; 6249.52 miles per year
Crusher to Wash Unpaved – 10.604 miles per hour; 21208.97 miles per year
Wash to Exit Unpaved – 8.338 miles per hour; 16675.53 miles per year
Quarry Trucks Unpaved – 1.154 miles per hour; 2308.44 miles per year

Reduction in emissions due to precipitation was only accounted for in the annual emission rate. Particulate emission rate per vehicle mile traveled for each particle size category is:

Hourly Emission Rate Factor Quarry Trucks – 80% Control

TSP = 1.37538 lbs/VMT
PM10 = 0.35053 lbs/VMT
PM2.5 = 0.03505 lbs/VMT

Annual Emission Rate Factor Quarry Trucks – 80% Control
TSP = 1.07393 lbs/VMT
PM10 = 0.27371 lbs/VMT
PM2.5 = 0.02737 lbs/VMT

Hourly Emission Rate Factor – 90% Control
TSP = 0.68769 lbs/VMT
PM10 = 0.17527 lbs/VMT
PM2.5 = 0.01753 lbs/VMT

Annual Emission Rate Factor – 90% Control
TSP = 0.55581 lbs/VMT
PM10 = 0.14165 lbs/VMT
PM2.5 = 0.01417 lbs/VMT

Table 6-6: Allowable Haul Road Fugitive Dust Emission Rates

Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Haul Road Crusher Plant to HMA Plant	10.064 miles/hr; 117552.54 miles/yr	8.49	6.86	2.16	1.75	0.22	0.17
Haul Road Crusher Plant to Exit	4.763 miles/hr; 83453.91 miles/yr	2.15	1.74	0.55	0.44	0.055	0.044
Haul Road Crusher Plant to Wash Plant	10.604 miles/hr; 123860.41 miles/yr	7.29	5.89	1.86	1.50	0.19	0.15
Haul Road Wash Plant to Exit	8.338 miles/hr; 97385.12 miles/yr	5.73	4.63	1.46	1.18	0.15	0.12
Haul Road Quarry Trucks to Crusher	1.154 miles/hr; 5055.49 miles/yr	2.39	1.87	0.61	0.48	0.061	0.048
	Total	**26.1**	**21.0**	**6.64**	**5.35**	**0.66**	**0.54**

Estimates for 1429 hp Main Aggregate Crushing Diesel-Fired Engine (NO_X, CO, SO_2, VOC, PM, CO_2, and CH_4)

A 1429 horsepower (hp) engine (Unit34) provides power to the aggregate crushing and screening plant. Emission rates for NO_X, CO, PM and NMHC are based on manufacturer specifications (see Attachment A-XXXX-7-1429.pdf). Sulfur dioxide (SO_2) emissions are estimated based on sulfur content of diesel fuel, not to exceed 0.05% fuel content and a fuel usage rate of 72.6 gal/hr. CO_2 and CH_4 emission rates are found in AP-42 Section 3.3. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 4380 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 3904 hours per year.

<u>Manufacturer Emission Factors:</u>

Pollutant	Emission Factor (lbs/hr)
Nitrogen Oxide	33.3
Carbon Monoxides	5.00
Particulate	0.31
Hydrocarbons	1.10

Sulfur dioxide emission rate was calculated using the fuel consumption rate for this engine of 72.6 gallons per hour, a fuel density of 7.0 pounds per gallon, a fuel sulfur content of 0.05%, and a sulfur to sulfur dioxide conversion factor of two (2). The following equation calculates the emission rate for sulfur dioxide (SO_2).

Emission Rate (lbs/hr) = Fuel (gal/hr) * Density lbs/gal * % Sulfur Content * Factor

$$\text{Emission Rate (lbs/hr)} = \frac{72.6 \text{ gallons}}{\text{hr}} \left| \frac{7.0 \text{ lbs}}{\text{gallon}} \right| \frac{0.0005 \text{ lbs Sulfur}}{\text{lbs of fuel}} \left| \frac{2 \text{ lbs Sulfur Dioxide}}{1 \text{ lb Sulfur}} \right.$$

Emission Rate (lbs/hr) = 0.51 lbs/hr

Carbon Dioxide emissions were estimated using AP-42 Table 3.3-1 emission factor of 1.08 lbs/hp-hr.

Methane emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.000705 lbs/hp-hr.

The following equation was used to calculate the annual emission rate for each engine pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{2000 \text{ lbs/ton}}$$

Table 6-7: Pre-Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
34	NO_X	1429	33.30	72.93
	CO	1429	5.00	10.95
	SO_2	1429	0.51	1.11
	VOC	1429	1.10	2.41
	TSP	1429	0.31	0.68
	PM_{10}	1429	0.31	0.68
	$PM_{2.5}$	1429	0.31	0.68
	CO_2	1429	1543	3379
	CH_4	1429	1.01	2.21

Table 6-8: Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
34	NO_X	1429	33.30	65.00
	CO	1429	5.00	9.76
	SO_2	1429	0.51	0.99
	VOC	1429	1.10	2.15
	TSP	1429	0.31	0.61
	PM_{10}	1429	0.31	0.61
	$PM_{2.5}$	1429	0.31	0.61
	CO_2	1429	1543	3013
	CH_4	1429	1.01	1.97

Estimates for 113 hp Standby Aggregate Crushing Diesel-Fired Engine (NO_X, CO, SO_2, VOC, PM, CO_2, and CH_4)

A 113 horsepower (hp) engine (Unit35) provides power to the aggregate crushing and screening plant when the main generator is shutdown. Emission rates for NO_X, CO, and NMHC are based on manufacturer specifications (see Attachment A-XXXX-7-113.pdf). Sulfur dioxide (SO_2) emissions are estimated based on sulfur content of diesel fuel, not to exceed 0.05% fuel content and a fuel usage rate of 5.5 gal/hr. PM, CO_2 and CH_4 emission rates are found in AP-42 Section 3.3. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 4880 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 4880 hours per year.

<u>Manufacturer Emission Factors:</u>

Pollutant	Emission Factor (grams/hr)	Emission Rate (lbs/hr)
Nitrogen Oxide	1500	3.31
Carbon Monoxides	250	0.55
Hydrocarbons	113	0.25

Sulfur dioxide emission rate was calculated using the fuel consumption rate for this engine of 5.5 gallons per hour, a fuel density of 7.0 pounds per gallon, a fuel sulfur content of 0.05%, and a sulfur to sulfur dioxide conversion factor of two (2). The following equation calculates the emission rate for sulfur dioxide (SO_2).

Emission Rate (lbs/hr) = Fuel (gal/hr) * Density lbs/gal * % Sulfur Content * Factor

$$\text{Emission Rate (lbs/hr)} = \frac{5.5\ \text{gallons}}{\text{hr}} \left| \frac{7.0\ \text{lbs}}{\text{gallon}} \right| \frac{0.0005\ \text{lbs Sulfur}}{\text{lbs of fuel}} \left| \frac{2\ \text{lbs Sulfur Dioxide}}{1\ \text{lb Sulfur}} \right.$$

Emission Rate (lbs/hr) = 0.039 lbs/hr

Particulate emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.0022 lbs/hp-hr.

Carbon Dioxide emissions were estimated using AP-42 Table 3.3-1 emission factor of 1.08 lbs/hp-hr.

Methane emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.000705 lbs/hp-hr.

The following equation was used to calculate the annual emission rate for each engine pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{2000\ \text{lbs/ton}}$$

Table 6-9: Pre-Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
35	NO_X	1429	3.31	8.07
	CO	1429	0.55	1.34
	SO_2	1429	0.039	0.094
	VOC	1429	0.25	0.61
	TSP	1429	0.25	0.61
	PM_{10}	1429	0.25	0.61
	$PM_{2.5}$	1429	0.25	0.61
	CO_2	1429	122	267
	CH_4	1429	0.080	0.18

Table 6-10: Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
35	NO_X	1429	3.31	8.07
	CO	1429	0.55	1.34
	SO_2	1429	0.039	0.094
	VOC	1429	0.25	0.61
	TSP	1429	0.25	0.61
	PM_{10}	1429	0.25	0.61
	$PM_{2.5}$	1429	0.25	0.61
	CO_2	1429	122	298
	CH_4	1429	0.080	0.19

Estimates for 475 hp Aggregate Wash Plant Diesel-Fired Engine (NO_X, CO, SO_2, VOC, PM, CO_2, and CH_4)

A 475 horsepower (hp) engine (Unit50) provides power to the aggregate wash plant. Emission rates for NO_X, CO, PM, and NMHC are based on manufacturer specifications (see Attachment A-XXXX-7-475.pdf). Sulfur dioxide (SO_2) emissions are estimated based on sulfur content of diesel fuel, not to exceed 0.05% fuel content and a fuel usage rate of 23 gal/hr. CO_2 and CH_4 emission rates are found in AP-42 Section 3.3. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 4571 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 4571 hours per year.

Manufacturer Emission Factors:

Pollutant	Emission Factor (lbs/hr)
Nitrogen Oxide	7.74
Carbon Monoxides	1.47
Particulate	0.09
Hydrocarbons	0.16

Sulfur dioxide emission rate was calculated using the fuel consumption rate for this engine of 23 gallons per hour, a fuel density of 7.0 pounds per gallon, a fuel sulfur content of 0.05%, and a sulfur to sulfur dioxide conversion factor of two (2). The following equation calculates the emission rate for sulfur dioxide (SO_2).

Emission Rate (lbs/hr) = Fuel (gal/hr) * Density lbs/gal * % Sulfur Content * Factor

$$\text{Emission Rate (lbs/hr)} = \frac{23 \text{ gallons}}{\text{hr}} \times \frac{7.0 \text{ lbs}}{\text{gallon}} \times \frac{0.0005 \text{ lbs Sulfur}}{\text{lbs of fuel}} \times \frac{2 \text{ lbs Sulfur Dioxide}}{1 \text{ lb Sulfur}}$$

Emission Rate (lbs/hr) = 0.16 lbs/hr

Carbon Dioxide emissions were estimated using AP-42 Table 3.3-1 emission factor of 1.08 lbs/hp-hr.

Methane emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.000705 lbs/hp-hr.

The following equation was used to calculate the annual emission rate for each engine pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{2000 \text{ lbs/ton}}$$

Table 6-11: Pre-Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
50	NO_X	1429	7.74	17.7
	CO	1429	1.47	3.36
	SO_2	1429	0.16	0.37
	VOC	1429	0.09	0.21
	TSP	1429	0.16	0.37
	PM_{10}	1429	0.16	0.37
	$PM_{2.5}$	1429	0.16	0.37
	CO_2	1429	513	1172
	CH_4	1429	0.33	0.77

Table 6-12: Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
50	NO_X	1429	7.74	17.7
	CO	1429	1.47	3.36
	SO_2	1429	0.16	0.37
	VOC	1429	0.09	0.21
	TSP	1429	0.16	0.37
	PM_{10}	1429	0.16	0.37
	$PM_{2.5}$	1429	0.16	0.37
	CO_2	1429	513	1172
	CH_4	1429	0.33	0.77

Table 6-13 Summary of Uncontrolled NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
		NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
Unit #	Description	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Quarry	Quarry Mining									3.30	5.09	1.56	2.41	0.24	0.36
1	Feeder									3.30	5.09	1.56	2.41	0.24	0.36
2	Cedarapids Jaw Crusher									2.70	5.91	1.20	2.63	0.22	0.49
3	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
4	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
5	Cedarapids 6'x20' Screen									12.5	27.4	4.35	9.53	0.29	0.64
6	Stacker Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
7	Under Screen Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
8	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
9	Secondary Cone Crusher									2.70	5.91	1.20	2.63	0.22	0.49
10	Secondary Cone Crusher Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
11	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
12	Under Screen Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
13	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
14	Secondary Cone Crusher									2.70	5.91	1.20	2.63	0.22	0.49
15	Secondary Cone Crusher Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
16	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
17	Cedarapids 6'x20' Screen									12.5	27.4	4.35	9.53	0.29	0.64
18	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
19	Stacker Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
20	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
21	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
22	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36

Table 6-13 Summary of Uncontrolled NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
Unit #	Description	NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
23	Stacker Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
24	Under Screen Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
25	Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
26	Cedarapids 6'x20' Screen									12.5	27.4	4.35	9.53	0.29	0.64
27	Under Screen Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
28	Stacker Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
29	Under Screen Transfer Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
30	Stacker Conveyor									1.50	3.29	0.55	1.20	0.16	0.36
31	Stacker Conveyor Drop to Pile									3.30	5.09	1.56	2.41	0.24	0.36
32	Finish Product Storage Pile									3.30	5.09	1.56	2.41	0.24	0.36
33	Product Truck Loading - Finish Pile									3.30	5.09	1.56	2.41	0.24	0.36
34	Crusher Plant Generator	33.30	72.9	5.00	11.0	0.51	1.11	1.10	2.41	0.31	0.68	0.31	0.68	0.31	0.68
35	Crusher Plant Standby Generator	3.31	8.07	0.55	1.34	0.039	0.094	0.25	0.61	0.25	0.61	0.25	0.61	0.25	0.61
36	Wet Plant Feeder									3.30	5.09	1.56	2.41	0.24	0.36
37	Wet Plant Transfer Conveyor									1.50	3.29	0.55	1.2	0.16	0.36
38	Wet Plant Transfer Conveyor									1.50	3.29	0.55	1.2	0.16	0.36
39	Twin Screw Wash Plant									Material is saturated when processed. No emissions are estimated for these regulated units.					
40	Wet Plant Stacker Conveyor														
41	Wet Plant Transfer Conveyor														
42	Wet Plant Stacker Conveyor														

Table 6-13 Summary of Uncontrolled NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
		NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
Unit #	Description	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
43	Wet Plant Transfer Conveyor														
44	Wet Plant Transfer Conveyor														
45	Wet Plant Stacker Conveyor														
46	Wet Plant Transfer Conveyor														
47	Wet Plant Stacker Conveyor														
48	Wet Plant Finish Product Storage Pile									3.30	5.09	1.56	2.41	0.24	0.36
49	Wet Plant Product Truck Loading - Finish Pile									3.30	5.09	1.56	2.41	0.24	0.36
50	Wash Plant Generator	7.74	17.7	1.47	3.36	0.16	0.37	0.090	0.21	0.16	0.37	0.16	0.37	0.16	0.37
51	Haul Road Crusher to HMA									84.9	150.3	21.6	38.3	2.16	3.83
51	Haul Road Crusher to Exit									21.5	38.0	5.48	9.7	0.55	0.97
51	Haul Road Crusher to Wash Plant									72.9	129.1	18.6	32.9	1.86	3.29
51	Haul Road Wash Plant to Exit									57.3	101.5	14.6	25.9	1.46	2.59
51	Haul Road Quarry Trucks to Crusher									12.0	20.5	3.05	5.22	0.31	0.52
	Total	**44.3**	**98.7**	**7.02**	**15.7**	**0.71**	**1.57**	**1.44**	**3.22**	**359**	**664**	**107**	**199**	**14.6**	**28.1**

Table 6-14 Summary of Allowable NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
Unit #	Description	NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Quarry	Quarry Mining									3.30	2.32	1.56	1.10	0.24	3.30
1	Feeder									3.30	2.32	1.56	1.10	0.24	3.30
2	Cedarapids Jaw Crusher									0.60	0.60	0.27	0.27	0.050	0.60
3	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
4	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
5	Cedarapids 6'x20' Screen									1.10	1.10	0.37	0.37	0.025	1.10
6	Stacker Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
7	Under Screen Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
8	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
9	Secondary Cone Crusher									0.60	0.60	0.27	0.27	0.050	0.60
10	Secondary Cone Crusher Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
11	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
12	Under Screen Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
13	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
14	Secondary Cone Crusher									0.60	0.60	0.27	0.27	0.050	0.60
15	Secondary Cone Crusher Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
16	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
17	Cedarapids 6'x20' Screen									1.10	1.10	0.37	0.37	0.025	1.10
18	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
19	Stacker Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
20	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
21	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
22	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070

Table 6-14 Summary of Allowable NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
Unit #	Description	NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
23	Stacker Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
24	Under Screen Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
25	Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
26	Cedarapids 6'x20' Screen									1.10	1.10	0.37	0.37	0.025	1.10
27	Under Screen Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
28	Stacker Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
29	Under Screen Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
30	Stacker Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
31	Stacker Conveyor Drop to Pile									1.98	1.39	0.94	0.66	0.14	1.98
32	Finish Product Storage Pile									3.30	2.32	1.56	1.10	0.24	3.30
33	Product Truck Loading - Finish Pile									3.30	2.32	1.56	1.10	0.24	3.30
34	Crusher Plant Generator	33.30	65.0	5.00	9.76	0.51	0.99	1.10	2.15	0.31	0.61	0.31	0.61	0.31	0.61
35	Crusher Plant Standby Generator	3.31	8.07	0.55	1.34	0.039	0.094	0.25	0.61	0.25	0.61	0.25	0.61	0.25	0.61
36	Wet Plant Feeder									3.30	2.32	1.56	1.10	0.24	3.30
37	Wet Plant Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
38	Wet Plant Transfer Conveyor									0.070	0.070	0.023	0.023	0.0065	0.070
39	Twin Screw Wash Plant									Material is saturated when processed. No emissions are estimated for these regulated units.					
40	Wet Plant Stacker Conveyor														
41	Wet Plant Transfer Conveyor														
42	Wet Plant Stacker Conveyor														

Table 6-14 Summary of Allowable NOx, CO, SO2, VOC, and PM Emission Rates

Uncontrolled Emission Totals															
		NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
Unit #	Description	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
43	Wet Plant Transfer Conveyor														
44	Wet Plant Transfer Conveyor														
45	Wet Plant Stacker Conveyor														
46	Wet Plant Transfer Conveyor														
47	Wet Plant Stacker Conveyor														
48	Wet Plant Finish Product Storage Pile									3.30	2.32	1.56	1.10	0.24	3.30
49	Wet Plant Product Truck Loading - Finish Pile									3.30	2.32	1.56	1.10	0.24	3.30
50	Wash Plant Generator	7.74	17.7	1.47	3.36	0.16	0.37	0.090	0.21	0.16	0.37	0.16	0.37	0.16	0.37
51	Haul Road Crusher to HMA									8.49	6.86	2.16	1.75	0.22	0.17
51	Haul Road Crusher to Exit									2.15	1.74	0.55	0.44	0.055	0.044
51	Haul Road Crusher to Wash Plant									7.29	5.89	1.86	1.50	0.19	0.15
51	Haul Road Wash Plant to Exit									5.73	4.63	1.46	1.18	0.15	0.12
51	Haul Road Quarry Trucks to Crusher									2.39	1.87	0.61	0.48	0.061	0.048
	Total	**44.3**	**98.7**	**7.02**	**15.7**	**0.71**	**1.57**	**1.44**	**3.22**	**359**	**664**	**107**	**199**	**14.6**	**28.1**

Estimates for Federal HAPs Air Pollutants

The main aggregate plant crusher generator (Unit 34), aggregate plant standby generator (Unit 35), and wash plant generator (Unit 50) are sources of HAPs as it appears in Section 112 (b) of the 1990 CAAA. Emissions of HAPs were determined for the main, standby and wash plant generators using AP-42 Section 3.3 and Section 1.3.

The following tables summarize the HAPs emission rates from the main aggregate plant crusher generator, aggregate plant standby generator, and wash plant generator. Total combined HAPs emissions from Kirtland Aggregate Plants is 0.084 pounds per hour and 0.013 tons per year.

Table 6-15: HAPs Emission Rates from the Aggregate Plant Main Generator (34)

Horsepower Rating:	1429	horsepower	
Fuel Usage:	72.6	gallons/hr	
MMBtu/hr:	9.2928	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	9.2928E-06	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	3904	hours per year	

Type of Fuel:	Diesel
Emission Factors	AP-42 Section 3.3 and Section 1.3

Non-PAH HAPS	**CAS#**		**Emission Factor (lbs/mmBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acetalehyde	75-07-0		7.67E-04	0.007128	0.013913
Acrolein	107-02-8		9.25E-05	0.000860	0.001678
Benzene	71-43-2		9.33E-04	0.008670	0.016924
1,3-Butadiene	106-99-0		3.91E-05	0.000363	0.000709
Formaldehyde	50-00-0		1.18E-03	0.010966	0.021405
Propylene	115-07-1		2.58E-03	0.023975	0.046800
Toluene	108-88-3		4.09E-04	0.003801	0.007419
Xylene	1330-20-7		2.85E-04	0.002648	0.005170
		Total Non-PAH HAPS	6.29E-03	0.058411	0.114018

PAH HAPS	**CAS#**		**Emission Factor (lbs/mmBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acenaphthene	83-32-9		1.42E-06	0.000013	0.000026
Acenaphthylene	208-96-8		5.06E-06	0.000047	0.000092
Anthracene	120-12-7		1.87E-06	0.000017	0.000034
Benzo(a)anthracene	56-55-3		1.68E-06	0.000016	0.000030
Benzo(a)pyrene	50-32-8		1.88E-07	0.000002	0.000003
Benzo(b)fluoranthene	205-99-2		9.91E-08	0.000001	0.000002
Benzo(a)pyrene	192-97-2		1.55E-07	0.000001	0.000003
Benzo(g,h,I)perylene	191-24-2		4.89E-07	0.000005	0.000009
Benzo(k)fluoranthene	207-08-9		1.55E-07	0.000001	0.000003
Dibenz(a,h)anthracene			5.83E-07	0.000005	0.000011
Chrysene	218-01-9		3.53E-07	0.000003	0.000006
Fluoranthene	206-44-0		7.61E-06	0.000071	0.000138
Fluorene	86-73-7		2.92E-05	0.000271	0.000530
Indeno(1,2,3-cd)pyrene	193-39-5		3.75E-07	0.000003	0.000007
Naphthalene	91-20-3		8.48E-05	0.000788	0.001538
Phenanthrene	85-01-8		2.94E-05	0.000273	0.000533
Pyrene	129-00-0		4.78E-06	0.000044	0.000087
		Total PAH HAPS	1.68E-04	0.001563	0.003051

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000037	0.000073
Beryllium		3	0.000028	0.000054
Cadmium		3	0.000028	0.000054
Chromium		3	0.000028	0.000054
Lead		9	0.000084	0.000163
Manganese		6	0.000056	0.000109
Mercury		3	0.000028	0.000054
Nickel		3	0.000028	0.000054
Selenium		15	0.000139	0.000272
	Total Metals HAPS	49	0.000455	0.000889
	Total HAPS		**0.060**	**0.0091**

Table 6-16: HAPs Emission Rates from the Aggregate Plant Standby Generator (35)

Horsepower Rating:	113	horsepower	
Fuel Usage:	5.5	gallons/hr	
MMBtu/hr:	0.704	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	0.000000704	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	4880	hours per year	

Type of Fuel: Diesel
Emission Factors AP-42 Section 3.3 and Section 1.3

Non-PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acetalehyde	75-07-0		7.67E-04	0.000540	0.001318
Acrolein	107-02-8		9.25E-05	0.000065	0.000159
Benzene	71-43-2		9.33E-04	0.000657	0.001603
1,3-Butadiene	106-99-0		3.91E-05	0.000028	0.000067
Formaldehyde	50-00-0		1.18E-03	0.000831	0.002027
Propylene	115-07-1		2.58E-03	0.001816	0.004432
Toluene	108-88-3		4.09E-04	0.000288	0.000703
Xylene	1330-20-7		2.85E-04	0.000201	0.000490
		Total Non-PAH HAPS	6.29E-03	0.004425	0.010797

PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acenaphthene	83-32-9		1.42E-06	0.000001	0.000002
Acenaphthylene	208-96-8		5.06E-06	0.000004	0.000009
Anthracene	120-12-7		1.87E-06	0.000001	0.000003
Benzo(a)anthracene	56-55-3		1.68E-06	0.000001	0.000003
Benzo(a)pyrene	50-32-8		1.88E-07	0.000000	0.000000
Benzo(b)fluoranthene	205-99-2		9.91E-08	0.000000	0.000000
Benzo(a)pyrene	192-97-2		1.55E-07	0.000000	0.000000
Benzo(g,h,I)perylene	191-24-2		4.89E-07	0.000000	0.000001
Benzo(k)fluoranthene	207-08-9		1.55E-07	0.000000	0.000000
Dibenz(a,h)anthracene			5.83E-07	0.000000	0.000001
Chrysene	218-01-9		3.53E-07	0.000000	0.000001
Fluoranthene	206-44-0		7.61E-06	0.000005	0.000013
Fluorene	86-73-7		2.92E-05	0.000021	0.000050
Indeno(1,2,3-cd)pyrene	193-39-5		3.75E-07	0.000000	0.000001
Naphthalene	91-20-3		8.48E-05	0.000060	0.000146
Phenanthrene	85-01-8		2.94E-05	0.000021	0.000051
Pyrene	129-00-0		4.78E-06	0.000003	0.000008
		Total PAH HAPS	1.68E-04	0.000118	0.000289

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000003	0.000007
Beryllium		3	0.000002	0.000005
Cadmium		3	0.000002	0.000005
Chromium		3	0.000002	0.000005
Lead		9	0.000006	0.000015
Manganese		6	0.000004	0.000010
Mercury		3	0.000002	0.000005
Nickel		3	0.000002	0.000005
Selenium		15	0.000011	0.000026
	Total Metals HAPS	49	0.000034	0.000084
	Total HAPS		**0.0046**	**0.00086**

Table 6-17: HAPs Emission Rates from the Wash Plant Generator (50)

Horsepower Rating:	475	horsepower	
Fuel Usage:	23	gallons/hr	
MMBtu/hr:	2.944	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	0.000002944	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	4571	hours per year	

Type of Fuel:	Diesel
Emission Factors	AP-42 Section 3.3 and Section 1.3

Non-PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acetalehyde	75-07-0		7.67E-04	0.002258	0.005161
Acrolein	107-02-8		9.25E-05	0.000272	0.000622
Benzene	71-43-2		9.33E-04	0.002747	0.006278
1,3-Butadiene	106-99-0		3.91E-05	0.000115	0.000263
Formaldehyde	50-00-0		1.18E-03	0.003474	0.007940
Propylene	115-07-1		2.58E-03	0.007596	0.017360
Toluene	108-88-3		4.09E-04	0.001204	0.002752
Xylene	1330-20-7		2.85E-04	0.000839	0.001918
		Total Non-PAH HAPS	6.29E-03	0.018505	0.042293

PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acenaphthene	83-32-9		1.42E-06	0.000004	0.000010
Acenaphthylene	208-96-8		5.06E-06	0.000015	0.000034
Anthracene	120-12-7		1.87E-06	0.000006	0.000013
Benzo(a)anthracene	56-55-3		1.68E-06	0.000005	0.000011
Benzo(a)pyrene	50-32-8		1.88E-07	0.000001	0.000001
Benzo(b)fluoranthene	205-99-2		9.91E-08	0.000000	0.000001
Benzo(a)pyrene	192-97-2		1.55E-07	0.000000	0.000001
Benzo(g,h,I)perylene	191-24-2		4.89E-07	0.000001	0.000003
Benzo(k)fluoranthene	207-08-9		1.55E-07	0.000000	0.000001
Dibenz(a,h)anthracene			5.83E-07	0.000002	0.000004
Chrysene	218-01-9		3.53E-07	0.000001	0.000002
Fluoranthene	206-44-0		7.61E-06	0.000022	0.000051
Fluorene	86-73-7		2.92E-05	0.000086	0.000196
Indeno(1,2,3-cd)pyrene	193-39-5		3.75E-07	0.000001	0.000003
Naphthalene	91-20-3		8.48E-05	0.000250	0.000571
Phenanthrene	85-01-8		2.94E-05	0.000087	0.000198
Pyrene	129-00-0		4.78E-06	0.000014	0.000032
		Total PAH HAPS	1.68E-04	0.000495	0.001132

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000012	0.000027
Beryllium		3	0.000009	0.000020
Cadmium		3	0.000009	0.000020
Chromium		3	0.000009	0.000020
Lead		9	0.000026	0.000061
Manganese		6	0.000018	0.000040
Mercury		3	0.000009	0.000020
Nickel		3	0.000009	0.000020
Selenium		15	0.000044	0.000101
	Total Metals HAPS	49	0.000144	0.000330
	Total HAPS		**0.019**	**0.0034**

Hot Mix Asphalt Plant

Pre-Control Particulate Emission Rates

Material Handling ($PM_{2.5}$, PM_{10}, and TSP)

To estimate material handling pre-control particulate emissions rates for screening, pug mill and conveyor transfer operations, emission factors were obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Aug. 2004, Section 11.19.2, Table 11.19.2-2. To determine missing $PM_{2.5}$ emission factors the ratio of 0.35/0.053 from $PM_{10}/PM_{2.5}$ *k* factors found in AP-42 Section 13.2.4 (11/2006) were used.

To estimate material handling pre-control particulate emission rates for aggregate handling operations (aggregate/RAP piles/ loading cold feed bins), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent.

To estimate material handling pre-control particulate emission rates for RAP handling operations (loading RAP feed bin), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent. Additionally, the emission factors are reduced further because of the inherent properties of RAP with a coating of asphalt which captures small particles within the material. Based on EPA documents "EIIP – Preferred and Alternative Methods for Estimating Air Emissions from Hot-Mix-Asphalt Plants, Final Report, July 1996, Table 3.2-1 Fugitive Dust – Crushed RAP material" the inherent typical efficiency of the material is 70% (see Attachment C). The equation in AP-42 Section 13.2.4 was multiplied by 0.3 to account for the 70% reduction in emissions due to RAP material properties.

The asphalt will contain 1.5% mineral filler. Pre-control particulate emissions rates for mineral filler silo loading was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 11.12 (06/06), Table 11.12-2 "Cement Unloading to Elevated Storage Silo". To determine missing $PM_{2.5}$ emission factors the ratio of 0.995/0.050 from $TSP/PM_{2.5}$ uncontrolled emission equations found in AP-42 Section 11.12 (06/06), Table 11.12-3 "Cement Unloading to Elevated Storage Silo" was used.

Maximum hourly asphalt production is 400 tons per hours. Virgin aggregate/ RAP/Mineral filler/Asphalt cement ratios used in estimating material handling particulate emission rates is equal to 57.5/35.0/1.5/6.0. These ratios are estimates and ratios may change with mix requirements, these are not requested permit conditions.

Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Maximum Hour Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00660 lbs/ton;

E_{PM10} (lbs/ton) = 0.00312 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00047 lbs/ton

E_{TSP} (lbs/ton) RAP = 0.00198 lbs/ton; 70% inherent control

E_{PM10} (lbs/ton) RAP = 0.00094 lbs/ton; 70% inherent control

$E_{PM2.5}$ (lbs/ton)RAP = 0.00014 lbs/ton; 70% inherent control

Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Annual Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00465 lbs/ton;

E_{PM10} (lbs/ton) = 0.00220 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00033 lbs/ton

E_{TSP} (lbs/ton) RAP = 0.00139 lbs/ton; 70% inherent control

E_{PM10} (lbs/ton) RAP = 0.00066 lbs/ton; 70% inherent control

$E_{PM2.5}$ (lbs/ton)RAP = 0.00010 lbs/ton; 70% inherent control

AP-42 Emission Factors:

All Bin Unloading and Conveyor Transfers = Uncontrolled Conveyor Transfer Point Emission Factor

Crushing = Uncontrolled Tertiary Crushing Emission Factor

Screening = Uncontrolled Screening Emission Factor

Pug Mill = Uncontrolled Conveyor Transfer Point Emission Factor

Material Handling Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Uncontrolled Screening	0.02500	0.00870	0.00132
Uncontrolled Screen Unloading, Pug Mill Loading and Unloading, Feed Bin Unloading, and Conveyor Transfers	0.00300	0.00110	0.00017
Uncontrolled Aggregate Storage Piles, Cold Aggregate Feeder Loading Max Hourly	0.00660	0.00312	0.00047
Uncontrolled Aggregate Storage Piles, Cold Aggregate Feeder Loading Annual	0.00465	0.00220	0.00033
Uncontrolled RAP Feeder Loading Max Hour	0.00192	0.00094	0.00014
Uncontrolled RAP Feeder Loading Annual	0.00139	0.00066	0.00010

AP-42 Section 11.12 Table 11.12-2 Uncontrolled Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.72	0.46	0.036

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-18 Pre-Controlled Regulated Process Equipment Emission Rates

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
52	Cold Aggregate/RAP Storage Pile	370	2.44	7.53	1.15	3.56	0.17	0.54
53	Feed Bin Loading	230	1.52	4.68	0.72	2.21	0.11	0.34
54	Feed Bin Unloading	230	0.69	3.02	0.25	1.11	0.04	0.17
55	Scalping Screen	230	5.75	25.19	2.00	8.76	0.30	1.33
56	Scalping Screen Unloading	230	0.69	3.02	0.25	1.11	0.039	0.17
57	Pug Mill Load	236	0.71	3.10	0.26	1.14	0.040	0.18
58	Pug Mill Unload	236	0.71	3.10	0.26	1.14	0.040	0.18
59	Conveyor Transfer to Slinger Conveyor	236	0.71	3.10	0.26	1.14	0.040	0.18
60	RAP Bin Loading	140	0.28	0.86	0.13	0.40	0.020	0.061
61	RAP Bin Unloading	140	0.42	1.84	0.15	0.67	0.024	0.10
62	RAP Screen	140	3.50	15.33	1.22	5.33	0.18	0.81
63	RAP Screen Unloading	140	0.42	1.84	0.15	0.67	0.024	0.10
64	RAP Transfer Conveyor	140	0.42	1.84	0.15	0.67	0.024	0.10

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
65	RAP Transfer Conveyor	140	0.42	1.84	0.15	0.67	0.024	0.10
		TOTALS	**18.67**	**76.29**	**7.12**	**28.61**	**1.09**	**4.36**

HMA Haul Truck Travel

Haul truck travel emissions were estimated using AP-42, Section 13.2.2 (ver.11/06) “Unpaved Roads” emission equation. Haul trucks will be used to deliver asphalt cement, mineral filler, RAP, and transport asphalt product. Table 6-2 summarizes the emission rate for each haul truck category.

Unpaved Roads – HMA Plant
AP-42, Section 13.2.2 (ver.11/06) “Unpaved Roads”

$$E = k * (s/12)^a * (W/3)^b * [(365 - p)/365] * VMT$$

Where k = constant PM2.5 = 0.15
PM10 = 1.5
TSP = 4.9
s = % silt content (Table 13.2.2-1, “Sand and Gravel” 4.8%)
W = mean vehicle weight (27.5 tons)
p = number of days with at least 0.01 in of precip. (70 days)
a = Constant PM2.5 = 0.9
PM10 = 0.9
TSP = 0.7
b = Constant PM2.5 = 0.45
PM10 = 0.45
TSP = 0.45
Trucks per Hour
Total Trucks Entrance = 22.8 trucks per hour average
Mineral Filler = 0.2 truck per hour average
Asphalt Cement = 1.0 truck per hour average
Asphalt = 16.0 truck per hour average
RAP = 5.6 truck per hour average

VMT =Vehicle Miles Traveled
Mineral Filler Unpaved – 0.22956 miles/hr: 229.56 mile/yr
Asphalt Cement Unpaved – 0.91826 miles/hr: 918.26 mile/yr
Asphalt Truck Unpaved – 15.30430 miles/hr: 15304.30 mile/yr
RAP Truck Unpaved – 5.35651 miles/hr: 5356.51 mile/yr

Reduction in emissions due to precipitation was only accounted for in the annual emission rate. Particulate emission rate per vehicle mile traveled for each particle size category is:

Hourly Emission Rate Factor
TSP = 6.9925 lbs/VMT
PM10 = 1.7821 lbs/VMT
PM2.5 = 0.1782 lbs/VMT

Annual Emission Rate Factor
TSP = 5.8430 lbs/VMT
PM10 = 1.4892 lbs/VMT
PM2.5 = 0.1489 lbs/VMT

Table 6-19: Pre-Controlled Haul Road Fugitive Dust Emission Rates

Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Mineral Filler Truck Emissions Unpaved	0.22956 miles/hr; 229.56 miles/yr	1.61	0.65	0.41	0.17	0.041	0.017
Asphalt Cement Truck Emissions Unpaved	0.91826 miles/hr; 918.26 miles/yr	6.42	2.59	1.64	0.66	0.16	0.066
Asphalt Truck Emissions Unpaved	15.30430 miles/hr; 15304.30 miles/yr	107.02	43.25	27.27	11.02	2.73	1.10
RAP Truck Emissions Unpaved	5.35651 miles/hr; 5356.51 miles/yr	37.46	15.14	9.55	3.86	0.95	0.39
	Total	**152.50**	**61.63**	**38.87**	**15.71**	**3.89**	**1.57**

Drum Mix Hot Mix Asphalt Plant

Drum mix hot mix asphalt plant uncontrolled emissions were estimated using AP-42, Section 11.1 "Hot Mix Asphalt Plants" (revised 03/04), tables 11.1.3, 7, 8 and 14 emission equations. The drum dryer is permitted to combust either fuel oil or natural gas/propane. The worst-case emission factor from either combusting fuel oil or natural gas/propane was used to estimate emission rates. Hourly emission rates are based on maximum hourly asphalt production (400 tph) and maximum annual emission rates are based on operating 8760 hours per year. To determine missing $PM_{2.5}$ emission factor the sum of uncontrolled filterable from Table 11.1-4 plus uncontrolled organic and inorganic condensable in Table 11.1-3 was used. Silo filling and plant loadout emission factors were calculated using the default value of –0.5 for asphalt volatility and a tank temperature setting of 325˚ F for HMA mix temperature. Yard emissions were found in AP-42 Section 11.1.2.5. TOC emission equation is 0.0011 lbs/ton of asphalt produced and CO is equal to the TOC emission rate times 0.32. Percent sulfur content of the burner fuel will not exceed 0.5 percent.

Emissions of VOCs (TOCs) from the asphalt cement storage tanks were determined with EPA's TANK 4.0.9d program and the procedures found in EPA's "Emission Factor Documentation for AP-42 Section 11.1 (12/2000) Section 4.4.5" for input to the TANK program.

AP-42 Section 11.1 Table 11.1-3, 7, 8, and 14 Uncontrolled Emission Factors:

Process Unit	Pollutant	Emission Factor (lbs/ton)
Drum Mixer	NO_X	0.055
	CO	0.13
	VOC	0.032
	TOC	0.044
	TSP	28.0
	PM_{10}	6.5
	$PM_{2.5}$	1.565
Drum Unloading	CO	0.001179981
	TOC	0.012186685
	TSP	0.000585889
	PM_{10}	0.000585889
	$PM_{2.5}$	0.000585889
Silo Loadout	CO	0.001349240
	TOC	0.004158948
	TSP	0.000521937
	PM_{10}	0.000521937
	$PM_{2.5}$	0.000521937
Yard	CO	0.000352
	TOC	0.0011

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-20: Pre-Controlled Hot Mix Plant Emission Rates

Process Unit Number	Process Unit Description	Pollutant	Average Hourly Process Rate (tons/hour)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
68	Asphalt Drum Dryer	NO_X	400	22.0	96.4
		CO	400	52.0	228
		SO_2	400	23.2	102
		VOC	400	12.8	56.1
		TSP	400	11200	49056
		PM_{10}	400	2600	11388
		$PM_{2.5}$	400	626	2742
70	Drum Mixer Unloading	CO	400	0.47	2.07
		TOC	400	4.87	21.4
		TSP	400	0.23	1.03
		PM_{10}	400	0.23	1.03
		$PM_{2.5}$	400	0.23	1.03
71	Asphalt Silo Unloading	CO	400	0.54	2.36
		TOC	400	1.66	7.29
		TSP	400	0.21	0.91
		PM_{10}	400	0.21	0.91
		$PM_{2.5}$	400	0.21	0.91
73	Asphalt Cement Storage Tanks	TOC	60,000 gallons	0.039	0.17
77	YARD	TOC	400	0.44	1.93
		CO	400	0.14	0.62

Controlled Particulate Emission Rates

No controls or emission reductions for combustion emissions (NO_X, CO, SO_2, VOC, or TOC) are proposed for the drum dryer (Units 68), unloading the drum mixer (Unit 70), asphalt silos (Unit 71), asphalt heater (Unit 72), HMA plant generator (Unit 74) or HMA plant standby generator (Unit 75) with the exception of limiting annual production rates for production equipment or hours of operation for the plant generator.

Controlled Material Handling ($PM_{2.5}$, PM_{10}, and TSP)

No fugitive dust controls or emission reductions are proposed for the aggregate/RAP storage piles (Unit 52) or loading of the cold aggregate/RAP feed bins (Units 53, 60) with the exception of limiting annual production rates.

Fugitive dust control for unloading the cold aggregate feed bins onto the cold aggregate feed bin conveyor (Unit 54) will be controlled, as needed, with enclosures and/or water sprays at the exit of the feed bins. Fugitive dust control for unloading the RAP feed bins onto the RAP feed bin conveyor (Unit 61) will be controlled, as needed, with enclosures and/or water sprays at the exit of the RAP feed bins. Fugitive dust control for the RAP transfer conveyor (Units 64, 65) will be controlled with material moisture content and/or enclosure. Fugitive dust control for the plant transfer conveyor (Unit 59) will be controlled with material moisture content and/or enclosure. It is estimated that these methods will control to an efficiency of 95.3 percent per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for loading and unloading the pug mill (Unit 57, 58) will be controlled, as needed, with enclosures and/or water sprays. It is estimated that these methods will control to an efficiency of 95.3 percent per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for the scalping screen (Unit 55), and RAP screen (Unit 62) will be controlled, as needed, with enclosures and/or water sprays. It is estimated that these methods will control to an efficiency of 91.2 percent for screening operations per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Fugitive dust control for the conveyor transfer from the scalping screen (Unit 55) unloading to the scalping screen conveyor (Unit 56) or RAP screen (Unit 62) unloading to the RAP transfer conveyor (Unit 63) will be controlled with material moisture content and/or enclosure. It is estimated that this method will control to an efficiency of 95.3 percent per AP42 Section 11.19.2, Table 11.19.2-2. Additional emission reductions include limiting annual production rates.

Particulate emissions from loading the mineral filler silo (Unit 66) will be controlled with a baghouse dust collector on the exhaust vent. This dust collector consists of filter bags and is passive with no fan. It functions only when material is loaded into the silo. The filter bags are cleaned by air pulses at set intervals. Baghouse fines are dumped back into the silo. It is estimated that this method will control to an efficiency of 99 percent or greater based on information from filter bag specifications. Additional emission reductions include limiting annual production rates.

Particulate emissions from the drum dryer/mixer (Unit 68) will be controlled with a baghouse dust collector (Unit 69) on the exhaust vent. It is estimated that this method will control to an efficiency of 99.88 percent per AP42 Section 11.1, Table 11.1-3 “controlled emission factor vs. uncontrolled emission factor”. Baghouse fines are returned to the drum dryer/mixer via a closed loop system. Additional emission reductions include limiting annual production rates.

No fugitive controls or emission reductions are proposed for unloading the drum dryer/mixer or asphalt silos (Units 70, 71) with the exception of limiting annual production rates. No fugitive controls are proposed for yard emissions (Unit 77) or asphalt storage tanks (Units 73).

To estimate material handling control particulate emissions rates for screening, pug mill and conveyor transfer operations, emission factors were obtained from EPA’s Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Aug. 2004, Section 11.19.2, Table 11.19.2-2.

To estimate material handling pre-control particulate emission rates for aggregate handling operations (aggregate/RAP storage piles and cold aggregate loading feed bins), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent.

To estimate material handling pre-control particulate emission rates for RAP handling operations (loading RAP feed bin), an emission equation was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 13.2.4 (11/2004), where the k (TSP = 0.74, PM_{10} = 0.35, $PM_{2.5}$ = 0.053), wind speed for determining the maximum hourly emission rate is the NMED default of 11 MPH and for determining annual emission rate is based on the average wind speed for Farmington for the years of 1996 through 2006 of 8.4 mph, and the NMED default moisture content of 2 percent. Additionally, the emission factors are reduced further, because of the inherent properties of RAP with a coating of asphalt which captures small particles within the material. Based on EPA documents "EIIP – Preferred and Alternative Methods for Estimating Air Emissions from Hot-Mix-Asphalt Plants, Final Report, July 1996, Table 3.2-1 Fugitive Dust – Crushed RAP material" the inherent typical efficiency of the material is 70% (see Attachment C). The equation in AP-42 Section 13.2.4 was multiplied by 0.3 to account for the 70% reduction in emissions due to RAP material properties.

The asphalt will contain approximately 1.5% mineral filler. Control particulate emissions rates for mineral filler silo loading was obtained from EPA's Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, Section 11.12 (06/06), Table 11.12-2 uncontrolled "Cement Unloading to Elevated Storage Silo" and a control efficiency of 99% for the baghouse. To determine missing $PM_{2.5}$ emission factors the k factor ratio of 0.8/0.048 from TSP/$PM_{2.5}$ controlled emission equations found in AP-42 Section 11.12 (06/06), Table 11.12-3 "Cement Unloading to Elevated Storage Silo" was used.

Maximum hourly asphalt production is 400 tons per hours. Virgin aggregate/ RAP/Mineral filler/Asphalt cement ratios used in estimating material handling particulate emission rates is equal to 57.5/35.0/1.5/6.0. These ratios are estimates and ratios may change with mix requirements, these are not requested permit conditions. Annual emissions in tons per year (tpy) were calculated assuming an annual production throughput of 400,000 tons of asphalt per year.

Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Maximum Hour Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00660 lbs/ton;

E_{PM10} (lbs/ton) = 0.00312 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00047 lbs/ton

E_{TSP} (lbs/ton) RAP = 0.00198 lbs/ton; 70% inherent control

E_{PM10} (lbs/ton) RAP = 0.00094 lbs/ton; 70% inherent control

$E_{PM2.5}$ (lbs/ton)RAP = 0.00014 lbs/ton; 70% inherent control

Aggregate Storage Piles and Feed Bin Loading Emission Equation:

Annual Emission Factor

E (lbs/ton) = k x 0.0032 x $(U/5)^{1.3}$ / $(M/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.74 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{PM10} (lbs/ton) = 0.35 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

$E_{PM2.5}$ (lbs/ton) = 0.053 x 0.0032 x $(8.4/5)^{1.3}$ / $(2/2)^{1.4}$

E_{TSP} (lbs/ton) = 0.00465 lbs/ton;

E_{PM10} (lbs/ton) = 0.00220 lbs/ton

$E_{PM2.5}$ (lbs/ton) = 0.00033 lbs/ton

E_{TSP} (lbs/ton) RAP = 0.00139 lbs/ton; 70% inherent control

E_{PM10} (lbs/ton) RAP = 0.00066 lbs/ton; 70% inherent control

$E_{PM2.5}$ (lbs/ton)RAP = 0.00010 lbs/ton; 70% inherent control

AP-42 Emission Factors:

Feed Bin Unloading = Controlled Conveyor Transfer Point Emission Factor
Crusher = Controlled Tertiary Crusher Emission Factor
Screen = Controlled Screening Emission Factor
Transfer Conveyor = Controlled Conveyor Transfer Point Emission Factor
Scalping Screen Conveyor = Controlled Conveyor Transfer Point Emission Factor
Pug Mill = Controlled Conveyor Transfer Point Emission Factor
Pug Mill Conveyor = Controlled Conveyor Transfer Point Emission Factor

Material Handling Emission Factors:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Feed Bin Unloading	0.00014	0.00005	0.000013
Controlled Crushing	0.00120	0.00054	0.00010
Controlled Screening	0.00220	0.00074	0.00005
Transfer Conveyor	0.00014	0.00005	0.000013
Controlled Screen Unloading and Pug Mill Loading and Unloading	0.00014	0.00005	0.000013
Uncontrolled Aggregate Storage Piles, Cold Aggregate Feeder Loading Max Hourly	0.00660	0.00312	0.00047
Uncontrolled Aggregate Storage Piles, Cold Aggregate Feeder Loading Annual	0.00465	0.00220	0.00033
Uncontrolled RAP Feeder Loading Max Hour	0.00192	0.00094	0.00014
Uncontrolled RAP Feeder Loading Annual	0.00139	0.00066	0.00010

AP-42 Section 11.12 Table 11.12-2 Uncontrolled Emission Factors with 99% Control Efficiency:

Process Unit	TSP Emission Factor (lbs/ton)	PM_{10} Emission Factor (lbs/ton)	$PM_{2.5}$ Emission Factor (lbs/ton)
Mineral Filler Silo Loading	0.0072	0.0046	0.00036

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Hourly Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-21 Controlled Material Handling Emission Rates

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
52	Cold Aggregate/RAP Storage Pile	370	2.44	0.86	1.15	0.41	0.17	0.062
53	Feed Bin Loading	230	1.52	0.53	0.72	0.25	0.11	0.038
54	Feed Bin Unloading	230	0.032	0.016	0.011	0.0053	0.0030	0.0015
55	Scalping Screen	230	0.51	0.25	0.17	0.085	0.012	0.0058
56	Scalping Screen Unloading	230	0.032	0.016	0.011	0.0053	0.0030	0.0015
57	Pug Mill Load	236	0.033	0.017	0.011	0.0054	0.0031	0.0015
58	Pug Mill Unload	236	0.033	0.017	0.011	0.0054	0.0031	0.0015
59	Conveyor Transfer to Slinger Conveyor	236	0.033	0.017	0.011	0.0054	0.0031	0.0015
60	RAP Bin Loading	140	0.28	0.10	0.13	0.046	0.020	0.0070
61	RAP Bin Unloading	140	0.020	0.010	0.0064	0.0032	0.0018	0.00091
62	RAP Screen	140	0.31	0.15	0.10	0.052	0.0070	0.0035
63	RAP Screen Unloading	140	0.020	0.010	0.0064	0.0032	0.0018	0.00091
64	RAP Transfer Conveyor	140	0.020	0.010	0.0064	0.0032	0.0018	0.00091

Unit #	Process Unit Description	Process Rate (tph)	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
65	RAP Transfer Conveyor	140	0.020	0.010	0.0064	0.0032	0.0018	0.00091
		TOTALS	**5.29**	**2.02**	**2.36**	**0.88**	**0.34**	**0.13**

Controlled Haul Truck Travel

Haul truck travel emissions were estimated using AP-42, Section 13.2.1 (ver.01/11) "Paved Roads" emission equation and AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads" emission equation. The haul in and out of the plant from Murray Road will be paved. All other haul roads throughout the plant are unpaved that will be controlled with surfactants, millings, and water. Haul road traffic emission rates controlled by surfactants, millings, and/or water have applied a control efficiency of 90%. Table B-5 summarizes the emission rate for each haul truck category.

Unpaved Roads – HMA Plant
AP-42, Section 13.2.2 (ver.11/06) "Unpaved Roads"

$$E = k * (s/12)^a * (W/3)^b * [(365 - p)/365] * VMT$$

Where k = constant PM2.5 = 0.15
PM10 = 1.5
TSP = 4.9
s = % silt content (Table 13.2.2-1, "Sand and Gravel" 4.8%)
W = mean vehicle weight (27.5 tons)
p = number of days with at least 0.01 in of precip. (NMED Policy = 60 days)
a = Constant PM2.5 = 0.9
PM10 = 0.9
TSP = 0.7
b = Constant PM2.5 = 0.45
PM10 = 0.45
TSP = 0.45
Trucks per Hour
Total Trucks Entrance = 22.8 trucks per hour average
Mineral Filler = 0.2 truck per hour average
Asphalt Cement = 1.0 truck per hour average
Asphalt = 16.0 truck per hour average
RAP = 5.6 truck per hour average

VMT =Vehicle Miles Traveled
Mineral Filler Unpaved – 0.22956 miles/hr: 229.56 mile/yr
Asphalt Cement Unpaved – 0.91826 miles/hr: 918.26 mile/yr
Asphalt Truck Unpaved – 15.30430 miles/hr: 15304.30 mile/yr
RAP Truck Unpaved – 5.35651 miles/hr: 5356.51 mile/yr

Reduction in emissions due to precipitation was only accounted for in the annual emission rate. Particulate emission rate per vehicle mile traveled for each particle size category is:

Hourly Emission Rate Factor with 90% CE
TSP = 0.69925 lbs/VMT
PM10 = 0.17821 lbs/VMT
PM2.5 = 0.01782 lbs/VMT

Annual Emission Rate Factor with 90% CE
TSP = 0.58430 lbs/VMT
PM10 = 0.14892 lbs/VMT
PM2.5 = 0.01489 lbs/VMT

Table 6-22: Controlled Haul Road Fugitive Dust Emission Rates

Process Unit Description	Process Rate	TSP Emission Rate (lbs/hr)	TSP Emission Rate (tons/yr)	PM_{10} Emission Rate (lbs/hr)	PM_{10} Emission Rate (tons/yr)	$PM_{2.5}$ Emission Rate (lbs/hr)	$PM_{2.5}$ Emission Rate (tons/yr)
Mineral Filler Truck Emissions Unpaved	0.22956 miles/hr; 229.56 miles/yr	0.16	0.065	0.041	0.017	0.0041	0.0017
Asphalt Cement Truck Emissions Unpaved	0.91826 miles/hr; 918.26 miles/yr	0.64	0.26	0.16	0.066	0.016	0.0066
Asphalt Truck Emissions Unpaved	15.30430 miles/hr; 15304.30 miles/yr	10.70	4.32	2.73	1.10	0.27	0.11
RAP Truck Emissions Unpaved	5.35651 miles/hr; 5356.51 miles/yr	3.75	1.51	0.95	0.39	0.095	0.039
	Total	**15.25**	**6.16**	**3.89**	**1.57**	**0.39**	**0.16**

Drum Mix Hot Mix Asphalt Plant

Particulate emissions from the drum dryer/mixer (Unit 68) will be controlled with a baghouse dust collector (Unit 69) on the exhaust vent. This dust collector consists of filter bags and a fan that draws all the drum mixer exhaust through the dust collector. It is estimated that this method will control to an efficiency of 99.88 percent per AP42 Section 11.1, Table 11.1-3. Additional emission reductions include limiting annual production rates. No fugitive controls are proposed for unloading the drum dryer/mixer or asphalt silos (Units 70, 71) with the exception of limiting annual production rates. No fugitive controls are proposed for yard emissions or asphalt storage tank emissions.

Drum mix hot mix asphalt plant controlled emissions were estimated using AP-42, Section 11.1 “Hot Mix Asphalt Plants” (revised 03/04), tables 11.1-3, -4, -7, -8 and -14 emission rates for all pollutants. The drum dryer is permitted to combust either fuel oil or natural gas/propane. The worst-case emission factor from either combusting fuel oil or natural gas/propane was used to estimate emission rates. Hourly emission rates are based on maximum hourly asphalt production (400 tph) and annual emission rates are based on maximum annual asphalt production (400,000 tpy). PM (TSP, PM_{10}, $PM_{2.5}$) emission rates were estimated using the controlled Total PM emission factor found in Table 11.1-3, Fabric Filter. PM_{10} and $PM_{2.5}$ emission rates were estimated using the controlled Total PM_{10} emission factor found in Table 11.1-3, Fabric Filter. Drum dryer/mixer unloading and silo filling emission factors were calculated using the default value of –0.5 for asphalt volatility and a tank temperature setting of 325˚ F for HMA mix temperature. Yard emissions were found in AP-42 Section 11.1.2.5. TOC emission equation is 0.0011 lbs/ton of asphalt produced and CO is equal to the TOC emission rate times 0.32. Percent sulfur content of the burner fuel will not exceed 0.5 percent.

Emissions of VOCs (TOCs) from the asphalt cement storage tank (Unit 73) were determined with EPA’s TANK 4.0.9d program and the procedures found in EPA’s “Emission Factor Documentation for AP-42 Section 11.1 (12/2000) Section 4.4.5” for input to the TANK program.

AP-42 Section 11.1 Table 11.1-3, 7, 8, and 14 Controlled Emission Factors:

Process Unit	Pollutant	Emission Factor (lbs/ton)
Asphalt Drum	NO_X	0.055
	CO	0.13
	VOC	0.032
	SO_2	0.058
	TSP	0.033
	PM_{10}	0.023
	$PM_{2.5}$	0.023
Drum Unloading	CO	0.001179981
	TOC	0.012186685
	TSP	0.000585889
	PM_{10}	0.000585889
	$PM_{2.5}$	0.000585889
Silo Loadout	CO	0.001349240
	TOC	0.004158948
	TSP	0.000521937
	PM_{10}	0.000521937
	$PM_{2.5}$	0.000521937
Yard	CO	0.000352
	TOC	0.0011

The following equation was used to calculate the hourly emission rate for each process unit:

Emission Rate (lbs/hour) = Process Rate (tons/hour) * Emission Factor (lbs/ton)

The following equation was used to calculate the annual emission rate for each process unit:

$$\text{Emission Rate (tons/year)} = \frac{\text{Process Rate (tons/year)} * \text{Emission Factor (lbs/ton)}}{\text{2000 lbs/ton}}$$

Table 6-23: Controlled Hot Mix Plant Emission Rates

Process Unit Number	Process Unit Description	Pollutant	Process Rate	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
69	Asphalt Drum Dryer Baghouse	NO_X	400	22.0	11.0
		CO	400	52.0	26.0
		SO_2	400	23.2	11.6
		VOC	400	12.8	6.40
		TSP	400	13.2	6.60
		PM_{10}	400	9.20	4.60
		$PM_{2.5}$	400	9.20	4.60
70	Drum Mixer Unloading	CO	400	0.47	0.53
		TOC	400	4.87	5.5
		TSP	400	0.23	0.12
		PM_{10}	400	0.23	0.12
		$PM_{2.5}$	400	0.23	0.12
71	Asphalt Silo Unloading	CO	400	0.54	0.27
		TOC	400	1.66	0.83
		TSP	400	0.21	0.10
		PM_{10}	400	0.21	0.10
		$PM_{2.5}$	400	0.21	0.10
73	Asphalt Cement Storage Tanks	TOC	60,000 gallons	0.039	0.17
77	YARD	TOC	400	0.44	0.22
		CO	400	0.14	0.070

Estimates for 1429 hp HMA Diesel-Fired Engine (NO_X, CO, SO_2, VOC, PM, CO_2, and CH_4)

A 1429 horsepower (hp) engine (Unit74) provides power to the HMA plant. Emission rates for NO_X, CO, PM and NMHC are based on manufacturer specifications (see Attachment A-XXXX-7-1429.pdf). Sulfur dioxide (SO_2) emissions are estimated based on sulfur content of diesel fuel, not to exceed 0.05% fuel content and a fuel usage rate of 72.6 gal/hr. CO_2 and CH_4 emission rates are found in AP-42 Section 3.3. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 8760 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 4800 hours per year.

Manufacturer Emission Factors:

Pollutant	Emission Factor (lbs/hr)
Nitrogen Oxide	33.3
Carbon Monoxides	5.00
Particulate	0.31
Hydrocarbons	1.10

Sulfur dioxide emission rate was calculated using the fuel consumption rate for this engine of 72.6 gallons per hour, a fuel density of 7.0 pounds per gallon, a fuel sulfur content of 0.05%, and a sulfur to sulfur dioxide conversion factor of two (2). The following equation calculates the emission rate for sulfur dioxide (SO_2).

Emission Rate (lbs/hr) = Fuel (gal/hr) * Density lbs/gal * % Sulfur Content * Factor

$$\text{Emission Rate (lbs/hr)} = \frac{72.6\ \text{gallons}}{\text{hr}} \Big| \frac{7.0\ \text{lbs}}{\text{gallon}} \Big| \frac{0.0005\ \text{lbs Sulfur}}{\text{lbs of fuel}} \Big| \frac{2\ \text{lbs Sulfur Dioxide}}{1\ \text{lb Sulfur}}$$

Emission Rate (lbs/hr) = 0.51 lbs/hr

Carbon Dioxide emissions were estimated using AP-42 Table 3.3-1 emission factor of 1.08 lbs/hp-hr.

Methane emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.000705 lbs/hp-hr.

The following equation was used to calculate the annual emission rate for each engine pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{2000\ \text{lbs/ton}}$$

Table 6-24: Pre-Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
74	NO_X	1429	33.30	145.85
	CO	1429	5.00	21.90
	SO_2	1429	0.51	4.82
	VOC	1429	1.10	2.26
	TSP	1429	0.31	1.36
	PM_{10}	1429	0.31	1.36
	$PM_{2.5}$	1429	0.31	1.36
	CO_2	1429	1543	7005
	CH_4	1429	1.01	4.41

Table 6-25: Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
74	NO_X	1429	33.30	79.92
	CO	1429	5.00	12.00
	SO_2	1429	0.51	2.64
	VOC	1429	1.10	1.24
	TSP	1429	0.31	0.74
	PM_{10}	1429	0.31	0.74
	$PM_{2.5}$	1429	0.31	0.74
	CO_2	1429	1543	3839
	CH_4	1429	1.01	2.42

Estimates for 158 hp Standby HMA Plant Diesel-Fired Engine (NO_X, CO, SO_2, VOC, PM, CO_2, and CH_4)

A 158 horsepower (hp) engine (Unit75) provides power to the HMA plant when the main generator is shutdown. Emission rates for NO_X, CO, PM, and NMHC are based on EPA Tier 3 emission factors. Sulfur dioxide (SO_2) emissions are estimated based on sulfur content of diesel fuel, not to exceed 0.05% fuel content and a fuel usage rate of 6.1 gal/hr. CO_2 and CH_4 emission rates are found in AP-42 Section 3.3. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 8760 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 3960 hours per year.

Manufacturer Emission Factors:

Pollutant	Emission Factor (grams/hp-hr)	Emission Rate (lbs/hr)
Nitrogen Oxide (NMHC+NOx)	4.00	1.04
Carbon Monoxides	5.00	1.30
Hydrocarbons (10% of NMHC+NOx)	0.40	0.10
Particulate	0.30	0.078

Sulfur dioxide emission rate was calculated using the fuel consumption rate for this engine of 6.1 gallons per hour, a fuel density of 7.0 pounds per gallon, a fuel sulfur content of 0.05%, and a sulfur to sulfur dioxide conversion factor of two (2). The following equation calculates the emission rate for sulfur dioxide (SO_2).

Emission Rate (lbs/hr) = Fuel (gal/hr) * Density lbs/gal * % Sulfur Content * Factor

$$\text{Emission Rate (lbs/hr)} = \frac{6.1 \text{ gallons}}{\text{hr}} \times \frac{7.0 \text{ lbs}}{\text{gallon}} \times \frac{0.0005 \text{ lbs Sulfur}}{\text{lbs of fuel}} \times \frac{2 \text{ lbs Sulfur Dioxide}}{1 \text{ lb Sulfur}}$$

Emission Rate (lbs/hr) = 0.043 lbs/hr

Carbon Dioxide emissions were estimated using AP-42 Table 3.3-1 emission factor of 1.08 lbs/hp-hr.

Methane emissions were estimated using AP-42 Table 3.3-1 emission factor of 0.000705 lbs/hp-hr.

The following equation was used to calculate the annual emission rate for each engine pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{2000 \text{ lbs/ton}}$$

Table 6-26: Pre-Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
75	NO_X	475	1.04	4.56
	CO	475	1.30	5.70
	SO_2	475	0.10	0.46
	VOC	475	0.043	0.19
	TSP	475	0.078	0.34
	PM_{10}	475	0.078	0.34
	$PM_{2.5}$	475	0.078	0.34
	CO_2	475	170.6	747.4
	CH_4	475	0.11	0.49

Table 6-27: Controlled Combustion Emission Rates

Process Unit Number	Pollutant	Generator Rating (hp)	Emission Rate (lbs/hr)	Emission Rate (tons/yr)
75	NO_X	475	1.04	2.06
	CO	475	1.30	2.58
	SO_2	475	0.10	0.21
	VOC	475	0.043	0.086
	TSP	475	0.078	0.15
	PM_{10}	475	0.078	0.15
	$PM_{2.5}$	475	0.078	0.15
	CO_2	475	170.6	337.9
	CH_4	475	0.11	0.22

Fuel Oil-Fired Asphalt Heater

One TBD distillate diesel fuel or natural gas/propane asphalt heater (Unit 72) heats the asphalt oil before it is mixed with the aggregate in the drum dryer/mixer. The unit is rated at 1,000,000 Btu/hr. The estimated hourly diesel fuel usage for the heater is approximately 7.8 gallons per hour (128,000 Btu/gal) and 10.9 gallons per hour for natural gas/propane (91,500 Btu/gal). Emissions of nitrogen oxides (NO_X), carbon monoxides (CO), sulfur dioxide (SO_2), hydrocarbons (VOC) and particulate (PM) are estimated using either AP-42 Section 1.3 “External Combustion Sources” (rev 9/98) or AP-42 Section 1.5 “Liquefied Petroleum Gas Combustion” (7/08), whichever produced the highest emission rate. Sulfur content of the diesel fuel is not to exceed 0.05% fuel content. No controls are proposed for the fuel asphalt heater. Uncontrolled annual emissions in tons per year (tpy) were calculated assuming operation of 8760 hours per year. Controlled annual emissions in tons per year (tpy) were calculated assuming operation of 8760 hours per year. The highest resulting pollutant emissions from either the diesel or natural gas/propane were used in the application.

AP-42 Emission Factors: Section 1.3 and 1.5

Diesel Emission Factors

Pollutant	Emission Factor
Nitrogen Oxides	0.02 lbs/gal-hr
Carbon Monoxides	0.005 lbs/gal-hr
Particulate	0.002 lbs/gal-hr
Hydrocarbons	0.00034 lbs/gal-hr
Sulfur Dioxides	0.142S lbs/gal-hr
Carbon Dioxide	22300 lbs/gal-hr
Methane	0.216 lbs/gal-hr
Nitrous Oxide	0.26 lbs/gal-hr

S = % Fuel Sulfur Content

Natural Gas/ Propane Emission Factors

Pollutant	Emission Factor
Nitrogen Oxides	0.013 lbs/gal-hr
Carbon Monoxides	0.0075 lbs/gal-hr
Particulate	0.0007 lbs/gal-hr
Hydrocarbons	0.001 lbs/gal-hr
Sulfur Dioxides	0.000018 lbs/gal-hr
Carbon Dioxide	12500 lbs/gal-hr
Methane	0.200 lbs/gal-hr
Nitrous Oxide	0.90 lbs/gal-hr

Emission Rate (lbs/hr) = EF (lbs/gal-hr) * fuel usage (gal)

The following equation was used to calculate the annual emission rate for each heater pollutant:

$$\text{Emission Rate (tons/year)} = \frac{\text{Emission Rate (lbs/hour)} * \text{Operating Hour (hrs/year)}}{\text{2000 lbs/ton}}$$

Table 6-28: Combustion Emission Rates for TBD Diesel Heater

Process Unit Number	**Pollutant**	**Fuel Usage (gal)**	Emission Rate **(lbs/hr)**	Emission Rate **(tons/yr)**
72	NO_X	7.8	0.16	0.68
	CO	7.8	0.039	0.17
	VOC	7.8	0.0027	0.012
	SO_2	7.8	0.055	0.24
	PM	7.8	0.016	0.068
	CO_2	7.8	174.2	763.1
	CH_4	7.8	0.0017	0.0074
	N_2O	7.8	0.0020	0.0089

Table 6-29: Combustion Emission Rates for TBD Natural Gas/Propane Heater

Process Unit Number	**Pollutant**	**Fuel Usage (gal)**	Emission Rate **(lbs/hr)**	Emission Rate **(tons/yr)**
72	NO_X	10.9	0.14	0.62
	CO	10.9	0.082	0.36
	VOC	10.9	0.011	0.048
	SO_2	10.9	0.00020	0.00086
	PM	10.9	0.0077	0.034
	CO_2	10.9	136.6	598.4
	CH_4	10.9	0.0022	0.0096
	N_2O	10.9	0.0098	0.043

Table 6-30 Summary of Uncontrolled NOx, CO, SO2, and PM Emission Rates

Uncontrolled Emission Totals															
Unit #	Description	NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
52	Cold Aggregate/RAP Storage Pile									2.44	7.53	1.15	3.56	0.17	0.54
53	Feed Bin Loading									1.52	4.68	0.72	2.21	0.11	0.34
54	Feed Bin Unloading									0.69	3.02	0.25	1.11	0.04	0.17
55	Scalping Screen									5.75	25.19	2.00	8.76	0.30	1.33
56	Scalping Screen Unloading									0.69	3.02	0.25	1.11	0.039	0.17
57	Pug Mill Load									0.71	3.10	0.26	1.14	0.040	0.18
58	Pug Mill Unload									0.71	3.10	0.26	1.14	0.040	0.18
59	Conveyor Transfer to Slinger Conveyor									0.71	3.10	0.26	1.14	0.040	0.18
60	RAP Bin Loading									0.28	0.86	0.13	0.40	0.020	0.061
61	RAP Bin Unloading									0.42	1.84	0.15	0.67	0.024	0.10
62	RAP Screen									3.50	15.33	1.22	5.33	0.18	0.81
63	RAP Screen Unloading									0.42	1.84	0.15	0.67	0.024	0.10
64	RAP Transfer Conveyor									0.42	1.84	0.15	0.67	0.024	0.10
65	RAP Transfer Conveyor									0.42	1.84	0.15	0.67	0.024	0.10
66	Mineral Filler Silo Loading									18.00	18.92	11.50	12.09	0.90	0.95
68	Drum Dryer	22.0	96.4	52.0	227.8	23.2	101.6	12.8	56.1	11200	49056	2600	11388	626	2742
70	Drum Mixer Unloading			0.47	2.07			4.87	21.4	0.23	1.03	0.23	1.03	0.23	1.03
71	Asphalt Silo Unloading			0.54	2.36			1.66	7.29	0.21	0.91	0.21	0.91	0.21	0.91
72	Asphalt Heater	0.16	0.68	0.082	0.36	0.055	0.24	0.011	0.048	0.016	0.068	0.016	0.068	0.016	0.068
73	Asphalt Cement Storage Tank			***	***			0.037	0.16						
74	HMA Main Plant Generator	33.3	145.9	5.00	21.9	0.52	2.26	1.10	4.82	0.31	1.36	0.31	1.36	0.31	1.36
75	HMA Standby Generator	1.04	4.56	1.30	5.70	0.043	0.19	0.10	0.46	0.078	0.34	0.078	0.34	0.078	0.34
76	Haul Road Traffic									152.5	61.6	38.9	15.7	3.89	1.57
77	Yard			0.14	0.62			0.44	1.93						
	Total	**56**	**247**	**60**	**261**	**24**	**104**	**21**	**92**	**11390**	**49217**	**2658**	**11448**	**633**	**2752**

*** Insignificant

Table 6-31 Summary of Allowable NOx, CO, SO2, and PM Emission Rates

Allowable Emission Totals															
Unit #	Description	NOx		CO		SO_2		VOC		TSP		PM_{10}		$PM_{2.5}$	
		lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
52	Cold Aggregate/RAP Storage Pile									2.44	0.86	1.15	0.41	0.17	0.062
53	Feed Bin Loading									1.52	0.53	0.72	0.25	0.11	0.038
54	Feed Bin Unloading									0.032	0.016	0.011	0.0053	0.0030	0.0015
55	Scalping Screen									0.51	0.25	0.17	0.085	0.012	0.0058
56	Scalping Screen Unloading									0.032	0.016	0.011	0.0053	0.0030	0.0015
57	Pug Mill Load									0.033	0.017	0.011	0.0054	0.0031	0.0015
58	Pug Mill Unload									0.033	0.017	0.011	0.0054	0.0031	0.0015
59	Conveyor Transfer to Slinger Conveyor									0.033	0.017	0.011	0.0054	0.0031	0.0015
60	RAP Bin Loading									0.28	0.10	0.13	0.046	0.020	0.0070
61	RAP Bin Unloading									0.020	0.010	0.0064	0.0032	0.0018	0.00091
62	RAP Screen									0.31	0.15	0.10	0.052	0.0070	0.0035
63	RAP Screen Unloading									0.020	0.010	0.0064	0.0032	0.0018	0.00091
64	RAP Transfer Conveyor									0.020	0.010	0.0064	0.0032	0.0018	0.00091
65	RAP Transfer Conveyor									0.020	0.010	0.0064	0.0032	0.0018	0.00091
66	Mineral Filler Silo Loading									0.18	0.022	0.12	0.014	0.0090	0.0011
68	Drum Dryer	22.0	11.0	52.0	26.0	23.2	11.6	12.8	6.40	13.2	6.60	9.20	4.60	9.20	4.60
70	Drum Mixer Unloading			0.47	0.24			4.87	2.44	0.23	0.12	0.23	0.12	0.23	0.12
71	Asphalt Silo Unloading			0.54	0.27			1.66	0.83	0.21	0.10	0.21	0.10	0.21	0.10
72	Asphalt Heater	0.16	0.68	0.082	0.36	0.055	0.24	0.011	0.05	0.016	0.068	0.016	0.068	0.016	0.068
73	Asphalt Cement Storage Tank			***	***			0.014	0.062						
74	HMA Main Plant Generator	33.3	79.9	5.00	12.0	0.52	1.24	1.10	2.64	0.31	0.74	0.31	0.74	0.31	0.74
75	HMA Standby Generator	1.04	2.06	1.30	2.58	0.043	0.086	0.10	0.21	0.078	0.15	0.078	0.15	0.078	0.15
76	Haul Road Traffic									15.25	6.16	3.89	1.57	0.39	0.16
77	Yard			0.14	0.070			0.44	0.22						
	Total	**56.5**	**93.7**	**59.5**	**41.5**	**23.8**	**13.2**	**21.0**	**12.8**	**34.8**	**16.0**	**16.4**	**8.26**	**10.8**	**6.07**

*** Insignificant

Estimates for State Toxic Air Pollutants (Asphalt Fumes)

The Hot Mix Asphalt Plant (HMA) drum dryer/mixer, asphalt silo loading, asphalt silo unloading, yard emissions, and heated asphalt cement storage tank are sources of asphalt fumes listed in the NMED's 20.2.72 NMAC, 502 "Toxic Air Pollutants and Emissions", Table A. Emissions of asphalt fumes from the drum dryer/mixer are based on PM organic condensable emission factors found in AP-42 Section 11.1, Table 11.1-3 (0.12 pounds per ton x 400 tons/hr) from the drum dryer/mixer baghouse stack or 4.8 pounds per hour.

Emissions of asphalt fumes from the asphalt silo loading (Unit 70), asphalt silo unloading (Unit 71), yard (asphalt transported in asphalt trucks-Unit 77), and hot oil asphalt storage tanks (Unit 73) were based on the assumption that the emissions of concern from the silo filling, silo unloading, hot oil asphalt storage tanks, and yard asphalt fumes sources are the PAH HAPs plus other semi-volatile HAPs from the particulate (PM) organics and the volatile organic HAPs from the Total Organic Compounds (TOC). These two combined make up asphalt fume emissions from the silo filling, silo unloading, hot oil asphalt storage tanks, and yard sources. Using information found in AP-42 Section 11.1, Tables 11.1-14, 15, and 16 were reviewed and the following emission equations or emission factors were used to estimate asphalt fumes emissions from silo filling, silo unloading, hot oil asphalt storage tanks, and yard.

<u>Drum Loadout</u>
Asphalt Fumes $EF = 0.00036(-V)e^{((0.0251)(T+460)-20.43)}$

<u>Silo Filling</u>
Asphalt Fumes $EF = 0.00078(-V)e^{((0.0251)(T+460)-20.43)}$

<u>Asphalt Storage Tanks</u>
Asphalt Fumes EF = VOC emissions from TANKs * 1.3%

<u>Yard</u>
Asphalt Fumes EF = 0.0000165 lbs/ton of asphalt loaded

Silo filling and silo unloading emission factors were calculated using the default value of –0.5 for asphalt volatility and a tank temperature setting of 325˚ F for HMA mix temperature. Inputting these values in to the equations gives you a pound per ton value of 0.000189 lbs/ton and 0.000087 lbs/ton or asphalt fumes emission rates of 0.075 and 0.035 pounds per hour.

Emissions of asphalt fumes from the Yard were based on 1.5 percent of the TOC emission. Yard emission factors are found in AP-42 Section 11.1.2.5. TOC emission factor is 0.0011 lbs/ton of asphalt produced. Asphalt fumes emissions are 0.0000165 lbs/ton of asphalt produced or 0.0066 pounds per hour (400 tph of asphalt production).

Emissions of asphalt fumes from the asphalt cement storage (2) tanks (Unit 73) were determined with EPA's TANK 4.0.9d program and the procedures found in EPA's "Emission Factor Documentation for AP-42 Section 11.1 (12/2000) Section 4.4.5" for input to the TANK program. The annual VOC emissions for working and breathing losses from two 10,000 gallon tank were estimated at 123.42 pounds per year or 0.014 pounds per hour. Based on 1.3 percent of the VOC emissions (0.014 pounds per hour total from both tanks), the asphalt fumes emission rate is 0.00018 pounds per hour.

Total asphalt fumes from the HMA plant is 4.92 pounds per hour and 2.46 tons per year.

Estimates for State Toxic Air Pollutants (Calcium Hydroxide)

A potential mineral filler that will be used is lime (calcium hydroxide). Calcium hydroxide is listed in the NMED's 20.2.72 NMAC, 502 "Toxic Air Pollutants and Emissions", Table A. Controlled emissions of lime from the mineral filler silo during loading is 0.18 pounds per hour.

Estimates for Federal HAPs Air Pollutants

The Hot Mix Asphalt Plant (HMA) drum dryer (Unit 68), asphalt heater (Unit 72), HMA plant generator/engine (Unit 74), and HMA plant standby generator/engine (Unit 75) are sources of HAPs as it appears in Section 112 (b) of the 1990 CAAA. Emissions of HAPs were determined for the drum mixer using AP-42 Section 11.1 Tables 11.1-10, 11.1-12. Emissions of HAPs were determined for the main and standby plant generators using AP-42 Section 3.3 and Section 1.3. Emissions of HAPs were determined for the asphalt heaters using AP-42 Section 1.3.

The following tables summarize the HAPs emission rates from the drum mixer, HMA plant generator/engine, HMA plant standby generator/engine, and asphalt heater. Total combined HAPs emissions from Kirtland HMA is 4.26 pounds per hour and 2.11 tons per year.

Table 6-32: HAPs Emission Rates from the Drum Dryer/Mixer

EPA HAPS Emissions Drum Mixer Hot Mix Asphalt Plant with Fabric Filter

Average Hourly Production Rate:	400	tons per hour
Yearly Production Rate:	400000	tons per year

Type of Fuel:	Waste Fuel Oil
Emission Factors	AP-42 Section 11.1 Tables 11.1-10, 11.1-12

Non-PAH HAPS	**CAS#**		**Emission Factor (lbs/ton)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acetalehyde	75-07-0		1.3E-03	0.520000	0.260000
Acrolein	107-02-8		2.6E-05	0.010400	0.005200
Benzene	71-43-2		3.9E-04	0.156000	0.078000
Ethylbenzene	100-41-4		2.4E-04	0.096000	0.048000
Formaldehyde	50-00-0		3.1E-03	1.240000	0.620000
Hexane	110-54-3		9.2E-04	0.368000	0.184000
Isooctane	540-84-1		4.0E-05	0.016000	0.008000
Methyl Ethyl Ketone	78-93-3		2.0E-05	0.008000	0.004000
Propionaldehyde	123-38-6		1.3E-04	0.052000	0.026000
Quinone	106-51-4		1.6E-04	0.064000	0.032000
Methyl chorlform	71-55-6		4.8E-05	0.019200	0.009600
Toluene	108-88-3		2.9E-03	1.160000	0.580000
Xylene	1330-20-7		2.0E-04	0.080000	0.040000
		Total Non-PAH HAPS	9.5E-03	3.789600	1.894800

PAH HAPS	**CAS#**		**Emission Factor (lbs/ton)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
2-Methylnaphthalene	91-57-6		1.7E-04	0.068000	0.034000
Acenaphthene	83-32-9		1.4E-06	0.000560	0.000280
Acenaphthylene	208-96-8		2.2E-05	0.008800	0.004400
Anthracene	120-12-7		3.1E-06	0.001240	0.000620
Benzo(a)anthracene	56-55-3		2.1E-07	0.000084	0.000042
Benzo(a)pyrene	50-32-8		9.8E-09	0.000004	0.000002
Benzo(b)fluoranthene	205-99-2		1.0E-07	0.000040	0.000020
Benzo(b)pyrene	192-97-2		1.1E-07	0.000044	0.000022
Benzo(g,h,I)perylene	191-24-2		4.0E-08	0.000016	0.000008
Benzo(k)fluoranthene	207-08-9		4.1E-08	0.000016	0.000008
Chrysene	218-01-9		1.8E-07	0.000072	0.000036
Fluoranthene	206-44-0		6.1E-07	0.000244	0.000122
Fluorene	86-73-7		1.1E-05	0.004400	0.002200
Indeno(1,2,3-cd)pyrene	193-39-5		7.0E-09	0.000003	0.000001
Naphthalene	91-20-3		6.5E-04	0.260000	0.130000
Perylene	198-55-0		8.8E-09	0.000004	0.000002
Phenanthrene	85-01-8		2.3E-05	0.009200	0.004600
Pyrene	129-00-0		3.0E-06	0.001200	0.000600
		Total PAH HAPS	8.8E-04	0.353927	0.176963

HAPS Metals		Emission Factor (lbs/ton)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		5.6E-07	0.000224	0.000112
Beryllium		0.0E+00	0.000000	0.000000
Cadmium		4.1E-07	0.000164	0.000082
Chromium		5.5E-06	0.002200	0.001100
Cobalt		2.6E-08	0.000010	0.000005
Hexavalent Chromium		4.5E-07	0.000180	0.000090
Lead		1.5E-05	0.006000	0.003000
Manganese		7.7E-06	0.003080	0.001540
Mercury		2.6E-06	0.001040	0.000520
Nickel		6.3E-05	0.025200	0.012600
Phosphorus		2.8E-05	0.011200	0.005600
Selenium		3.5E-07	0.000140	0.000070
	Total Metals HAPS	1.2E-04	0.049438	0.024719
	Total HAPS		**4.19**	**2.10**

Table 6-33: HAPs Emission Rates from the HMA Plant Main Generator (74)

Horsepower Rating:	1429	horsepower	
Fuel Usage:	72.6	gallons/hr	
MMBtu/hr:	9.2928	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	9.2928E-06	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	4800	hours per year	

Type of Fuel:	Diesel
Emission Factors	AP-42 Section 3.3 and Section 1.3

Non-PAH HAPS	**CAS#**		**Emission Factor (lbs/mmBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acetalehyde	75-07-0		7.67E-04	0.007128	0.017106
Acrolein	107-02-8		9.25E-05	0.000860	0.002063
Benzene	71-43-2		9.33E-04	0.008670	0.020808
1,3-Butadiene	106-99-0		3.91E-05	0.000363	0.000872
Formaldehyde	50-00-0		1.18E-03	0.010966	0.026317
Propylene	115-07-1		2.58E-03	0.023975	0.057541
Toluene	108-88-3		4.09E-04	0.003801	0.009122
Xylene	1330-20-7		2.85E-04	0.002648	0.006356
		Total Non-PAH HAPS	6.29E-03	0.058411	0.140186

PAH HAPS	**CAS#**		**Emission Factor (lbs/mmBtu)**	**Emission Rate (lbs/hr)**	**Emission Rate (ton/yr)**
Acenaphthene	83-32-9		1.42E-06	0.000013	0.000032
Acenaphthylene	208-96-8		5.06E-06	0.000047	0.000113
Anthracene	120-12-7		1.87E-06	0.000017	0.000042
Benzo(a)anthracene	56-55-3		1.68E-06	0.000016	0.000037
Benzo(a)pyrene	50-32-8		1.88E-07	0.000002	0.000004
Benzo(b)fluoranthene	205-99-2		9.91E-08	0.000001	0.000002
Benzo(a)pyrene	192-97-2		1.55E-07	0.000001	0.000003
Benzo(g,h,I)perylene	191-24-2		4.89E-07	0.000005	0.000011
Benzo(k)fluoranthene	207-08-9		1.55E-07	0.000001	0.000003
Dibenz(a,h)anthracene			5.83E-07	0.000005	0.000013
Chrysene	218-01-9		3.53E-07	0.000003	0.000008
Fluoranthene	206-44-0		7.61E-06	0.000071	0.000170
Fluorene	86-73-7		2.92E-05	0.000271	0.000651
Indeno(1,2,3-cd)pyrene	193-39-5		3.75E-07	0.000003	0.000008
Naphthalene	91-20-3		8.48E-05	0.000788	0.001891
Phenanthrene	85-01-8		2.94E-05	0.000273	0.000656
Pyrene	129-00-0		4.78E-06	0.000044	0.000107
		Total PAH HAPS	1.68E-04	0.001563	0.003752

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000037	0.000089
Beryllium		3	0.000028	0.000067
Cadmium		3	0.000028	0.000067
Chromium		3	0.000028	0.000067
Lead		9	0.000084	0.000201
Manganese		6	0.000056	0.000134
Mercury		3	0.000028	0.000067
Nickel		3	0.000028	0.000067
Selenium		15	0.000139	0.000335
	Total Metals HAPS	49	0.000455	0.001093
	Total HAPS		**0.060**	**0.011**

Table 6-34: HAPs Emission Rates from the HMA Plant Standby Generator (75)

Horsepower Rating:	158	horsepower	
Fuel Usage:	6.1	gallons/hr	
MMBtu/hr:	0.7808	Btu	(based on 128000 Btu/gallon)
Btu x 10^-12/hr:	7.808E-07	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	3960	hours per year	

Type of Fuel:	Diesel
Emission Factors	AP-42 Section 3.3 and Section 1.3

Non-PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acetalehyde	75-07-0		7.67E-04	0.000599	0.001186
Acrolein	107-02-8		9.25E-05	0.000072	0.000143
Benzene	71-43-2		9.33E-04	0.000728	0.001442
1,3-Butadiene	106-99-0		3.91E-05	0.000031	0.000060
Formaldehyde	50-00-0		1.18E-03	0.000921	0.001824
Propylene	115-07-1		2.58E-03	0.002014	0.003989
Toluene	108-88-3		4.09E-04	0.000319	0.000632
Xylene	1330-20-7		2.85E-04	0.000223	0.000441
		Total Non-PAH HAPS	6.29E-03	0.004908	0.009717

PAH HAPS	CAS#		Emission Factor (lbs/mmBtu)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acenaphthene	83-32-9		1.42E-06	0.000001	0.000002
Acenaphthylene	208-96-8		5.06E-06	0.000004	0.000008
Anthracene	120-12-7		1.87E-06	0.000001	0.000003
Benzo(a)anthracene	56-55-3		1.68E-06	0.000001	0.000003
Benzo(a)pyrene	50-32-8		1.88E-07	0.000000	0.000000
Benzo(b)fluoranthene	205-99-2		9.91E-08	0.000000	0.000000
Benzo(a)pyrene	192-97-2		1.55E-07	0.000000	0.000000
Benzo(g,h,I)perylene	191-24-2		4.89E-07	0.000000	0.000001
Benzo(k)fluoranthene	207-08-9		1.55E-07	0.000000	0.000000
Dibenz(a,h)anthracene			5.83E-07	0.000000	0.000001
Chrysene	218-01-9		3.53E-07	0.000000	0.000001
Fluoranthene	206-44-0		7.61E-06	0.000006	0.000012
Fluorene	86-73-7		2.92E-05	0.000023	0.000045
Indeno(1,2,3-cd)pyrene	193-39-5		3.75E-07	0.000000	0.000001
Naphthalene	91-20-3		8.48E-05	0.000066	0.000131
Phenanthrene	85-01-8		2.94E-05	0.000023	0.000045
Pyrene	129-00-0		4.78E-06	0.000004	0.000007
		Total PAH HAPS	1.68E-04	0.000131	0.000260

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000003	0.000006
Beryllium		3	0.000002	0.000005
Cadmium		3	0.000002	0.000005
Chromium		3	0.000002	0.000005
Lead		9	0.000007	0.000014
Manganese		6	0.000005	0.000009
Mercury		3	0.000002	0.000005
Nickel		3	0.000002	0.000005
Selenium		15	0.000012	0.000023
	Total Metals HAPS	49	0.000038	0.000076
	Total HAPS		**0.0051**	**0.00078**

Table B-35: HAPs Emission Rates from the Asphalt Heater

Btu Rating	1.0	MMBtu/hr	(based on 128000 Btu/gallon)
Fuel Usage:	7.8	gallons/hr	
Btu x 10^-12/hr:	0.000001	Btu x10^-12	(based on 128000 Btu/gallon)
Yearly Operating Hours:	8760	hours per year	

Type of Fuel:	Diesel
Emission Factors	AP-42 Section 1.3

Organic Compounds	CAS#		Emission Factor (lbs/10^3 gal)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Acenaphthene	83-32-9		2.11E-05	0.000000	0.000001
Acenaphthylene	208-96-8		2.53E-07	0.000000	0.000000
Anthracene	120-12-7		1.22E-06	0.000000	0.000000
Benzene	71-43-2		2.14E-04	0.000002	0.000007
Benzo(a)anthracene	56-55-3		4.01E-06	0.000000	0.000000
Benzo(b,k)fluoranthene	205-99-2		1.48E-06	0.000000	0.000000
Benzo(g,h,I)perylene	191-24-2		2.26E-06	0.000000	0.000000
Chrysene	218-01-9		2.38E-06	0.000000	0.000000
Dibenz(a,h)anthracene			1.67E-06	0.000000	0.000000
Ethylbenzene	100-41-4		6.36E-05	0.000000	0.000002
Fluoranthene	206-44-0		4.84E-06	0.000000	0.000000
Fluorene	86-73-7		4.47E-06	0.000000	0.000000
Formaldehyde	50-00-0		6.10E-02	0.000476	0.002084
Indeno(1,2,3-cd)pyrene	193-39-5		2.14E-06	0.000000	0.000000
Naphthalene	91-20-3		1.13E-03	0.000009	0.000039
Phenanthrene	85-01-8		1.05E-05	0.000000	0.000000
Pyrene	129-00-0		4.25E-06	0.000000	0.000000
Toluene	108-88-3		6.20E-03	0.000048	0.000212
Xylene	1330-20-7		1.09E-04	0.000001	0.000004
		Total Organic Compounds	6.88E-02	0.000536	0.002350

HAPS Metals		Emission Factor (lbs/Btu^12)	Emission Rate (lbs/hr)	Emission Rate (ton/yr)
Arsenic		4	0.000004	0.000018
Beryllium		3	0.000003	0.000013
Cadmium		3	0.000003	0.000013
Chromium		3	0.000003	0.000013
Lead		9	0.000009	0.000039
Manganese		6	0.000006	0.000026
Mercury		3	0.000003	0.000013
Nickel		3	0.000003	0.000013
Selenium		15	0.000015	0.000066
	Total Metals HAPS	49	0.000049	0.000215
	Total HAPS		**0.0011**	**0.0026**

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at http://www.epa.gov/ttn/chief/ap42/index.html
- EPA's Internet emission factor database WebFIRE at http://cfpub.epa.gov/webfire/
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases:

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC).** You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

- ■ If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
- ☐ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
- ■ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
- ☐ If an older version of AP-42 is used, include a complete copy of the section.
- ■ If an EPA document or other material is referenced, include a complete copy.
- ☐ Fuel specifications sheet.
- ☐ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.

A-XXXX-7-AP42S1-3and S1-5	Asphalt Heater Combustion and HAPs Emission Factors
A-XXXX-7-AP42S1-3	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S3-3	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S3-4	Diesel-Fired Engine HAPs Emission Factors
A-XXXX-7-AP42S11-1	HMA Plant and HAPs Emission Factors
A-XXXX-7-AP42S11-12	Mineral Filler Silo Emission Factors
A-XXXX-7-AP42S11-19-2	Crushers, Screens, and Transfer Point Emission Factors
A-XXXX-7-AP42S13-2-2	Unpaved Road Emission Factors
A-XXXX-7-AP42S13-2-4	Material Handling Emission Factors
A-XXXX-7-ii03	EIIP Volume II Chapter 03
A-XXXX-7-WindspeedsNewMexico	Farmington Wind Speed Annual Average 1996 to 2006
A-XXXX-7-1429	Unit 34 and 74: Main Aggregate and HMA Plant Generators
A-XXXX-7-113	Unit 35: Aggregate Standby Generator
A-XXXX-7-475	Unit 50: Wash Plant Generator
A-XXXX-7-Tier3	Unit 75: HMA Standby Generator
A-XXXX-7-ACTANK1and2	Unit 73: Asphalt Cement Storage Tanks (2)
A-XXXX-7-AggPlant.xls	Kirtland Aggregate Plant Emissions Spreadsheet
A-XXXX-7-HMA.xls	Kirtland HMA Plant Emissions Spreadsheet

1.3 Fuel Oil Combustion

1.3.1 General[1-3]

Two major categories of fuel oil are burned by combustion sources: distillate oils and residual oils. These oils are further distinguished by grade numbers, with Nos. 1 and 2 being distillate oils; Nos. 5 and 6 being residual oils; and No. 4 being either distillate oil or a mixture of distillate and residual oils. No. 6 fuel oil is sometimes referred to as Bunker C. Distillate oils are more volatile and less viscous than residual oils. They have negligible nitrogen and ash contents and usually contain less than 0.3 percent sulfur (by weight). Distillate oils are used mainly in domestic and small commercial applications, and include kerosene and diesel fuels. Being more viscous and less volatile than distillate oils, the heavier residual oils (Nos. 5 and 6) may need to be heated for ease of handling and to facilitate proper atomization. Because residual oils are produced from the residue remaining after the lighter fractions (gasoline, kerosene, and distillate oils) have been removed from the crude oil, they contain significant quantities of ash, nitrogen, and sulfur. Residual oils are used mainly in utility, industrial, and large commercial applications.

1.3.2 Firing Practices[4]

The major boiler configurations for fuel oil-fired combustors are watertube, firetube, cast iron, and tubeless design. Boilers are classified according to design and orientation of heat transfer surfaces, burner configuration, and size. These factors can all strongly influence emissions as well as the potential for controlling emissions.

Watertube boilers are used in a variety of applications ranging from supplying large amounts of process steam to providing space heat for industrial facilities. In a watertube boiler, combustion heat is transferred to water flowing through tubes which line the furnace walls and boiler passes. The tube surfaces in the furnace (which houses the burner flame) absorb heat primarily by radiation from the flames. The tube surfaces in the boiler passes (adjacent to the primary furnace) absorb heat primarily by convective heat transfer.

Firetube boilers are used primarily for heating systems, industrial process steam generators, and portable power boilers. In firetube boilers, the hot combustion gases flow through the tubes while the water being heated circulates outside of the tubes. At high pressures and when subjected to large variations in steam demand, firetube units are more susceptible to structural failure than watertube boilers. This is because the high-pressure steam in firetube units is contained by the boiler walls rather than by multiple small-diameter watertubes, which are inherently stronger. As a consequence, firetube boilers are typically small and are used primarily where boiler loads are relatively constant. Nearly all firetube boilers are sold as packaged units because of their relatively small size.

A cast iron boiler is one in which combustion gases rise through a vertical heat exchanger and out through an exhaust duct. Water in the heat exchanger tubes is heated as it moves upward through the tubes. Cast iron boilers produce low pressure steam or hot water, and generally burn oil or natural gas. They are used primarily in the residential and commercial sectors.

Another type of heat transfer configuration used on smaller boilers is the tubeless design. This design incorporates nested pressure vessels with water in between the shells. Combustion gases are fired into the inner pressure vessel and are then sometimes recirculated outside the second vessel.

Table 1.3-1. (cont.)

Firing Configuration (SCC)[a]	SO_2[b]		SO_3[c]		NO_x[d]		CO[e]		Filterable PM[f]	
	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING
Boilers < 100 Million Btu/hr										
No. 6 oil fired (1-02-004-02/03) (1-03-004-02/03)	157S	A	2S	A	55	A	5	A	9.19(S)+3.22[i]	B
No. 5 oil fired (1-03-004-04)	157S	A	2S	A	55	A	5	A	10[i]	A
No. 4 oil fired (1-03-005-04)	150S	A	2S	A	20	A	5	A	7	B
Distillate oil fired (1-02-005-02/03) (1-03-005-02/03)	142S	A	2S	A	20	A	5	A	2	A
Residential furnace (A2104004/A2104011)	142S	A	2S	A	18	A	5	A	0.4[g]	B

a To convert from lb/103 gal to kg/103 L, multiply by 0.120. SCC = Source Classification Code.
b References 1-2,6-9,14,56-60. S indicates that the weight % of sulfur in the oil should be multiplied by the value given. For example, if the fuel is 1% sulfur, then S = 1.
c References 1-2,6-8,16,57-60. S indicates that the weight % of sulfur in the oil should be multiplied by the value given. For example, if the fuel is 1% sulfur, then S = 1.
d References 6-7,15,19,22,56-62. Expressed as NO2. Test results indicate that at least 95% by weight of NOx is NO for all boiler types except residential furnaces, where about 75% is NO. For utility vertical fired boilers use 105 lb/103 gal at full load and normal (>15%) excess air. Nitrogen oxides emissions from residual oil combustion in industrial and commercial boilers are related to fuel nitrogen content, estimated by the following empirical relationship: lb NO2 /103 gal = 20.54 + 104.39(N), where N is the weight % of nitrogen in the oil. For example, if the fuel is 1% nitrogen, then N = 1.
e References 6-8,14,17-19,56-61. CO emissions may increase by factors of 10 to 100 if the unit is improperly operated or not well maintained.
f References 6-8,10,13-15,56-60,62-63. Filterable PM is that particulate collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train. Particulate emission factors for residual oil combustion are, on average, a function of fuel oil sulfur content where S is the weight % of sulfur in oil. For example, if fuel oil is 1% sulfur, then S = 1.
g Based on data from new burner designs. Pre-1970's burner designs may emit filterable PM as high as 3.0 1b/103 gal.
h The SO2 emission factor for both no. 2 oil fired and for no. 2 oil fired with LNB/FGR, is 142S, not 157S. Errata dated April 28, 2000. Section corrected May 2010.
i The PM factors for No.6 and No. 5 fuel were reversed. Errata dated April 28, 2000. Section corrected May 2010.

Table 1.3-2. CONDENSABLE PARTICULATE MATTER EMISSION FACTORS FOR OIL COMBUSTION[a]

Firing Configuration[b] (SCC)	Controls	CPM - TOT[c, d]		CPM - IOR[c, d]		CPM - ORG[c, d]	
		Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING	Emission Factor (lb/10^3 gal)	EMISSION FACTOR RATING
No. 2 oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	All controls, or uncontrolled	1.3[d, e]	D	65% of CPM-TOT emission factor[c]	D	35% of CPM-TOT emission factor[c]	D
No. 6 oil fired (1-01-004-01/04, 1-02-004-01, 1-03-004-01)	All controls, or uncontrolled	1.5[f]	D	85% of CPM-TOT emission factor[d]	E	15% of CPM-TOT emission factor[d]	E

[a] All condensable PM is assumed to be less than 1.0 micron in diameter.
[b] No data are available for numbers 3, 4, and 5 oil. For number 3 oil, use the factors provided for number 2 oil. For numbers 4 and 5 oil, use the factors provided for number 6 oil.
[c] CPM-TOT = total condensable particulate matter.
CPM-IOR = inorganic condensable particulate matter.
CPM-ORG = organic condensable particulate matter.
[d] To convert to lb/MMBtu of No. 2 oil, divide by 140 MMBtu/10^3 gal. To convert to lb/MMBtu of No. 6 oil, divide by 150 MMBtu/10^3 gal.
[e] References: 76-78.
[f] References: 79-82.

Table 1.3-3. EMISSION FACTORS FOR TOTAL ORGANIC COMPOUNDS (TOC), METHANE, AND NONMETHANE TOC (NMTOC) FROM UNCONTROLLED FUEL OIL COMBUSTION[a]

EMISSION FACTOR RATING: A

Firing Configuration (SCC)	TOC[b] Emission Factor (lb/10^3 gal)	Methane[b] Emission Factor (lb/10^3 gal)	NMTOC[b] Emission Factor (lb/10^3 gal)
Utility boilers			
No. 6 oil fired, normal firing (1-01-004-01)	1.04	0.28	0.76
No. 6 oil fired, tangential firing (1-01-004-04)	1.04	0.28	0.76
No. 5 oil fired, normal firing (1-01-004-05)	1.04	0.28	0.76
No. 5 oil fired, tangential firing (1-01-004-06)	1.04	0.28	0.76
No. 4 oil fired, normal firing (1-01-005-04)	1.04	0.28	0.76
No. 4 oil fired, tangential firing (1-01-005-05)	1.04	0.28	0.76
Industrial boilers			
No. 6 oil fired (1-02-004-01/02/03)	1.28	1.00	0.28
No. 5 oil fired (1-02-004-04)	1.28	1.00	0.28
Distillate oil fired (1-02-005-01/02/03)	0.252	0.052	0.2
No. 4 oil fired (1-02-005-04)	0.252	0.052	0.2
Commercial/institutional/residential combustors			
No. 6 oil fired (1-03-004-01/02/03)	1.605	0.475	1.13
No. 5 oil fired (1-03-004-04)	1.605	0.475	1.13
Distillate oil fired (1-03-005-01/02/03)	0.556	0.216	0.34
No. 4 oil fired (1-03-005-04)	0.556	0.216	0.34
Residential furnace (A2104004/A2104011)	2.493	1.78	0.713

a To convert from lb/103 gal to kg/103 L, multiply by 0.12. SCC = Source Classification Code.

b References 29-32. Volatile organic compound emissions can increase by several orders of magnitude if the boiler is improperly operated or is not well maintained.

Table 1.3-9. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM FUEL OIL COMBUSTION[a]

Organic Compound	Average Emission Factor[b] (lb/10^3 Gal)	EMISSION FACTOR RATING
Benzene	2.14E-04	C
Ethylbenzene	6.36E-05[c]	E
Formaldehyde[d]	3.30E-02	C
Naphthalene	1.13E-03	C
1,1,1-Trichloroethane	2.36E-04[c]	E
Toluene	6.20E-03	D
o-Xylene	1.09E-04[c]	E
Acenaphthene	2.11E-05	C
Acenaphthylene	2.53E-07	D
Anthracene	1.22E-06	C
Benz(a)anthracene	4.01E-06	C
Benzo(b,k)fluoranthene	1.48E-06	C
Benzo(g,h,i)perylene	2.26E-06	C
Chrysene	2.38E-06	C
Dibenzo(a,h) anthracene	1.67E-06	D
Fluoranthene	4.84E-06	C
Fluorene	4.47E-06	C
Indo(1,2,3-cd)pyrene	2.14E-06	C
Phenanthrene	1.05E-05	C
Pyrene	4.25E-06	C
OCDD	3.10E-09[c]	E

[a] Data are for residual oil fired boilers, Source Classification Codes (SCCs) 1-01-004-01/04.

[b] References 64-72. To convert from lb/10^3 gal to kg/10^3 L, multiply by 0.12.

[c] Based on data from one source test (Reference 67).

[d] The formaldehyde number presented here is based only on data from utilities using No. 6 oil. The number presented in Table 1.3-7 is based on utility, commercial, and industrial boilers.

Table 1.3-10. EMISSION FACTORS FOR TRACE ELEMENTS FROM DISTILLATE FUEL OIL COMBUSTION SOURCES[a]

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor (lb/10^{12} Btu)										
	As	Be	Cd	Cr	Cu	Pb	Hg	Mn	Ni	Se	Zn
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	4	3	3	3	6	9	3	6	3	15	4

[a] Data are for distillate oil fired boilers, SCC codes 1-01-005-01, 1-02-005-01, and 1-03-005-01. References 29-32, 40-44 and 83. To convert from lb/10^{12} Btu to pg/J, multiply by 0.43.

1.5 Liquefied Petroleum Gas Combustion

1.5.1 General[1]

Liquefied petroleum gas (LPG or LP-gas) consists of propane, propylene, butane, and butylenes; the product used for domestic heating is composed primarily of propane. This gas, obtained mostly from gas wells (but also, to a lesser extent, as a refinery by-product) is stored as a liquid under moderate pressures. There are three grades of LPG available as heating fuels: commercial-grade propane, engine fuel-grade propane (also known as HD-5 propane), and commercial-grade butane. In addition, there are high-purity grades of LPG available for laboratory work and for use as aerosol propellants. Specifications for the various LPG grades are available from the American Society for Testing and Materials and the Gas Processors Association. A typical heating value for commercial-grade propane and HD-5 propane is 90,500 British thermal units per gallon (Btu/gal), after vaporization; for commercial-grade butane, the value is 97,400 Btu/gal.

The largest market for LPG is the domestic/commercial market, followed by the chemical industry (where it is used as a petrochemical feedstock) and the agriculture industry. Propane is also used as an engine fuel as an alternative to gasoline and as a standby fuel for facilities that have interruptible natural gas service contracts.

1.5.2 Firing Practices[2]

The combustion processes that use LPG are very similar to those that use natural gas. Use of LPG in commercial and industrial applications may require a vaporizer to provide the burner with the proper mix of air and fuel. The burner itself will usually have different fuel injector tips as well as different fuel-to-air ratio controller settings than a natural gas burner since the LPG stoichiometric requirements are different than natural gas requirements. LPG is fired as a primary and backup fuel in small commercial and industrial boilers and space heating equipment and can be used to generate heat and process steam for industrial facilities and in most domestic appliances that typically use natural gas.

1.5.3 Emissions[1,3-5]

1.5.3.1 Criteria Pollutants -

LPG is considered a "clean" fuel because it does not produce visible emissions. However, gaseous pollutants such as nitrogen oxides (NO_x), carbon monoxide (CO), and organic compounds are produced as are small amounts of sulfur dioxide (SO_2) and particulate matter (PM). The most significant factors affecting NO_x, CO, and organic emissions are burner design, burner adjustment, boiler operating parameters, and flue gas venting. Improper design, blocking and clogging of the flue vent, and insufficient combustion air result in improper combustion and the emission of aldehydes, CO, hydrocarbons, and other organics. NO_x emissions are a function of a number of variables, including temperature, excess air, fuel and air mixing, and residence time in the combustion zone. The amount of SO_2 emitted is directly proportional to the amount of sulfur in the fuel. PM emissions are very low and result from soot, aerosols formed by condensable emitted species, or boiler scale dislodged during combustion. Emission factors for LPG combustion are presented in Table 1.5-1.

Table 1.5-1 presents emission factors on a volume basis ($lb/10^3gal$). To convert to an energy basis (lb/MMBtu), divide by a heating value of 91.5 $MMBtu/10^3gal$ for propane and 102 $MMBtu/10^3gal$ for butane.

1.5.3.2 Greenhouse Gases[6-11] -

Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions are all produced during LPG combustion. Nearly all of the fuel carbon (99.5 percent) in LPG is converted to CO_2 during the combustion process. This conversion is relatively independent of firing configuration. Although the formation of CO acts to reduce CO_2 emissions, the amount of CO produced is insignificant compared to the amount of CO_2 produced. The majority of the 0.5 percent of fuel carbon not converted to CO_2 is due to incomplete combustion in the fuel stream.

Table 1.5-1. EMISSION FACTORS FOR LPG COMBUSTION[a]

EMISSION FACTOR RATING: E

Pollutant	Butane Emission Factor ($lb/10^3$ gal)		Propane Emission Factor ($lb/10^3$ gal)	
	Industrial Boilers[b] (SCC 1-02-010-01)	Commercial Boilers[c] (SCC 1-03-010-01)	Industrial Boilers[b] (SCC 1-02-010-02)	Commercial Boilers[c] (SCC 1-03-010-02)
PM, Filterable [d]	0.2	0.2	0.2	0.2
PM, Condensable	0.6	0.6	0.5	0.5
PM, Total	0.8	0.8	0.7	0.7
SO_2[e]	0.09S	0.09S	0.10S	0.10S
NO_x[f]	15	15	13	13
N_2O[g]	0.9	0.9	0.9	0.9
CO_2[h,j]	14,300	14,300	12,500	12,500
CO	8.4	8.4	7.5	7.5
TOC	1.1	1.1	1.0	1.0
CH_4[k]	0.2	0.2	0.2	0.2

[a] Assumes PM, CO, and TOC emissions are the same, on a heat input basis, as for natural gas combustion. Use heat contents of 91.5 x 10^6 $Btu/10^3$ gallon for propane, 102 x 10^6 $Btu/10^3$ gallon for butane, 1020 x 10^6 $Btu/10^6$ scf for methane when calculating an equivalent heat input basis. For example, the equation for converting from methane's emissions factors to propane's emissions factors is as follows: lb pollutant/10^3 gallons of propane = (lb pollutant /10^6 ft^3 methane) * (91.5 x 10^6 $Btu/10^3$ gallons of propane) / (1020 x 10^6 $Btu/10^6$ scf of methane). The NO_x emission factors have been multiplied by a correction factor of 1.5, which is the approximate ratio of propane/butane NO_x emissions to natural gas NO_x emissions. To convert from $lb/10^3$ gal to $kg/10^3$ L, multiply by 0.12. SCC = Source Classification Code.

[b] Heat input capacities generally between 10 and 100 million Btu/hour.

[c] Heat input capacities generally between 0.3 and 10 million Btu/hour.

[d] Filterable particulate matter (PM) is that PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train. For natural gas, a fuel with similar combustion characteristics, all PM is less than 10 μm in aerodynamic equivalent diameter (PM-10).

[e] S equals the sulfur content expressed in gr/100 ft^3 gas vapor. For example, if the butane sulfur content is 0.18 gr/100 ft^3, the emission factor would be (0.09 x 0.18) = 0.016 lb of $SO_2/10^3$ gal butane burned.

[f] Expressed as NO_2.

[g] Reference 12.

[h] Assuming 99.5% conversion of fuel carbon to CO_2.

[j] EMISSION FACTOR RATING = C.

[k] Reference 13.

3.3 Gasoline And Diesel Industrial Engines

3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene[b]	9.33 E-04
Toluene[b]	4.09 E-04
Xylenes[b]	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene[b,c]	<3.91 E-05
Formaldehyde[b]	1.18 E-03
Acetaldehyde[b]	7.67 E-04
Acrolein[b]	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene[b]	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

[a] Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.
[b] Hazardous air pollutant listed in the *Clean Air Act*.
[c] Based on data from 1 engine.

3.4 Large Stationary Diesel And All Stationary Dual-fuel Engines

3.4.1 General

The primary domestic use of large stationary diesel engines (greater than 600 horsepower [hp]) is in oil and gas exploration and production. These engines, in groups of 3 to 5, supply mechanical power to operate drilling (rotary table), mud pumping, and hoisting equipment, and may also operate pumps or auxiliary power generators. Another frequent application of large stationary diesels is electricity generation for both base and standby service. Smaller uses include irrigation, hoisting, and nuclear power plant emergency cooling water pump operation.

Dual-fuel engines were developed to obtain compression ignition performance and the economy of natural gas, using a minimum of 5 to 6 percent diesel fuel to ignite the natural gas. Large dual-fuel engines have been used almost exclusively for prime electric power generation. This section includes all dual-fuel engines.

3.4.2 Process Description

All reciprocating internal combustion (IC) engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 ignition methods used in stationary reciprocating IC engines, compression ignition (CI) and spark ignition (SI). In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder. Although all diesel- fueled engines are compression ignited and all gasoline- and gas-fueled engines are spark ignited, gas can be used in a CI engine if a small amount of diesel fuel is injected into the compressed gas/air mixture to burn any mixture ratio of gas and diesel oil (hence the name dual fuel), from 6 to 100 percent diesel oil.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.[1]

3.4.3 Emissions And Controls

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank

Table 3.4-3. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Benzene[b]	7.76 E-04
Toluene[b]	2.81 E-04
Xylenes[b]	1.93 E-04
Propylene	2.79 E-03
Formaldehyde[b]	7.89 E-05
Acetaldehyde[b]	2.52 E-05
Acrolein[b]	7.88 E-06

[a]Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.
[b]Hazardous air pollutant listed in the *Clean Air Act*.

Table 3.4-4. PAH EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

PAH	Emission Factor (lb/MMBtu) (fuel input)
Naphthalene[b]	1.30 E-04
Acenaphthylene	9.23 E-06
Acenaphthene	4.68 E-06
Fluorene	1.28 E-05
Phenanthrene	4.08 E-05
Anthracene	1.23 E-06
Fluoranthene	4.03 E-06
Pyrene	3.71 E-06
Benz(a)anthracene	6.22 E-07
Chrysene	1.53 E-06
Benzo(b)fluoranthene	1.11 E-06
Benzo(k)fluoranthene	<2.18 E-07
Benzo(a)pyrene	<2.57 E-07
Indeno(1,2,3-cd)pyrene	<4.14 E-07
Dibenz(a,h)anthracene	<3.46 E-07
Benzo(g,h,l)perylene	<5.56 E-07
TOTAL PAH	<2.12 E-04

[a] Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.

[b] Hazardous air pollutant listed in the *Clean Air Act*.

11.1 Hot Mix Asphalt Plants

11.1.1 General[1-3,23, 392-394]

Hot mix asphalt (HMA) paving materials are a mixture of size-graded, high quality aggregate (which can include reclaimed asphalt pavement [RAP]), and liquid asphalt cement, which is heated and mixed in measured quantities to produce HMA. Aggregate and RAP (if used) constitute over 92 percent by weight of the total mixture. Aside from the amount and grade of asphalt cement used, mix characteristics are determined by the relative amounts and types of aggregate and RAP used. A certain percentage of fine aggregate (less than 74 micrometers [µm] in physical diameter) is required for the production of good quality HMA.

Hot mix asphalt paving materials can be manufactured by: (1) batch mix plants, (2) continuous mix (mix outside dryer drum) plants, (3) parallel flow drum mix plants, and (4) counterflow drum mix plants. This order of listing generally reflects the chronological order of development and use within the HMA industry.

In 1996, approximately 500 million tons of HMA were produced at the 3,600 (estimated) active asphalt plants in the United States. Of these 3,600 plants, approximately 2,300 are batch plants, 1,000 are parallel flow drum mix plants, and 300 are counterflow drum mix plants. The total 1996 HMA production from batch and drum mix plants is estimated at about 240 million tons and 260 million tons, respectively. About 85 percent of plants being manufactured today are of the counterflow drum mix design, while batch plants and parallel flow drum mix plants account for 10 percent and 5 percent respectively. Continuous mix plants represent a very small fraction of the plants in use (≤0.5 percent) and, therefore, are not discussed further.

An HMA plant can be constructed as a permanent plant, a skid-mounted (easily relocated) plant, or a portable plant. All plants can have RAP processing capabilities. Virtually all plants being manufactured today have RAP processing capability. Most plants have the capability to use either gaseous fuels (natural gas) or fuel oil. However, based upon Department of Energy and limited State inventory information, between 70 and 90 percent of the HMA is produced using natural gas as the fuel to dry and heat the aggregate.

11.1.1.1 Batch Mix Plants –

Figure 11.1-1 shows the batch mix HMA production process. Raw aggregate normally is stockpiled near the production unit. The bulk aggregate moisture content typically stabilizes between 3 to 5 percent by weight.

Processing begins as the aggregate is hauled from the storage piles and is placed in the appropriate hoppers of the cold feed unit. The material is metered from the hoppers onto a conveyer belt and is transported into a rotary dryer (typically gas- or oil-fired). Dryers are equipped with flights designed to shower the aggregate inside the drum to promote drying efficiency.

As the hot aggregate leaves the dryer, it drops into a bucket elevator and is transferred to a set of vibrating screens, where it is classified into as many as four different grades (sizes) and is dropped into individual "hot" bins according to size. At newer facilities, RAP also may be transferred to a separate heated storage bin. To control aggregate size distribution in the final batch mix, the operator opens various hot bins over a weigh hopper until the desired mix and weight are obtained. Concurrent with the aggregate being weighed, liquid asphalt cement is pumped from a heated storage tank to an asphalt bucket, where it is weighed to achieve the desired aggregate-to-asphalt cement ratio in the final mix.

bins or storage silos. The fugitive dust sources associated with drum mix plants are similar to those of batch mix plants with regard to truck traffic and to aggregate material feed and handling operations.

Table 11.1-1 presents emission factors for filterable PM and PM-10, condensable PM, and total PM for batch mix HMA plants. Particle size data for batch mix HMA plants, based on the control technology used, are shown in Table 11.1-2. Table 11.1-3 presents filterable PM and PM-10, condensable PM, and total PM emission factors for drum mix HMA plants. Particle size data for drum mix HMA plants, based on the control technology used, are shown in Table 11.1-4. Tables 11.1-5 and -6 present emission factors for CO, CO_2, NO_x, sulfur dioxide (SO_2), total organic compounds (TOC), formaldehyde, CH_4, and VOC from batch mix plants. Tables 11.1-7 and -8 present emission factors for CO, CO_2, NO_x, SO_2, TOC, CH_4, VOC, and hydrochloric acid (HCl) from drum mix plants. The emission factors for CO, NO_x, and organic compounds represent normal plant operations without scrutiny of the burner design, operation, and maintenance. Information provided in Reference 390 indicates that attention to burner design, periodic evaluation of burner operation, and appropriate maintenance can reduce these emissions. Table 11.1-9 presents organic pollutant emission factors for batch mix plants. Table 11.1-10 presents organic pollutant emission factors for drum mix plants. Tables 11.1-11 and -12 present metals emission factors for batch and drum mix plants, respectively. Table 11.1-13 presents organic pollutant emission factors for hot (asphalt) oil systems.

11.1.2.5 Fugitive Emissions from Production Operations –

Emission factors for HMA load-out and silo filling operations can be estimated using the data in Tables 11.1-14, -15, and -16. Table 11.1-14 presents predictive emission factor equations for HMA load-out and silo filling operations. Separate equations are presented for total PM, extractable organic PM (as measured by EPA Method 315), TOC, and CO. For example, to estimate total PM emissions from drum mix or batch mix plant load-out operations using an asphalt loss-on-heating of 0.41 percent and temperature of 290°F, the following calculation is made:

$$
\begin{aligned}
EF &= 0.000181 + 0.00141(-V)e^{((0.0251)(290 + 460) - 20.43)} \\
&= 0.000181 + 0.00141(-(-0.41))e^{((0.0251)(290 + 460) - 20.43)} \\
&= 0.000181 + 0.00141(0.41)e^{(-1.605)} \\
&= 0.000181 + 0.00141(0.41)(0.2009) \\
&= 0.000181 + 0.000116 \\
&= 0.00030 \text{ lb total PM/ton of asphalt loaded}
\end{aligned}
$$

Tables 11.1-15 and -16 present speciation profiles for organic particulate-based and volatile particulate-based compounds, respectively. The speciation profile shown in Table 11.1-15 can be applied to the extractable organic PM emission factors estimated by the equations in Table 11.1-14 to estimate emission factors for specific organic PM compounds. The speciation profile presented in Table 11.1-16 can be applied to the TOC emission factors estimated by the equations in Table 11.1-14 to estimate emission factors for specific volatile organic compounds. The derivations of the predictive emission factor equations and the speciation profiles can be found in Reference 1.

For example, to estimate TOC emissions from drum mix plant load-out operations using an asphalt loss-on-heating of 0.41 percent and temperature of 290°F, the following calculation is made:

$$
\begin{aligned}
EF &= 0.0172(-V)e^{((0.0251)(290 + 460) - 20.43)} \\
&= 0.0172(-(-0.41))e^{((0.0251)(290 + 460) - 20.43)} \\
&= 0.0172(0.41)e^{(-1.605)} \\
&= 0.0172(0.41)(0.2009) \\
&= 0.0014 \text{ lb TOC/ton of asphalt loaded}
\end{aligned}
$$

To estimate the benzene emissions from the same operation, use the TOC emission factor calculated above and apply the benzene fraction for load-out emissions from Table 11.1-16:

EF = 0.0014 (0.00052)
= 7.3×10^{-7} lb benzene/ton of asphalt loaded

Emissions from asphalt storage tanks can be estimated using the procedures described in AP-42 Section 7.1, Organic Liquid Storage Tanks, and the TANKS software. Site-specific data should be used for storage tank specifications and operating parameters, such as temperature. If site-specific data for Antoine's constants for an average asphalt binder used by the facility are unavailable, the following values for an average liquid asphalt binder can be used:

A = 75,350.06
B = 9.00346

These values should be inserted into the Antoine's equation in the following form:

$$\log_{10} P = \frac{-0.05223A}{T} + B$$

where:
P = vapor pressure, mm Hg
T = absolute temperature, Kelvin

The assumed average liquid molecular weight associated with these Antoine's constants is 1,000 atomic mass units and the average vapor molecular weight is 105. Emission factors estimated using these default values should be assigned a rating of E. Carbon monoxide emissions can be estimated by multiplying the THC emissions calculated by the TANKS program by 0.097 (the ratio of silo filling CO emissions to silo filling TOC emissions).

Vapors from the HMA loaded into transport trucks continue following load-out operations. The TOC emissions for the 8-minute period immediately following load-out (yard emissions) can be estimated using an emission factor of 0.00055 kg/Mg (0.0011 lb/ton) of asphalt loaded. This factor is assigned a rating of E. The derivation of this emission factor is described in Reference 1. Carbon monoxide emissions can be estimated by multiplying the TOC emissions by 0.32 (the ratio of truck load-out CO emissions to truck load-out THC emissions).

11.2.3 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the background report for this section. This and other documents can be found on the CHIEF Web Site at http://www.epa.gov/ttn/chief/, or by calling the Info CHIEF Help Desk at (919)541-1000.

December 2000

- All emission factors were revised and new factors were added. For selected pollutant emissions, separate factors were developed for distilate oil, No. 6 oil and waste oil fired dryers. Dioxin and Furan emission factors were developed for oil fired drum mix plants. Particulate, VOC and CO factors were developed for silo filling, truck load out and post truck load out operations at batch plants and drum mix plants. Organic species profiles were developed for silo filling, truck load out and post truck load out operations.

Table 11.1-3. PARTICULATE MATTER EMISSION FACTORS FOR DRUM MIX HOT MIX ASPHALT PLANTS[a]

Process	Filterable PM				Condensable PM[b]				Total PM			
	PM[c]	EMISSION FACTOR RATING	PM-10[d]	EMISSION FACTOR RATING	Inorganic	EMISSION FACTOR RATING	Organic	EMISSION FACTOR RATING	PM[e]	EMISSION FACTOR RATING	PM-10[f]	EMISSION FACTOR RATING
Dryer[g] (SCC 3-05-002-05,-55 to -63)												
Uncontrolled	28[h]	D	6.4	D	0.0074[j]	E	0.058[k]	E	28	D	6.5	D
Venturi or wet scrubber	0.026[m]	A	ND	NA	0.0074[n]	A	0.012[p]	A	0.045	A	ND	NA
Fabric filter	0.014[q]	A	0.0039	C	0.0074[n]	A	0.012[p]	A	0.033	A	0.023	C

[a] Factors are lb/ton of product. SCC = Source Classification Code. ND = no data. NA = not applicable. To convert from lb/ton to kg/Mg, multiply by 0.5.
[b] Condensable PM is that PM collected using an EPA Method 202, Method 5 (analysis of "back-half" or impingers), or equivalent sampling train.
[c] Filterable PM is that PM collected on or before the filter of an EPA Method 5 (or equivalent) sampling train.
[d] Particle size data from Reference 23 were used in conjunction with the filterable PM emission factors shown.
[e] Total PM is the sum of filterable PM, condensable inorganic PM, and condensable organic PM.
[f] Total PM-10 is the sum of filterable PM-10, condensable inorganic PM, and condensable organic PM.
[g] Drum mix dryer fired with natural gas, propane, fuel oil, and waste oil. The data indicate that fuel type does not significantly effect PM emissions.
[h] References 31, 36-38, 340.
[j] Because no data are available for uncontrolled condensable inorganic PM, the emission factor is assumed to be equal to the maximum controlled condensable inorganic PM emission factor.
[k] References 36-37.
[m] Reference 1, Table 4-14. Average of data from 36 facilities. Range: 0.0036 to 0.097 lb/ton. Median: 0.020 lb/ton. Standard deviation: 0.022 lb/ton.
[n] Reference 1, Table 4-14. Average of data from 30 facilities. Range: 0.0012 to 0.027 lb/ton. Median: 0.0051 lb/ton. Standard deviation: 0.0063 lb/ton.
[p] Reference 1, Table 4-14. Average of data from 41 facilities. Range: 0.00035 to 0.074 lb/ton. Median: 0.0046 lb/ton. Standard deviation: 0.016 lb/ton.
[q] Reference 1, Table 4-14. Average of data from 155 facilities. Range: 0.00089 to 0.14 lb/ton. Median: 0.010 lb/ton. Standard deviation: 0.017 lb/ton.

Table 11.1-4. SUMMARY OF PARTICLE SIZE DISTRIBUTION FOR DRUM MIX DRYERS[a]

EMISSION FACTOR RATING: E

Particle Size, µm[b]	Cumulative Mass Less Than or Equal to Stated Size (%)[c]		Emission Factors, lb/ton	
	Uncontrolled[d]	Fabric Filter	Uncontrolled[d]	Fabric Filter
1.0	ND	15[e]	ND	0.0021[e]
2.5	5.5	21[f]	1.5	0.0029[f]
10.0	23	30[g]	6.4	0.0042[g]
15.0	27	35[d]	7.6	0.0049[d]

[a] Emission factor units are lb/ton of HMA produced. Rounded to two significant figures. SCC 3-05-002-05, and 3-05-002-55 to -63. ND = no data available. To convert from lb/ton to kg/Mg, multiply by 0.5.

[b] Aerodynamic diameter.

[c] Applies only to the mass of filterable PM.

[d] Reference 23, Table 3-35. The emission factors are calculated using the particle size data from this reference in conjunction with the filterable PM emission factor shown in Table 11.1-3.

[e] References 214, 229. The emission factors are calculated using the particle size data from these references in conjunction with the filterable PM emission factor shown in Table 11.1-3.

[f] References 23, 214, 229. The emission factors are calculated using the particle size data from these references in conjunction with the filterable PM emission factor shown in Table 11.1-3.

[g] Reference 23, 25, 229. The emission factors are calculated using the particle size data from these references in conjunction with the filterable PM emission factor shown in Table 11.1-3. EMISSION FACTOR RATING: D.

Table 11.1-7. EMISSION FACTORS FOR CO, CO_2, NO_x, AND SO_2 FROM DRUM MIX HOT MIX ASPHALT PLANTS[a]

Process	CO[b]	EMISSION FACTOR RATING	CO_2[c]	EMISSION FACTOR RATING	NO_x	EMISSION FACTOR RATING	SO_2[c]	EMISSION FACTOR RATING
Natural gas-fired dryer (SCC 3-05-002-55,-56,-57)	0.13	B	33[d]	A	0.026[e]	D	0.0034[f]	D
No. 2 fuel oil-fired dryer (SCC 3-05-002-58,-59,-60)	0.13	B	33[d]	A	0.055[g]	C	0.011[h]	E
Waste oil-fired dryer (SCC 3-05-002-61,-62,-63)	0.13	B	33[d]	A	0.055[g]	C	0.058[j]	B
Coal-fired dryer[k] (SCC 3-05-002-98)	ND	NA	33[d]	A	ND	NA	0.19[m]	E

[a] Emission factor units are lb per ton of HMA produced. SCC = Source Classification Code. ND = no data available. NA = not applicable. To convert from lb/ton to kg/Mg, multiply by 0.5.

[b] References 25, 44, 48, 50, 149, 154, 197, 214, 229, 254, 339-342, 344, 346, 347, 390. The CO emission factors represent normal plant operations without scrutiny of the burner design, operation, and maintenance. Information is available that indicates that attention to burner design, periodic evaluation of burner operation, and appropriate maintenance can reduce CO emissions. Data for dryers firing natural gas, No. 2 fuel oil, and No. 6 fuel oil were combined to develop a single emission factor because the magnitude of emissions was similar for dryers fired with these fuels.

[c] Emissions of CO_2 and SO_2 can also be estimated based on fuel usage and the fuel combustion emission factors (for the appropriate fuel) presented in AP-42 Chapter 1. The CO_2 emission factors are an average of all available data, regardless of the dryer fuel (emissions were similar from dryers firing any of the various fuels). Fifty percent of the fuel-bound sulfur, up to a maximum (as SO_2) of 0.1 lb/ton of product, is expected to be retained in the product, with the remainder emitted as SO_2.

[d] Reference 1, Table 4-15. Average of data from 180 facilities. Range: 2.6 to 96 lb/ton. Median: 31 lb/ton. Standard deviation: 13 lb/ton.

[e] References 44-45, 48, 209, 341, 342.

[f] References 44-45, 48.

[g] References 25, 50, 153, 214, 229, 344, 346, 347, 352-354.

[h] References 50, 119, 255, 340

[j] References 25, 299, 300, 339, 345, 351, 371-377, 379, 380, 386-388.

[k] Dryer fired with coal and supplemental natural gas or fuel oil.

[m] References 88, 108, 189-190.

Table 11.1-8. EMISSION FACTORS FOR TOC, METHANE, VOC, AND HCl FROM DRUM MIX HOT MIX ASPHALT PLANTS[a]

Process	TOC[b]	EMISSION FACTOR RATING	CH_4[c]	EMISSION FACTOR RATING	VOC[d]	EMISSION FACTOR RATING	HCl[e]	EMISSION FACTOR RATING
Natural gas-fired dryer (SCC 3-05-002-55, -56,-57)	0.044[f]	B	0.012	C	0.032	C	ND	NA
No. 2 fuel oil-fired dryer (SCC 3-05-002-58, -59,-60)	0.044[f]	B	0.012	C	0.032	C	ND	NA
Waste oil-fired dryer (SCC 3-05-002-61, -62,-63)	0.044[f]	E	0.012	C	0.032	E	0.00021	D

[a] Emission factor units are lb per ton of HMA produced. SCC = Source Classification Code. ND = no data available. NA = not applicable. To convert from lb/ton to kg/Mg, multiply by 0.5.

[b] TOC equals total hydrocarbons as propane as measured with an EPA Method 25A or equivalent sampling train plus formaldehyde.

[c] References 25, 44-45, 48, 50, 339-340, 355. Factor includes data from natural gas-, No. 2 fuel oil, and waste oil-fired dryers. Methane measured with an EPA Method 18 or equivalent sampling train.

[d] The VOC emission factors are equal to the TOC factors minus the sum of the methane emission factors and the emission factors for compounds with negligible photochemical reactivity shown in Table 11.1-10; differences in values reported are due to rounding.

[e] References 348, 374, 376, 379, 380.

[f] References 25, 44-45, 48, 50, 149, 153-154, 209-212, 214, 241, 242, 339-340, 355.

Table 11.1-10. EMISSION FACTORS FOR ORGANIC POLLUTANT EMISSIONS FROM DRUM MIX HOT MIX ASPHALT PLANTS[a]

Process	Pollutant CASRN	Pollutant Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
Natural gas-fired dryer with fabric filter[b] (SCC 3-05-002-55, -56,-57)	Non-PAH hazardous air pollutants[c]				
	71-43-2	Benzene[d]	0.00039	A	25,44,45,50, 341, 342, 344-351, 373, 376, 377, 383, 384
	100-41-4	Ethylbenzene	0.00024	D	25,44,45
	50-00-0	Formaldehyde[e]	0.0031	A	25,35,44,45,50, 339-344, 347-349, 371-373, 384, 388
	110-54-3	Hexane	0.00092	E	339-340
	540-84-1	Isooctane (2,2,4-trimethylpentane)	$4.0x10^{-5}$	E	339-340
	71-55-6	Methyl chloroform[f]	$4.8x10^{-5}$	E	35
	108-88-3	Toluene	0.00015	D	35,44,45
	1330-20-7	Xylene	0.00020	D	25,44,45
		Total non-PAH HAPs	0.0051		
	PAH HAPs				
	91-57-6	2-Methylnaphthalene[g]	$7.4x10^{-5}$	D	44,45,48
	83-32-9	Acenaphthene[g]	$1.4x10^{-6}$	E	48
	208-96-8	Acenaphthylene[g]	$8.6x10^{-6}$	D	35,45,48
	120-12-7	Anthracene[g]	$2.2x10^{-7}$	E	35,48
	56-55-3	Benzo(a)anthracene[g]	$2.1x10^{-7}$	E	48
	50-32-8	Benzo(a)pyrene[g]	$9.8x10^{-9}$	E	48
	205-99-2	Benzo(b)fluoranthene[g]	$1.0x10^{-7}$	E	35,48
	192-97-2	Benzo(e)pyrene[g]	$1.1x10^{-7}$	E	48
	191-24-2	Benzo(g,h,i)perylene[g]	$4.0x10^{-8}$	E	48
	207-08-9	Benzo(k)fluoranthene[g]	$4.1x10^{-8}$	E	35,48
	218-01-9	Chrysene[g]	$1.8x10^{-7}$	E	35,48
	206-44-0	Fluoranthene[g]	$6.1x10^{-7}$	D	35,45,48
	86-73-7	Fluorene[g]	$3.8x10^{-6}$	D	35,45,48,163
	193-39-5	Indeno(1,2,3-cd)pyrene[g]	$7.0x10^{-9}$	E	48
	91-20-3	Naphthalene[g]	$9.0x10^{-5}$	D	35,44,45,48,163
	198-55-0	Perylene[g]	$8.8x10^{-9}$	E	48
	85-01-8	Phenanthrene[g]	$7.6x10^{-6}$	D	35,44,45,48,163
	129-00-0	Pyrene[g]	$5.4x10^{-7}$	D	45,48
		Total PAH HAPs	0.00019		

Table 11.1-10 (cont.)

Process	Pollutant CASRN	Pollutant Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
Natural gas-fired dryer with fabric filter[b] (SCC 3-05-002-55, -56,-57) (cont.)		Total HAPs	0.0053		
		Non-HAP organic compounds			
	106-97-8	Butane	0.00067	E	339
	74-85-1	Ethylene	0.0070	E	339-340
	142-82-5	Heptane	0.0094	E	339-340
	763-29-1	2-Methyl-1-pentene	0.0040	E	339,340
	513-35-9	2-Methyl-2-butene	0.00058	E	339,340
	96-14-0	3-Methylpentane	0.00019	D	339,340
	109-67-1	1-Pentene	0.0022	E	339-340
	109-66-0	n-Pentane	0.00021	E	339-340
		Total non-HAP organics	0.024		
No. 2 fuel oil-fired dryer with fabric filter (SCC 3-05-002-58, -59,-60)		Non-PAH HAPs[c]			
	71-43-2	Benzene[d]	0.00039	A	25,44,45,50, 341, 342, 344-351, 373, 376, 377, 383, 384
	100-41-4	Ethylbenzene	0.00024	D	25,44,45
	50-00-0	Formaldehyde[e]	0.0031	A	25,35,44,45,50, 339-344, 347-349, 371-373, 384, 388
	110-54-3	Hexane	0.00092	E	339-340
	540-84-1	Isooctane (2,2,4-trimethylpentane)	4.0×10^{-5}	E	339-340
	71-55-6	Methyl chloroform[f]	4.8×10^{-5}	E	35
	108-88-3	Toluene	0.0029	E	25, 50, 339-340
	1330-20-7	Xylene	0.00020	D	25,44,45
		Total non-PAH HAPs	0.0078		
		PAH HAPs			
	91-57-6	2-Methylnaphthalene[g]	0.00017	E	50
	83-32-9	Acenaphthene[g]	1.4×10^{-6}	E	48
	208-96-8	Acenaphthylene[g]	2.2×10^{-5}	E	50
	120-12-7	Anthracene[g]	3.1×10^{-6}	E	50,162
	56-55-3	Benzo(a)anthracene[g]	2.1×10^{-7}	E	48
	50-32-8	Benzo(a)pyrene[g]	9.8×10^{-9}	E	48
	205-99-2	Benzo(b)fluoranthene[g]	1.0×10^{-7}	E	35,48
	192-97-2	Benzo(e)pyrene[g]	1.1×10^{-7}	E	48

Table 11.1-10 (cont.)

Process	Pollutant CASRN	Pollutant Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
No. 2 fuel oil-fired dryer with fabric filter (SCC 3-05-002-58, -59,-60) (cont.)	191-24-2	Benzo(g,h,i)perylene[g]	4.0×10^{-8}	E	48
	207-08-9	Benzo(k)fluoranthene[g]	4.1×10^{-8}	E	35,48
	218-01-9	Chrysene[g]	1.8×10^{-7}	E	35,48
	206-44-0	Fluoranthene[g]	6.1×10^{-7}	D	35,45,48
	86-73-7	Fluorene[g]	1.1×10^{-5}	E	50,164
	193-39-5	Indeno(1,2,3-cd)pyrene[g]	7.0×10^{-9}	E	48
	91-20-3	Naphthalene[g]	0.00065	D	25,50,162,164
	198-55-0	Perylene[g]	8.8×10^{-9}	E	48
	85-01-8	Phenanthrene[g]	2.3×10^{-5}	D	50,162,164
	129-00-0	Pyrene[g]	3.0×10^{-6}	E	50
		Total PAH HAPs	0.00088		
		Total HAPs	0.0087		
	Non-HAP organic compounds				
	106-97-8	Butane	0.00067	E	339
	74-85-1	Ethylene	0.0070	E	339-340
	142-82-5	Heptane	0.0094	E	339-340
	763-29-1	2-Methyl-1-pentene	0.0040	E	339,340
	513-35-9	2-Methyl-2-butene	0.00058	E	339,340
	96-14-0	3-Methylpentane	0.00019	D	339,340
	109-67-1	1-Pentene	0.0022	E	339-340
	109-66-0	n-Pentane	0.00021	E	339-340
		Total non-HAP organics	0.024		

Table 11.1-10 (cont.)

Process	Pollutant CASRN	Pollutant Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
Fuel oil- or waste oil-fired dryer with fabric filter (SCC 3-05-002-58, -59,-60,-61,-62, -63)		Dioxins			
	1746-01-6	2,3,7,8-TCDD[g]	2.1×10^{-13}	E	339
		Total TCDD[g]	9.3×10^{-13}	E	339
	40321-76-4	1,2,3,7,8-PeCDD[g]	3.1×10^{-13}	E	339
		Total PeCDD[g]	2.2×10^{-11}	E	339-340
	39227-28-6	1,2,3,4,7,8-HxCDD[g]	4.2×10^{-13}	E	339
	57653-85-7	1,2,3,6,7,8-HxCDD[g]	1.3×10^{-12}	E	339
	19408-24-3	1,2,3,7,8,9-HxCDD[g]	9.8×10^{-13}	E	339
		Total HxCDD[g]	1.2×10^{-11}	E	339-340
	35822-46-9	1,2,3,4,6,7,8-HpCDD[g]	4.8×10^{-12}	E	339
		Total HpCDD[g]	1.9×10^{-11}	E	339-340
	3268-87-9	Octa CDD[g]	2.5×10^{-11}	E	339
		Total PCDD[g]	7.9×10^{-11}	E	339-340
		Furans			
	51207-31-9	2,3,7,8-TCDF[g]	9.7×10^{-13}	E	339
		Total TCDF[g]	3.7×10^{-12}	E	339-340
		1,2,3,7,8-PeCDF[g]	4.3×10^{-12}	E	339-340
		2,3,4,7,8-PeCDF[g]	8.4×10^{-13}	E	339
		Total PeCDF[g]	8.4×10^{-11}	E	339-340
		1,2,3,4,7,8-HxCDF[g]	4.0×10^{-12}	E	339
		1,2,3,6,7,8-HxCDF[g]	1.2×10^{-12}	E	339
		2,3,4,6,7,8-HxCDF[g]	1.9×10^{-12}	E	339
		1,2,3,7,8,9-HxCDF[g]	8.4×10^{-12}	E	340
		Total HxCDF[g]	1.3×10^{-11}	E	339-340
		1,2,3,4,6,7,8-HpCDF[g]	6.5×10^{-12}	E	339
		1,2,3,4,7,8,9-HpCDF[g]	2.7×10^{-12}	E	339
		Total HpCDF[g]	1.0×10^{-11}	E	339-340
	39001-02-0	Octa CDF[g]	4.8×10^{-12}	E	339
		Total PCDF[g]	4.0×10^{-11}	E	339-340
		Total PCDD/PCDF[g]	1.2×10^{-10}	E	339-340

Table 11.1-10 (cont.)

Process	Pollutant: CASRN	Pollutant: Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
Fuel oil- or waste oil-fired dryer (uncontrolled) (SCC 3-05-002-58, -59,-60,-61,-62, -63)	Hazardous air pollutants[c]				
	Dioxins				
		Total HxCDD[g]	5.4×10^{-12}	E	340
	35822-46-9	1,2,3,4,6,7,8-HpCDD[g]	3.4×10^{-11}	E	340
		Total HpCDD[g]	7.1×10^{-11}	E	340
	3268-87-9	Octa CDD[g]	2.7×10^{-9}	E	340
		Total PCDD[g]	2.8×10^{-9}	E	340
	Furans				
		Total TCDF[g]	3.3×10^{-11}	E	340
		Total PeCDF[g]	7.4×10^{-11}	E	340
		1,2,3,4,7,8-HxCDF[g]	5.4×10^{-12}	E	340
		2,3,4,6,7,8-HxCDF[g]	1.6×10^{-12}	E	340
		Total HxCDF[g]	8.1×10^{-12}	E	340
Fuel oil- or waste oil-fired dryer (uncontrolled) (SCC 3-05-002-58, -59,-60,-61,-62, -63) (cont.)		1,2,3,4,6,7,8-HpCDF[g]	1.1×10^{-11}	E	340
		Total HpCDF[g]	3.8×10^{-11}	E	340
		Total PCDF[g]	1.5×10^{-10}	E	340
		Total PCDD/PCDF[g]	3.0×10^{-9}	E	340

Table 11.1-10 (cont.)

Process	Pollutant CASRN	Pollutant Name	Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
Waste oil-fired dryer with fabric filter (SCC 3-05-002-61, -62,-63)	Non-PAH HAPs[c]				
	75-07-0	Acetaldehyde	0.0013	E	25
	107-02-8	Acrolein	$2.6x10^{-5}$	E	25
	71-43-2	Benzene[d]	0.00039	A	25,44,45,50,341,342, 344-351, 373, 376, 377, 383, 384
	100-41-4	Ethylbenzene	0.00024	D	25,44,45
	50-00-0	Formaldehyde[e]	0.0031	A	25,35,44,45,50,339-344,347-349,371-373, 384, 388
	110-54-3	Hexane	0.00092	E	339-340
	540-84-1	Isooctane (2,2,4-trimethylpentane)	$4.0x10^{-5}$	E	339-340
	78-93-3	Methyl Ethyl Ketone	$2.0x10^{-5}$	E	25
	123-38-6	Propionaldehyde	0.00013	E	25
	106-51-4	Quinone	0.00016	E	25
	71-55-6	Methyl chloroform[f]	$4.8x10^{-5}$	E	35
	108-88-3	Toluene	0.0029	E	25, 50, 339-340
	1330-20-7	Xylene	0.00020	D	25,44,45
		Total non-PAH HAPs	0.0095		
	PAH HAPs				
	91-57-6	2-Methylnaphthalene[g]	0.00017	E	50
	83-32-9	Acenaphthene[g]	$1.4x10^{-6}$	E	48
	208-96-8	Acenaphthylene[g]	$2.2x10^{-5}$	E	50
	120-12-7	Anthracene[g]	$3.1x10^{-6}$	E	50,162
	56-55-3	Benzo(a)anthracene[g]	$2.1x10^{-7}$	E	48
	50-32-8	Benzo(a)pyrene[g]	$9.8x10^{-9}$	E	48
	205-99-2	Benzo(b)fluoranthene[g]	$1.0x10^{-7}$	E	35,48
	192-97-2	Benzo(e)pyrene[g]	$1.1x10^{-7}$	E	48
	191-24-2	Benzo(g,h,i)perylene[g]	$4.0x10^{-8}$	E	48

Table 11.1-10 (cont.)

Process	Pollutant		Emission Factor, lb/ton	Emission Factor Rating	Ref. No.
	CASRN	Name			
Waste oil-fired dryer with fabric filter (SCC 3-05-002-61, -62,-63) (cont.)	207-08-9	Benzo(k)fluoranthene[g]	$4.1x10^{-8}$	E	35,48
	218-01-9	Chrysene[g]	$1.8x10^{-7}$	E	35,48
	206-44-0	Fluoranthene[g]	$6.1x10^{-7}$	D	35,45,48
	86-73-7	Fluorene[g]	$1.1x10^{-5}$	E	50,164
	193-39-5	Indeno(1,2,3-cd)pyrene[g]	$7.0x10^{-9}$	E	48
	91-20-3	Naphthalene[g]	0.00065	D	25,50,162,164
	198-55-0	Perylene[g]	$8.8x10^{-9}$	E	48
	85-01-8	Phenanthrene[g]	$2.3x10^{-5}$	D	50,162,164
	129-00-0	Pyrene[g]	$3.0x10^{-6}$	E	50
		Total PAH HAPs	0.00088		
		Total HAPs	0.010		
	Non-HAP organic compounds				
	67-64-1	Acetone[f]	0.00083	E	25
	100-52-7	Benzaldehyde	0.00011	E	25
	106-97-8	Butane	0.00067	E	339
	78-84-2	Butyraldehyde	0.00016	E	25
	4170-30-3	Crotonaldehyde	$8.6x10^{-5}$	E	25
	74-85-1	Ethylene	0.0070	E	339, 340
	142-82-5	Heptane	0.0094	E	339, 340
	66-25-1	Hexanal	0.00011	E	25
	590-86-3	Isovaleraldehyde	$3.2x10^{-5}$	E	25
	763-29-1	2-Methyl-1-pentene	0.0040	E	339, 340
	513-35-9	2-Methyl-2-butene	0.00058	E	339, 340
	96-14-0	3-Methylpentane	0.00019	D	339, 340
	109-67-1	1-Pentene	0.0022	E	339, 340
	109-66-0	n-Pentane	0.00021	E	339, 340
	110-62-3	Valeraldehyde	$6.7x10^{-5}$	E	25
		Total non-HAP organics	0.026		

[a] Emission factor units are lb/ton of hot mix asphalt produced. Table includes data from both parallel flow and counterflow drum mix dryers. Organic compound emissions from counterflow systems are expected to be less than from parallel flow systems, but the available data are insufficient to quantify

Table 11.1-10 (cont.)

accurately the difference in these emissions. CASRN = Chemical Abstracts Service Registry Number. SCC = Source Classification Code. To convert from lb/ton to kg/Mg, multiply by 0.5.

[b] Tests included dryers that were processing reclaimed asphalt pavement. Because of limited data, the effect of RAP processing on emissions could not be determined.

[c] Hazardous air pollutants (HAP) as defined in the 1990 Clean Air Act Amendments (CAAA).

[d] Based on data from 19 tests. Range: 0.000063 to 0.0012 lb/ton; median: 0.00030; Standard deviation: 0.00031.

[e] Based on data from 21 tests. Range: 0.0030 to 0.014 lb/ton; median: 0.0020; Standard deviation: 0.0036.

[f] Compound has negligible photochemical reactivity.

[g] Compound is classified as polycyclic organic matter, as defined in the 1990 CAAA. Total PCDD is the sum of the total tetra through octa dioxins; total PCDF is sum of the total tetra through octa furans; and total PCDD/PCDF is the sum of total PCDD and total PCDF.

Table 11.1-12. EMISSION FACTORS FOR METAL EMISSIONS FROM DRUM MIX HOT MIX ASPHALT PLANTS[a]

Process	Pollutant	Emission Factor, lb/ton	Emission Factor Rating	Reference Numbers
Fuel oil-fired dryer, uncontrolled (SCC 3-05-002-58, -59,-60)	Arsenic[b]	1.3×10^{-6}	E	340
	Barium	0.00025	E	340
	Beryllium[b]	0.0	E	340
	Cadmium[b]	4.2×10^{-6}	E	340
	Chromium[b]	2.4×10^{-5}	E	340
	Cobalt[b]	1.5×10^{-5}	E	340
	Copper	0.00017	E	340
	Lead[b]	0.00054	E	340
	Manganese[b]	0.00065	E	340
	Nickel[b]	0.0013	E	340
	Phosphorus[b]	0.0012	E	340
	Selenium[b]	2.4×10^{-6}	E	340
	Thallium	2.2×10^{-6}	E	340
	Zinc	0.00018	E	340
Natural gas- or propane-fired dryer, with fabric filter (SCC 3-05-002-55, -56,-57))	Antimony	1.8×10^{-7}	E	339
	Arsenic[b]	5.6×10^{-7}	D	25, 35, 339-340
	Barium	5.8×10^{-6}	E	25, 339-340
	Beryllium[b]	0.0	E	339-340
	Cadmium[b]	4.1×10^{-7}	D	25, 35, 162, 301, 339-340
	Chromium[b]	5.5×10^{-6}	C	25, 162-164, 301, 339-340
	Cobalt[b]	2.6×10^{-8}	E	339-340
	Copper	3.1×10^{-6}	D	25, 162-164, 339-340
	Hexavalent chromium[b]	4.5×10^{-7}	E	163
	Lead[b]	6.2×10^{-7}	E	35
	Manganese[b]	7.7×10^{-6}	D	25, 162-164, 339-340
	Mercury[b]	2.4×10^{-7}	E	35, 163
	Nickel[b]	6.3×10^{-5}	D	25, 163-164, 339-340
	Phosphorus[b]	2.8×10^{-5}	E	25, 339-340
	Silver	4.8×10^{-7}	E	25, 339-340
	Selenium[b]	3.5×10^{-7}	E	339-340
	Thallium	4.1×10^{-9}	E	339-340
	Zinc	6.1×10^{-5}	C	25, 35, 162-164, 339-340

Table 11.1-12 (cont.)

Process	Pollutant	Emission Factor, lb/ton	Emission Factor Rating	Reference Numbers
No. 2 fuel oil-fired dryer or waste oil/drain oil/No. 6 fuel oil-fired dryer, with fabric filter (SCC 3-05-002-58, -59,-60,-61,-62,-63)	Antimony	$1.8x10^{-7}$	E	339
	Arsenic[b]	$5.6x10^{-7}$	D	25, 35, 339-340
	Barium	$5.8x10^{-6}$	E	25, 339-340
	Beryllium[b]	0.0	E	339-340
	Cadmium[b]	$4.1x10^{-7}$	D	25, 35, 162, 301, 339-340
	Chromium[b]	$5.5x10^{-6}$	C	25, 162-164, 301, 339-340
	Cobalt[b]	$2.6x10^{-8}$	E	339-340
	Copper	$3.1x10^{-6}$	D	25, 162-164, 339-340
	Hexavalent chromium[b]	$4.5x10^{-7}$	E	163
	Lead[b]	$1.5x10^{-5}$	C	25, 162, 164, 178-179, 183, 301, 315, 339-340
	Manganese[b]	$7.7x10^{-6}$	D	25, 162-164, 339-340
	Mercury[b]	$2.6x10^{-6}$	D	162, 164, 339-340
	Nickel[b]	$6.3x10^{-5}$	D	25, 163-164, 339-340
	Phosphorus[b]	$2.8x10^{-5}$	E	25, 339-340
	Silver	$4.8x10^{-7}$	E	25, 339-340
	Selenium[b]	$3.5x10^{-7}$	E	339-340
	Thallium	$4.1x10^{-9}$	E	339-340
	Zinc	$6.1x10^{-5}$	C	25, 35, 162-164, 339-340

[a] Emission factor units are lb/ton of HMA produced. SCC = Source Classification Code. To convert from lb/ton to kg/Mg, multiply by 0.5. Emission factors apply to facilities processing virgin aggregate or a combination of virgin aggregate and RAP.

[b] Arsenic, beryllium, cadmium, chromium, hexavalent chromium, cobalt, lead, manganese, mercury, nickel, and selenium compounds are HAPs as defined in the 1990 CAAA. Elemental phosphorus also is a listed HAP, but the phosphorus measured by Method 29 is not elemental phosphorus.

Table 11.1-14. PREDICTIVE EMISSION FACTOR EQUATIONS FOR LOAD-OUT AND SILO FILLING OPERATIONS[a]

EMISSION FACTOR RATING: C

Source	Pollutant	Equation
Drum mix or batch mix plant load-out (SCC 3-05-002-14)	Total PM[b]	$EF = 0.000181 + 0.00141(-V)e^{((0.0251)(T + 460) - 20.43)}$
	Organic PM[c]	$EF = 0.00141(-V)e^{((0.0251)(T + 460) - 20.43)}$
	TOC[d]	$EF = 0.0172(-V)e^{((0.0251)(T + 460) - 20.43)}$
	CO	$EF = 0.00558(-V)e^{((0.0251)(T + 460) - 20.43)}$
Silo filling (SCC 3-05-002-13)	Total PM[b]	$EF = 0.000332 + 0.00105(-V)e^{((0.0251)(T + 460) - 20.43)}$
	Organic PM[c]	$EF = 0.00105(-V)e^{((0.0251)(T + 460) - 20.43)}$
	TOC[d]	$EF = 0.0504(-V)e^{((0.0251)(T + 460) - 20.43)}$
	CO	$EF = 0.00488(-V)e^{((0.0251)(T + 460) - 20.43)}$

[a] Emission factor units are lb/ton of HMA produced. SCC = Source Classification Code. To convert from lb/ton to kg/Mg, multiply by 0.5. EF = emission factor; V = asphalt volatility, as determined by ASTM Method D2872-88 "Effects of Heat and Air on a Moving Film of Asphalt (Rolling Thin Film Oven Test - RTFOT)," where a 0.5 percent loss-on-heating is expressed as "-0.5." Regional- or site-specific data for asphalt volatility should be used, whenever possible; otherwise, a default value of -0.5 should be used for V in these equations. T = HMA mix temperature in °F. Site-specific temperature data should be used, whenever possible; otherwise a default temperature of 325°F can be used. Reference 1, Tables 4-27 through 4-31, 4-34 through 4-36, and 4-38 through 4-41.

[b] Total PM, as measured by EPA Method 315 (EPA Method 5 plus the extractable organic particulate from the impingers). Total PM is assumed to be predominantly PM-2.5 since emissions consist of condensed vapors.

[c] Extractable organic PM, as measured by EPA Method 315 (methylene chloride extract of EPA Method 5 particulate plus methylene chloride extract of impinger particulate).

[d] TOC as propane, as measured with an EPA Method 25A sampling train or equivalent sampling train.

11.12 CONCRETE BATCHING

11.12-1 Process Description [1-5]

Concrete is composed essentially of water, cement, sand (fine aggregate) and coarse aggregate. Coarse aggregate may consist of gravel, crushed stone or iron blast furnace slag. Some specialty aggregate products could be either heavyweight aggregate (of barite, magnetite, limonite, ilmenite, iron or steel) or lightweight aggregate (with sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, slag pumice, cinders, or sintered fly ash). Supplementary cementitious materials, also called mineral admixtures or pozzolan minerals may be added to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.

Approximately 75 percent of the U.S. concrete manufactured is produced at plants that store, convey, measure and discharge these constituents into trucks for transport to a job site. At most of these plants, sand, aggregate, cement and water are all gravity fed from the weight hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. In a few cases concrete is dry batched or prepared at a building construction site. Figure 11.12-1 is a generalized process diagram for concrete batching.

The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

11.12-2 Emissions and Controls [6-8]

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or “sock”. Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant. Particulate emission factors for concrete batching are give in Tables 11.12-1 and 11.12-2.

TABLE 11.12-2 (ENGLISH UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating	Total PM	Emission Factor Rating	Total PM_{10}	Emission Factor Rating
Aggregate transfer [b] (3-05-011-04,-21,23)	0.0069	D	0.0033	D	ND		ND	
Sand transfer [b] (3-05-011-05,22,24)	0.0021	D	0.00099	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic)[c] (3-05-011-07)	0.72	E	0.46	E	0.00099	D	0.00034	D
Cement supplement unloading to elevated storage silo (pneumatic)[d] (3-05-011-17)	3.14	E	1.10	E	0.0089	D	0.0049	E
Weigh hopper loading [e] (3-05-011-08)	0.0051	D	0.0024	D	ND		ND	
Mixer loading (central mix)[f] (3-05-011-09)	0.544 or Eqn. 11.12-1	B	0.134 or Eqn. 11.12-1	B	0.0173 or Eqn. 11.12-1	B	0.0048 or Eqn. 11.12-1	B
Truck loading (truck mix)[g] (3-05-011-10)	0.995	B	0.278	B	0.0568 or Eqn. 11.12-1	B	0.0160 or Eqn. 11.12-1	B
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with k_{PM-10} =.35, k_{PM} = .74, U = 10mph, $M_{aggregate}$ =1.77%, and M_{sand} = 4.17%. These moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11, and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average $yard^3$ of concrete. The unit for these emission factors is lb of pollutant per ton of aggregate and sand.

[f] References 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

[g] Reference 9, 10, and 14. The emission factor units are lb of pollutant per ton of cement and cement supplement. The general factor is the arithmetic mean of all test data.

The particulate matter emissions from truck mix and central mix loading operations are calculated in accordance with the values in Tables 11.12-1 or 11.12-2 or by Equation 11.12-1[14] when site specific data are available.

$$E = k\,(0.0032)\left[\frac{U^a}{M^b}\right] + c \qquad \text{Equation 11.12-1}$$

E	=	Emission factor in lbs./ton of cement and cement supplement
k	=	Particle size multiplier (dimensionless)
U	=	Wind speed, miles per hour (mph)
M	=	Minimum moisture (% by weight) of cement and cement supplement
a, b	=	Exponents
c	=	Constant

The parameters for Equation 11.12-1 are summarized in Tables 11.12-3 and 11.12-4.

Table 11.12-3. Equation Parameters for Truck Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.8	1.75	0.3	0.013
	PM_{10}	0.32	1.75	0.3	0.0052
	$PM_{10\text{-}2.5}$	0.288	1.75	0.3	0.00468
	$PM_{2.5}$	0.048	1.75	0.3	0.00078
Uncontrolled[1]	Total PM	0.995			
	PM_{10}	0.278			
	$PM_{10\text{-}2.5}$	0.228			
	$PM_{2.5}$	0.050			

Table 11.12-4. Equation Parameters for Central Mix Operations

Condition	Parameter Category	k	a	b	c
Controlled[1]	Total PM	0.19	0.95	0.9	0.0010
	PM_{10}	0.13	0.45	0.9	0.0010
	$PM_{10\text{-}2.5}$	0.12	0.45	0.9	0.0009
	$PM_{2.5}$	0.03	0.45	0.9	0.0002
Uncontrolled[1]	Total PM	5.90	0.6	1.3	0.120
	PM_{10}	1.92	0.4	1.3	0.040
	$PM_{10\text{-}2.5}$	1.71	0.4	1.3	0.036
	$PM_{2.5}$	0.38	0.4	1.3	0

1. Emission factors expressed in lbs/tons of cement and cement supplement

To convert from units of lbs/ton to units of kilograms per mega gram, the emissions calculated by Equation 11.12-1 should be divided by 2.0.

Particulate emission factors per yard of concrete for an average batch formulation at a typical facility are given in Tables 11.12-4 and 11.12-5. For truck mix loading and central mix loading, the

11.19.2 Crushed Stone Processing and Pulverized Mineral Processing

11.19.2.1 Process Description [24, 25]

Crushed Stone Processing

Major rock types processed by the crushed stone industry include limestone, granite, dolomite, traprock, sandstone, quartz, and quartzite. Minor types include calcareous marl, marble, shell, and slate. Major mineral types processed by the pulverized minerals industry, a subset of the crushed stone processing industry, include calcium carbonate, talc, and barite. Industry classifications vary considerably and, in many cases, do not reflect actual geological definitions.

Rock and crushed stone products generally are loosened by drilling and blasting and then are loaded by power shovel or front-end loader into large haul trucks that transport the material to the processing operations. Techniques used for extraction vary with the nature and location of the deposit. Processing operations may include crushing, screening, size classification, material handling and storage operations. All of these processes can be significant sources of PM and PM-10 emissions if uncontrolled.

Quarried stone normally is delivered to the processing plant by truck and is dumped into a bin. A feeder is used as illustrated in Figure 11.19.2-1. The feeder or screens separate large boulders from finer rocks that do not require primary crushing, thus reducing the load to the primary crusher. Jaw, impactor, or gyratory crushers are usually used for initial reduction. The crusher product, normally 7.5 to 30 centimeters (3 to 12 inches) in diameter, and the grizzly throughs (undersize material) are discharged onto a belt conveyor and usually are conveyed to a surge pile for temporary storage or are sold as coarse aggregates.

The stone from the surge pile is conveyed to a vibrating inclined screen called the scalping screen. This unit separates oversized rock from the smaller stone. The undersized material from the scalping screen is considered to be a product stream and is transported to a storage pile and sold as base material. The stone that is too large to pass through the top deck of the scalping screen is processed in the secondary crusher. Cone crushers are commonly used for secondary crushing (although impact crushers are sometimes used), which typically reduces material to about 2.5 to 10 centimeters (1 to 4 inches). The material (throughs) from the second level of the screen bypasses the secondary crusher because it is sufficiently small for the last crushing step. The output from the secondary crusher and the throughs from the secondary screen are transported by conveyor to the tertiary circuit, which includes a sizing screen and a tertiary crusher.

Tertiary crushing is usually performed using cone crushers or other types of impactor crushers. Oversize material from the top deck of the sizing screen is fed to the tertiary crusher. The tertiary crusher output, which is typically about 0.50 to 2.5 centimeters (3/16th to 1 inch), is returned to the sizing screen. Various product streams with different size gradations are separated in the screening operation. The products are conveyed or trucked directly to finished product bins, to open area stock piles, or to other processing systems such as washing, air separators, and screens and classifiers (for the production of manufactured sand).

Some stone crushing plants produce manufactured sand. This is a small-sized rock product with a maximum size of 0.50 centimeters (3/16 th inch). Crushed stone from the tertiary sizing screen is sized in a vibrating inclined screen (fines screen) with relatively small mesh sizes.

Table 11.19.2-2 (English Units). EMISSION FACTORS FOR CRUSHED STONE PROCESSING OPERATIONS (lb/Ton)[a]

Source [b]	Total Particulate Matter [r,s]	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING	Total PM-2.5	EMISSION FACTOR RATING
Primary Crushing (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Primary Crushing (controlled) (SCC 3-05-020-01)	ND		ND[n]		ND[n]	
Secondary Crushing (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Secondary Crushing (controlled) (SCC 3-05-020-02)	ND		ND[n]		ND[n]	
Tertiary Crushing (SCC 3-050030-03)	0.0054[d]	E	0.0024[o]	C	ND[n]	
Tertiary Crushing (controlled) (SCC 3-05-020-03)	0.0012[d]	E	0.00054[p]	C	0.00010[q]	E
Fines Crushing (SCC 3-05-020-05)	0.0390[e]	E	0.0150[e]	E	ND	
Fines Crushing (controlled) (SCC 3-05-020-05)	0.0030[f]	E	0.0012[f]	E	0.000070[q]	E
Screening (SCC 3-05-020-02, 03)	0.025[c]	E	0.0087[l]	C	ND	
Screening (controlled) (SCC 3-05-020-02, 03)	0.0022[d]	E	0.00074[m]	C	0.000050[q]	E
Fines Screening (SCC 3-05-020-21)	0.30[g]	E	0.072[g]	E	ND	
Fines Screening (controlled) (SCC 3-05-020-21)	0.0036[g]	E	0.0022[g]	E	ND	
Conveyor Transfer Point (SCC 3-05-020-06)	0.0030[h]	E	0.00110[h]	D	ND	
Conveyor Transfer Point (controlled) (SCC 3-05-020-06)	0.00014[i]	E	4.6×10^{-5}[i]	D	1.3×10^{-5}[q]	E
Wet Drilling - Unfragmented Stone (SCC 3-05-020-10)	ND		8.0×10^{-5}[j]	E	ND	
Truck Unloading -Fragmented Stone (SCC 3-05-020-31)	ND		1.6×10^{-5}[j]	E	ND	
Truck Unloading - Conveyor, crushed stone (SCC 3-05-020-32)	ND		0.00010[k]	E	ND	

a. Emission factors represent uncontrolled emissions unless noted. Emission factors in lb/Ton of material of throughput. SCC = Source Classification Code. ND = No data.

b. Controlled sources (with wet suppression) are those that are part of the processing plant that employs current wet suppression technology similar to the study group. The moisture content of the study group without wet suppression systems operating (uncontrolled) ranged from 0.21 to 1.3 percent, and the same facilities operating wet suppression systems (controlled) ranged from 0.55 to 2.88 percent. Due to carry over of the small amount of moisture required, it has been shown that each source, with the exception of crushers, does not need to employ direct water sprays. Although the moisture content was the only variable measured, other process features may have as much influence on emissions from a given source. Visual observations from each source under normal operating conditions are probably the best indicator of which emission factor is most appropriate. Plants that employ substandard control measures as indicated by visual observations should use the uncontrolled factor with an appropriate control efficiency that best reflects the effectiveness of the controls employed.

c. References 1, 3, 7, and 8

d. References 3, 7, and 8

e. Reference 4

f. References 4 and 15

g. Reference 4

h. References 5 and 6

i. References 5, 6, and 15

j. Reference 11

k. Reference 12

l. References 1, 3, 7, and 8

m. References 1, 3, 7, 8, and 15

n. No data available, but emission factors for PM-10 for tertiary crushers can be used as an upper limit for primary or secondary crushing

o. References 2, 3, 7, 8

p. References 2, 3, 7, 8, and 15

q. Reference 15

r. PM emission factors are presented based on PM-100 data in the Background Support Document for Section 11.19.2

s. Emission factors for PM-30 and PM-50 are available in Figures 11.19.2-3 through 11.19.2-6.

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13.2.2 Unpaved Roads

13.2.2.1 General

When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The particulate emission factors presented in the previous draft version of this section of AP-42, dated October 2001, implicitly included the emissions from vehicles in the form of exhaust, brake wear, and tire wear as well as resuspended road surface material[25]. EPA included these sources in the emission factor equation for unpaved public roads (equation 1b in this section) since the field testing data used to develop the equation included both the direct emissions from vehicles and emissions from resuspension of road dust.

This version of the unpaved public road emission factor equation only estimates particulate emissions from resuspended road surface material [23, 26]. The particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using EPA's MOBILE6.2 [24]. This approach eliminates the possibility of double counting emissions. Double counting results when employing the previous version of the emission factor equation in this section and MOBILE6.2 to estimate particulate emissions from vehicle traffic on unpaved public roads. It also incorporates the decrease in exhaust emissions that has occurred since the unpaved public road emission factor equation was developed. The previous version of the unpaved public road emission factor equation includes estimates of emissions from exhaust, brake wear, and tire wear based on emission rates for vehicles in the 1980 calendar year fleet. The amount of PM released from vehicle exhaust has decreased since 1980 due to lower new vehicle emission standards and changes in fuel characteristics.

13.2.2.2 Emissions Calculation And Correction Parameters[1-6]

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Field investigations also have shown that emissions depend on source parameters that characterize the condition of a particular road and the associated vehicle traffic. Characterization of these source parameters allow for "correction" of emission estimates to specific road and traffic conditions present on public and industrial roadways.

Dust emissions from unpaved roads have been found to vary directly with the fraction of silt (particles smaller than 75 micrometers [µm] in diameter) in the road surface materials.[1] The silt fraction is determined by measuring the proportion of loose dry surface dust that passes a 200-mesh screen, using the ASTM-C-136 method. A summary of this method is contained in Appendix C of AP-42. Table 13.2.2-1 summarizes measured silt values for industrial unpaved roads. Table 13.2.2-2 summarizes measured silt values for public unpaved roads. It should be noted that the ranges of silt content vary over two orders of magnitude. Therefore, the use of data from this table can potentially introduce considerable error. Use of this data is strongly discouraged when it is feasible to obtain locally gathered data.

Since the silt content of a rural dirt road will vary with geographic location, it should be measured for use in projecting emissions. As a conservative approximation, the silt content of the parent soil in the area can be used. Tests, however, show that road silt content is normally lower than in the surrounding parent soil, because the fines are continually removed by the vehicle traffic, leaving a higher percentage of coarse particles.

Table 13.2.2-1. TYPICAL SILT CONTENT VALUES OF SURFACE MATERIAL ON INDUSTRIAL UNPAVED ROADS[a]

Industry	Road Use Or Surface Material	Plant Sites	No. Of Samples	Silt Content (%)	
				Range	Mean
Copper smelting	Plant road	1	3	16 - 19	17
Iron and steel production	Plant road	19	135	0.2 - 19	6.0
Sand and gravel processing	Plant road	1	3	4.1 - 6.0	4.8
	Material storage area	1	1	-	7.1
Stone quarrying and processing	Plant road	2	10	2.4 - 16	10
	Haul road to/from pit	4	20	5.0-15	8.3
Taconite mining and processing	Service road	1	8	2.4 - 7.1	4.3
	Haul road to/from pit	1	12	3.9 - 9.7	5.8
Western surface coal mining	Haul road to/from pit	3	21	2.8 - 18	8.4
	Plant road	2	2	4.9 - 5.3	5.1
	Scraper route	3	10	7.2 - 25	17
	Haul road (freshly graded)	2	5	18 - 29	24
Construction sites	Scraper routes	7	20	0.56-23	8.5
Lumber sawmills	Log yards	2	2	4.8-12	8.4
Municipal solid waste landfills	Disposal routes	4	20	2.2 - 21	6.4

[a]References 1,5-15.

The following empirical expressions may be used to estimate the quantity in pounds (lb) of size-specific particulate emissions from an unpaved road, per vehicle mile traveled (VMT):

For vehicles traveling on unpaved surfaces at industrial sites, emissions are estimated from the following equation:

$$E = k\ (s/12)^{a}(W/3)^{b} \tag{1a}$$

and, for vehicles traveling on publicly accessible roads, dominated by light duty vehicles, emissions may be estimated from the following:

$$E = \frac{k\ (s/12)^{a}(S/30)^{d}}{(M/0.5)^{c}} - C \tag{1b}$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)
S = mean vehicle speed (mph)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

The source characteristics s, W and M are referred to as correction parameters for adjusting the emission estimates to local conditions. The metric conversion from lb/VMT to grams (g) per vehicle kilometer traveled (VKT) is as follows:

1 lb/VMT = 281.9 g/VKT

The constants for Equations 1a and 1b based on the stated aerodynamic particle sizes are shown in Tables 13.2.2-2 and 13.2.2-4. The PM-2.5 particle size multipliers (k-factors) are taken from Reference 27.

Table 13.2.2-2. CONSTANTS FOR EQUATIONS 1a AND 1b

Constant	Industrial Roads (Equation 1a)			Public Roads (Equation 1b)		
	PM-2.5	PM-10	PM-30*	PM-2.5	PM-10	PM-30*
k (lb/VMT)	0.15	1.5	4.9	0.18	1.8	6.0
a	0.9	0.9	0.7	1	1	1
b	0.45	0.45	0.45	-	-	-
c	-	-	-	0.2	0.2	0.3
d	-	-	-	0.5	0.5	0.3
Quality Rating	B	B	B	B	B	B

*Assumed equivalent to total suspended particulate matter (TSP)
"-" = not used in the emission factor equation

Table 13.2.2-2 also contains the quality ratings for the various size-specific versions of Equation 1a and 1b. The equation retains the assigned quality rating, if applied within the ranges of source conditions, shown in Table 13.2.2-3, that were tested in developing the equation:

Table 13.2.2-3. RANGE OF SOURCE CONDITIONS USED IN DEVELOPING EQUATION 1a AND 1b

Emission Factor	Surface Silt Content, %	Mean Vehicle Weight		Mean Vehicle Speed		Mean No. of Wheels	Surface Moisture Content, %
		Mg	ton	km/hr	mph		
Industrial Roads (Equation 1a)	1.8-25.2	1.8-260	2-290	8-69	5-43	4-17[a]	0.03-13
Public Roads (Equation 1b)	1.8-35	1.4-2.7	1.5-3	16-88	10-55	4-4.8	0.03-13

[a] See discussion in text.

As noted earlier, the models presented as Equations 1a and 1b were developed from tests of traffic on unpaved surfaces. Unpaved roads have a hard, generally nonporous surface that usually dries quickly after a rainfall or watering, because of traffic-enhanced natural evaporation. (Factors influencing how fast a road dries are discussed in Section 13.2.2.3, below.) The quality ratings given above pertain to the mid-range of the measured source conditions for the equation. A higher mean vehicle weight and a higher than normal traffic rate may be justified when performing a worst-case analysis of emissions from unpaved roads.

The emission factors for the exhaust, brake wear and tire wear of a 1980's vehicle fleet (*C*) was obtained from EPA's MOBILE6.2 model [23]. The emission factor also varies with aerodynamic size range average uncontrolled conditions (but including natural mitigation) under the simplifying assumption that annual average emissions are inversely proportional to the number of days with measurable (more than 0.254 mm [0.01 inch]) precipitation:

$$E_{ext} = E\ [(365 - P)/365] \tag{2}$$

where:

E_{ext} = annual size-specific emission factor extrapolated for natural mitigation, lb/VMT

E = emission factor from Equation 1a or 1b

P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation (see below)

Figure 13.2.2-1 gives the geographical distribution for the mean annual number of "wet" days for the United States.

Equation 2 provides an estimate that accounts for precipitation on an annual average basis for the purpose of inventorying emissions. It should be noted that Equation 2 does not account for differences in the temporal distributions of the rain events, the quantity of rain during any event, or the potential for the rain to evaporate from the road surface. In the event that a finer temporal and spatial resolution is desired for inventories of public unpaved roads, estimates can be based on a more complex set of assumptions. These assumptions include:

1. The moisture content of the road surface material is increased in proportion to the quantity of water added;
2. The moisture content of the road surface material is reduced in proportion to the Class A pan evaporation rate;
3. The moisture content of the road surface material is reduced in proportion to the traffic volume; and
4. The moisture content of the road surface material varies between the extremes observed in the area. The CHIEF Web site (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html) has a file which contains a spreadsheet program for calculating emission factors which are temporally and spatially resolved. Information required for use of the spreadsheet program includes monthly Class A pan evaporation values, hourly meteorological data for precipitation, humidity and snow cover, vehicle traffic information, and road surface material information.

It is emphasized that <u>the simple assumption underlying Equation 2 and the more complex set of assumptions underlying the use of the procedure which produces a finer temporal and spatial resolution</u> have not been verified in any rigorous manner. For this reason, the quality ratings for either approach should be downgraded one letter from the rating that would be applied to Equation 1.

13.2.2.3 Controls[18-22]

A wide variety of options exist to control emissions from unpaved roads. Options fall into the following three groupings:

1. <u>Vehicle restrictions</u> that limit the speed, weight or number of vehicles on the road;

13.2.4 Aggregate Handling And Storage Piles

13.2.4.1 General

Inherent in operations that use minerals in aggregate form is the maintenance of outdoor storage piles. Storage piles are usually left uncovered, partially because of the need for frequent material transfer into or out of storage.

Dust emissions occur at several points in the storage cycle, such as material loading onto the pile, disturbances by strong wind currents, and loadout from the pile. The movement of trucks and loading equipment in the storage pile area is also a substantial source of dust.

13.2.4.2 Emissions And Correction Parameters

The quantity of dust emissions from aggregate storage operations varies with the volume of aggregate passing through the storage cycle. Emissions also depend on 3 parameters of the condition of a particular storage pile: age of the pile, moisture content, and proportion of aggregate fines.

When freshly processed aggregate is loaded onto a storage pile, the potential for dust emissions is at a maximum. Fines are easily disaggregated and released to the atmosphere upon exposure to air currents, either from aggregate transfer itself or from high winds. As the aggregate pile weathers, however, potential for dust emissions is greatly reduced. Moisture causes aggregation and cementation of fines to the surfaces of larger particles. Any significant rainfall soaks the interior of the pile, and then the drying process is very slow.

Silt (particles equal to or less than 75 micrometers [µm] in diameter) content is determined by measuring the portion of dry aggregate material that passes through a 200-mesh screen, using ASTM-C-136 method.[1] Table 13.2.4-1 summarizes measured silt and moisture values for industrial aggregate materials.

Table 13.2.4-1. TYPICAL SILT AND MOISTURE CONTENTS OF MATERIALS AT VARIOUS INDUSTRIES[a]

Industry	No. Of Facilities	Material	Silt Content (%)			Moisture Content (%)		
			No. Of Samples	Range	Mean	No. Of Samples	Range	Mean
Iron and steel production	9	Pellet ore	13	1.3 - 13	4.3	11	0.64 - 4.0	2.2
		Lump ore	9	2.8 - 19	9.5	6	1.6 - 8.0	5.4
		Coal	12	2.0 - 7.7	4.6	11	2.8 - 11	4.8
		Slag	3	3.0 - 7.3	5.3	3	0.25 - 2.0	0.92
		Flue dust	3	2.7 - 23	13	1	—	7
		Coke breeze	2	4.4 - 5.4	4.9	2	6.4 - 9.2	7.8
		Blended ore	1	—	15	1	—	6.6
		Sinter	1	—	0.7	0	—	—
		Limestone	3	0.4 - 2.3	1.0	2	ND	0.2
Stone quarrying and processing	2	Crushed limestone	2	1.3 - 1.9	1.6	2	0.3 - 1.1	0.7
		Various limestone products	8	0.8 - 14	3.9	8	0.46 - 5.0	2.1
Taconite mining and processing	1	Pellets	9	2.2 - 5.4	3.4	7	0.05 - 2.0	0.9
		Tailings	2	ND	11	1	—	0.4
Western surface coal mining	4	Coal	15	3.4 - 16	6.2	7	2.8 - 20	6.9
		Overburden	15	3.8 - 15	7.5	0	—	—
		Exposed ground	3	5.1 - 21	15	3	0.8 - 6.4	3.4
Coal-fired power plant	1	Coal (as received)	60	0.6 - 4.8	2.2	59	2.7 - 7.4	4.5
Municipal solid waste landfills	4	Sand	1	—	2.6	1	—	7.4
		Slag	2	3.0 - 4.7	3.8	2	2.3 - 4.9	3.6
		Cover	5	5.0 - 16	9.0	5	8.9 - 16	12
		Clay/dirt mix	1	—	9.2	1	—	14
		Clay	2	4.5 - 7.4	6.0	2	8.9 - 11	10
		Fly ash	4	78 - 81	80	4	26 - 29	27
		Misc. fill materials	1	—	12	1	—	11

[a] References 1-10. ND = no data.

13.2.4.3 Predictive Emission Factor Equations

Total dust emissions from aggregate storage piles result from several distinct source activities within the storage cycle:

1. Loading of aggregate onto storage piles (batch or continuous drop operations).
2. Equipment traffic in storage area.
3. Wind erosion of pile surfaces and ground areas around piles.
4. Loadout of aggregate for shipment or for return to the process stream (batch or continuous drop operations).

Either adding aggregate material to a storage pile or removing it usually involves dropping the material onto a receiving surface. Truck dumping on the pile or loading out from the pile to a truck with a front-end loader are examples of batch drop operations. Adding material to the pile by a conveyor stacker is an example of a continuous drop operation.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \text{(kg/megagram [Mg])}$$

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \text{(pound [lb]/ton)} \qquad (1)$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

Ranges Of Source Conditions For Equation 1			
Silt Content (%)	Moisture Content (%)	Wind Speed	
		m/s	mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

To retain the quality rating of the equation when it is applied to a specific facility, reliable correction parameters must be determined for specific sources of interest. The field and laboratory procedures for aggregate sampling are given in Reference 3. In the event that site-specific values for correction parameters cannot be obtained, the appropriate mean from Table 13.2.4-1 may be used, but the quality rating of the equation is reduced by 1 letter.

For emissions from equipment traffic (trucks, front-end loaders, dozers, etc.) traveling between or on piles, it is recommended that the equations for vehicle traffic on unpaved surfaces be used (see Section 13.2.2). For vehicle travel between storage piles, the silt value(s) for the areas among the piles (which may differ from the silt values for the stored materials) should be used.

Worst-case emissions from storage pile areas occur under dry, windy conditions. Worst-case emissions from materials-handling operations may be calculated by substituting into the equation appropriate values for aggregate material moisture content and for anticipated wind speeds during the worst case averaging period, usually 24 hours. The treatment of dry conditions for Section 13.2.2, vehicle traffic, "Unpaved Roads", follows the methodology described in that section centering on parameter p. A separate set of nonclimatic correction parameters and source extent values corresponding to higher than normal storage pile activity also may be justified for the worst-case averaging period.

13.2.4.4 Controls[12-13]

Watering and the use of chemical wetting agents are the principal means for control of aggregate storage pile emissions. Enclosure or covering of inactive piles to reduce wind erosion can also reduce emissions. Watering is useful mainly to reduce emissions from vehicle traffic in the storage pile area. Watering of the storage piles themselves typically has only a very temporary slight effect on total emissions. A much more effective technique is to apply chemical agents (such as surfactants) that permit more extensive wetting. Continuous chemical treating of material loaded onto piles, coupled with watering or treatment of roadways, can reduce total particulate emissions from aggregate storage operations by up to 90 percent.[12]

References For Section 13.2.4

1. C. Cowherd, Jr., *et al.*, *Development Of Emission Factors For Fugitive Dust Sources*, EPA-450/3-74-037, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

2. R. Bohn, *et al.*, *Fugitive Emissions From Integrated Iron And Steel Plants*, EPA-600/2-78-050, U. S. Environmental Protection Agency, Cincinnati, OH, March 1978.

3. C. Cowherd, Jr., *et al.*, *Iron And Steel Plant Open Dust Source Fugitive Emission Evaluation*, EPA-600/2-79-103, U. S. Environmental Protection Agency, Cincinnati, OH, May 1979.

4. *Evaluation Of Open Dust Sources In The Vicinity Of Buffalo, New York*, EPA Contract No. 68-02-2545, Midwest Research Institute, Kansas City, MO, March 1979.

5. C. Cowherd, Jr., and T. Cuscino, Jr., *Fugitive Emissions Evaluation*, MRI-4343-L, Midwest Research Institute, Kansas City, MO, February 1977.

6. T. Cuscino, Jr., *et al.*, *Taconite Mining Fugitive Emissions Study*, Minnesota Pollution Control Agency, Roseville, MN, June 1979.

7. *Improved Emission Factors For Fugitive Dust From Western Surface Coal Mining Sources*, 2 Volumes, EPA Contract No. 68-03-2924, PEDCo Environmental, Kansas City, MO, and Midwest Research Institute, Kansas City, MO, July 1981.

8. *Determination Of Fugitive Coal Dust Emissions From Rotary Railcar Dumping*, TRC, Hartford, CT, May 1984.

9. *PM-10 Emission Inventory Of Landfills In the Lake Calumet Area*, EPA Contract No. 68-02-3891, Midwest Research Institute, Kansas City, MO, September 1987.

10. *Chicago Area Particulate Matter Emission Inventory — Sampling And Analysis*, EPA Contract No. 68-02-4395, Midwest Research Institute, Kansas City, MO, May 1988.

11. *Update Of Fugitive Dust Emission Factors In AP-42 Section 11.2*, EPA Contract No. 68-02-3891, Midwest Research Institute, Kansas City, MO, July 1987.

12. G. A. Jutze, *et al.*, *Investigation Of Fugitive Dust Sources Emissions And Control*, EPA-450/3-74-036a, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1974.

13. C. Cowherd, Jr., *et al.*, *Control Of Open Fugitive Dust Sources*, EPA-450/3-88-008, U. S. Environmental Protection Agency, Research Triangle Park, NC, September 1988.

14. C. Cowherd, *Background Document for Revisions to Fine Fraction Ratios &sed for AP-42 Fugitive Dust Emission Factors*. Prepared by Midwest Research Institute for Western Governors Association, Western Regional Air Partnership, Denver, CO, February 1, 2006.