Appendix E – Record of Non-Applicability (RONA) and Air Quality Emissions Estimates

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RECORD OF NON-APPLICABILITY (RONA) FOR CLEAN AIR ACT CONFORMITY

UNITED STATES ARMY CORPS OF ENGINEERS

PROPOSED DECOMMISSIONING AND DEMOLITION OF THE SM-1 REACTOR FACILITY AT FORT BELVOIR IN FAIRFAX COUNTY, VIRGINIA

Introduction

The United States Environmental Protection Agency's (USEPA's) *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* (40 Code of Federal Regulations (CFR) Parts 51 and 93) provides the implementing guidance to document Clean Air Act (CAA) Conformity Determination requirements. The General Conformity Rule requires federal actions or federally funded actions planned to occur in a non-attainment or maintenance area to be reviewed prior to their implementation to ensure that the actions would not interfere with State's plans to meet or maintain the National Ambient Air Quality Standards (NAAQS). It is the responsibility of the federal agency to determine whether a Federal action conforms to the applicable implementation plan before the action is taken (40 CFR §51.850(a)).

Federal actions may be exempt from a formal Conformity Determination if: (1) the actions fit within one of the exemption categories or (2) their emissions do not exceed designated *de minimis* levels for criteria pollutants (40 CFR §93.153(c)). The exemption categories apply to actions that would result in no emission increase or an increase in emission that is clearly *de minimis*.

Proposed Action

<u>Action Proponent:</u> United States Army Corps of Engineers (USACE)

<u>Location:</u> Stationary Medium Power Model 1 (SM-1) Reactor Facility, United States (US) Army Garrison Fort Belvoir, Fairfax County, Virginia

<u>Proposed Action Name:</u> Decommissioning and Demolition of the SM-1 Reactor Facility

<u>Proposed Action and Emission Summary:</u> USACE maintains the SM-1 Reactor Facility in accordance with Army Regulation (AR) 50-7, *Army Reactor Program*, and Reactor Possession Permit No. SM1-1-09 issued by the US Army Nuclear and Countering Weapons of Mass Destruction Agency (USANCA). The Army Reactor Office (ARO), established by USANCA, oversees the Army Reactor Program (ARP) and designates the ARP Manager. USACE proposes to complete the decommissioning and demolition of SM-1 (Proposed Action). Prior to the removal of contaminated structures, equipment, and media from the SM-1 site, USANCA would transition the SM-1 Reactor Possession Permit Number SM1-1-09 to a Reactor Decommissioning Permit following ARO approval of a Decommissioning Plan (DP). USACE proposes to complete the decommissioning and demolition of SM-1 to a standard that allows for release of the SM-1 site for unrestricted use and terminate the ARO Reactor Decommissioning Permit (also referred to as the "Proposed Action"). The proposed decommissioning of SM-1 would occur over an approximately 5-year period from 2020 to 2025. Upon completion of the Proposed Action, the restored site would be returned to Fort Belvoir for future use.

Under USACE's Deactivated Nuclear Power Plant Program, decommissioning a nuclear reactor is required within 60 years of its deactivation to be consistent with US Nuclear Regulatory Commission (NRC) regulations (as adopted by the ARP in AR 50-7). The deactivated and defueled SM-1 Reactor Facility has been in a safe storage (SAFSTOR) condition and subject to regular inspection and monitoring for more than 46 years. Accordingly, the purpose of the

Proposed Action is to safely remove, transport, and dispose of all materials and equipment (M&E) and structures associated with the SM-1 Reactor Facility such that residual radioactivity levels meet the applicable criteria for unrestricted use. This action will eliminate any minor on-going direct or indirect emissions inherent in maintaining the present building and facilities.

The Proposed Action is needed to complete the decommissioning of the SM-1 Reactor Facility with the regulatory authority granted to DOD under the Atomic Energy Act (AEA). Additionally, implementing the Proposed Action would result in a cost savings to USACE as maintenance of the site would no longer be required. USACE maintenance of the SM-1 Reactor Facility is costly and not sustainable over the long-term. Further, the Proposed Action allows USACE to meet mission objectives to decommission their nuclear reactors and terminate their possession permit. In its current state, the SM-1 site will not support the military mission on Fort Belvoir, now or in the future.

USACE evaluated the potential direct, indirect, and cumulative physical, environmental, socioeconomic, and cultural effects of implementing the Proposed Action and reasonable alternatives to that scenario in an Environmental Assesstment (EA), prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; Title 42, United States Code [USC] Part 4321 et seq.); the NEPA-implementing regulations of the Council on Environmental Quality (CEQ) (40 CFR Parts 1500–1508); and the Army's NEPA regulations (32 CFR Part 651, *Environmental Analysis of Army Actions*). The EA is incorporated herein by reference. Each alternative is briefly discussed below.

- **No Action Alternative**. Continue to maintain SM-1 in a SAFSTOR condition with regular inspections and monitoring.
- **Proposed Action Alternative**. Complete the decommissioning and demolition of the SM-1 to a standard that allows for release of the site for unrestricted use and termination of the ARO Reactor Decommissioning Permit.

Pursuant to the NAAQS, Fairfax County is designated by the USEPA as a marginal non-attainment area for the 2008 8-hour ozone (O_3) NAAQS. Fairfax County is located in the ozone transport region where *de minimis* levels of volatile organic compounds (VOCs) and oxides of nitrogen [NO_x] (ozone precursors) are 50 and 100 tons per year (tpy), respectively (40 CFR § 93.153). Fairfax County is currently in attainment for all other criteria pollutants (i.e., carbon monoxide [CO], sulfur dioxide [SO_2], particulate matter 2.5 micrometers or less in diameter [$PM_{2.5}$], PM_{10}, nitrogen dioxide [NO_2], and lead [Pb]) (USEPA, 2019). Further information regarding Fairfax County's attainment status is provided in the EA.

The Proposed Action is subject to the General Conformity Rule because Fort Belvoir is within a nonattainment area and the Proposed Action Alternative would result in air pollutant emissions[1]. All emissions generated by the Proposed Action Alterative would be temporary (i.e., only occurring during construction) and no new emissions sources would be created. Temporary activities under the Proposed Action Alternative that would generate pollutant emissions include, but are not limited to:

- Handling and transport of excavated and imported materials (i.e., soil and concrete) during construction;
- Operation of heavy-duty, diesel-powered trucks and equipment at the site during demolition;
- Operation of heavy-duty, diesel-powered trucks traveling to and from the site to dispose of or deliver materials during demolition;

[1] Under the No Action Alternative, there would be no demolition of buildings or structures at the SM-1 site and existing conditions would continue for the foreseeable future. Therefore, implementation of the No Action Alternative would not result in any changes to existing air quality. Fort Belvoir's contribution to regional air quality would not change. Current ambient air quality trends and regional emissions would continue.

- Operation of workers' commuter vehicles traveling to and from the SM-1 site;
- Storage of excavated and imported materials in stockpiles;
- Use of unpaved areas/roads; and
- Site preparation activities (e.g., clearing, grubbing, tree removal).

In general, activities in the Proposed Action Alternative would have a temporary, less-than-significant impact on air quality. Projected Proposed Action Alternative emissions of applicable nonattainment criteria pollutants would be *de minimis*, as shown in **Table 1**. Detailed emission calculations, assumptions, and estimates for the Proposed Action Alternative are provided as **Attachment 1** to this RONA.

Table 1. Projected Proposed Action Alternative VOC and NO_x Emissions Compared to Applicable *De Minimis* Levels

Pollutant	2021 Proposed Action Alternative Emissions (tpy)	2022 Proposed Action Alternative Emissions (tpy)	2023 Proposed Action Alternative Emissions (tpy)	2024 Proposed Action Alternative Emissions (tpy)	2025 Proposed Action Alternative Emissions (tpy)	*De minimis* level (tpy)
VOCs	0.24	0.43	0.50	0.67	0.27	50
NO_x	2.39	6.48	6.73	7.69	1.74	100
Note: tpy = tons per year						

Activities in the Proposed Action Alternative would comply with applicable regulatory requirements and incorporate appropriate Best Management Practices (BMPs) (as identified in the EA) to further minimize anticipated, less-than-significant adverse effects.

In summary, despite Fort Belvoir's location in a nonattainment area, the USACE is exempt from preparing a Conformity Determination because emissions would not exceed designated *de minimis* levels for criteria pollutants. The Proposed Action would have no significant impacts on regional air quality. Additional details regarding the Proposed Action's impacts on air quality are provided in the EA. Detailed calculations are also provided as **Attachment 1** to this RONA.

<u>Affected Air Basins:</u> Fairfax County, VA

<u>Date RONA prepared:</u> 18 September 2019

Proposed Action Exemption

The Proposed Action is located within a nonattainment area; therefore, the Proposed Action is not exempt from the General Conformity Rule. However, per 40 CFR § 93.153(c), the Proposed Action qualifies as an action where emissions do not exceed designated *de minimis* levels for criteria pollutants and therefore, is consistent with one of the USEPA's exemption categories. The activities could result in temporary, less-than-significant impacts on air quality, but are not expected to change designation of the area with respect to NAAQS. Therefore, the Proposed Action is exempt from a formal Conformity Determination.

Attainment Area Status and Emission Evaluation Conclusion

Fairfax County is in a nonattainment area for 8-hour ozone. However, per 40 CFR § 93.153(c), the Proposed Action qualifies as an action where emissions do not exceed designated *de minimis* levels for criteria pollutants and therefore, is consistent with one of the USEPA's exemption categories. The projected emissions under the Proposed Action Alternative would be temporary and substantially less than the established *de minimis* emission thresholds (see **Table 1**). Generally, impacts on air quality from the Proposed Action Alternative would be temporary and less-than-significant. Moreover, the activities would comply with applicable regulatory requirements and appropriate BMPs would be incorporated. Therefore, there would be no significant effects to air quality and a change in the designation of the area with respect to NAAQS would not be expected. USACE concludes that further formal Conformity Determination procedures are not required, resulting in this RONA.

RONA Approval

To the best of my knowledge, the information presented in this Record of Non-Applicability is correct and accurate and I concur with the finding that the Proposed Action does not require a formal Conformity Determination.

03 April 2020	Brenda M. Barber, P.E
DATE	Brenda M. Barber, P.E. USACE Project Manager

Attachment 1: Air Quality Analysis Calculations

Projected Emissions for CY 2021
SM-1
Construction Year 1

	Projected Emissions (tons per year)							CY 2021 (metric tons per year)
Emission Source	**CO**	**NO_x**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2e**	**CO_2e**
Construction Equipment Operation	1.24E+00	2.39E+00	2.36E-01	1.40E-01	1.35E-01	1.75E-01	2.55E+02	2.31E+02
POV - Construction Worker Commuting	2.49E-03	2.76E-04	2.42E-04	5.73E-06	5.18E-06	3.64E-06	2.16E-01	1.96E-01
Site Preparation - Fugitive Emissions	-	-	-	1.04E+00	1.04E+00	-	-	-
Rock/Soil Export - Fugitive Emissions	-	-	-	1.59E-04	1.59E-05	-	-	-
Concrete Export - Fugitive Emissions	-	-	-	0.00E+00	0.00E+00	-	-	-
Total	1.24	2.39	0.24	1.18	1.18	0.17	255.01	231.34

Projected Emissions for CY 2022
SM-1
Construction Year 2

	Projected Emissions (tons per year)							CY 2022 (metric tons per year)
Emission Source	**CO**	**NO_x**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2e**	**CO_2e**
Construction Equipment Operation	2.21E+00	6.48E+00	4.27E-01	3.71E-01	3.58E-01	4.81E-01	6.97E+02	6.32E+02
POV - Construction Worker Commuting	4.60E-03	4.28E-04	4.20E-04	1.04E-05	8.60E-06	2.65E-06	4.20E-01	3.81E-01
Rock/Soil Export - Fugitive Emissions	-	-	-	0.00E+00	0.00E+00	-	-	-
Concrete Export - Fugitive Emissions	-	-	-	0.00E+00	0.00E+00	-	-	-
Total	2.22	6.48	0.43	0.37	0.36	0.48	697.11	632.41

Projected Emissions for CY 2023
SM-1
Construction Year 3

	Projected Emissions (tons per year)							CY 2023 (metric tons per year)
Emission Source	**CO**	**NO_x**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2e**	**CO_2e**
Construction Equipment Operation	2.48E+00	6.73E+00	5.00E-01	4.15E-01	4.00E-01	4.96E-01	7.18E+02	6.52E+02
POV - Construction Worker Commuting	4.32E-03	3.68E-04	3.67E-04	9.48E-06	8.60E-06	2.65E-06	4.08E-01	3.70E-01
Rock/Soil Export - Fugitive Emissions	-	-	-	1.24E-02	1.24E-03	-	-	-
Concrete Export - Fugitive Emissions	-	-	-	1.30E-02	1.62E-03	-	-	-
Total	2.48	6.73	0.50	0.44	0.40	0.50	718.63	651.93

Projected Emissions for CY 2024
SM-1
Construction Year 4

	Projected Emissions (tons per year)							CY 2024 (metric tons per year)
Emission Source	**CO**	**NO_x**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2e**	**CO_2e**
Construction Equipment Operation	3.31E+00	7.69E+00	6.72E-01	5.50E-01	5.30E-01	5.77E-01	8.34E+02	7.57E+02
POV - Construction Worker Commuting	4.07E-03	3.18E-04	3.29E-04	8.60E-06	8.60E-06	2.65E-06	3.95E-01	3.58E-01
Rock/Soil Export - Fugitive Emissions	-	-	-	2.47E-02	2.48E-03	-	-	-
Concrete Export - Fugitive Emissions	-	-	-	1.30E-02	1.62E-03	-	-	-
Total	3.31	7.69	0.67	0.59	0.53	0.58	834.85	757.36

Projected Emissions for CY 2025
SM-1
Construction Year 5

	Projected Emissions (tons per year)							CY 2025 (metric tons per year)
Emission Source	**CO**	**NO_x**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CO_2e**	**CO_2e**
Construction Equipment Operation	1.11E+00	1.74E+00	2.66E-01	1.81E-01	1.75E-01	1.20E-01	1.75E+02	1.58E+02
POV - Construction Worker Commuting	3.72E-04	2.88E-05	2.61E-05	6.94E-07	5.95E-07	2.87E-07	3.74E-02	3.39E-02
Rock/Soil Export and Import - Fugitive Emissions	-	-	-	5.35E-02	5.35E-03	-	-	-
Concrete Export - Fugitive Emissions	-	-	-	0.00E+00	0.00E+00	-	-	-
Total	1.11	1.74	0.27	0.23	0.18	0.12	174.61	158.40

Construction Equipment Projected Hours of Operation

SM-1

Equipment	Type	Average Rated HP	No. of Units	Days Per Year for Each Unit CY 2021 Days	CY 2022 Days	CY 2023 Days	CY 2024 Days	CY 2025 Days	Hours Per Year for All Units CY 2021 Hours	CY 2022 Hours	CY 2023 Hours	CY 2024 Hours	CY 2025 Hours
Asphalt paver	Diesel Pavers	130	1	21	0	0	0	0	168	0	0	0	0
Asphalt roller	Diesel Rollers	130	1	21	0	0	0	0	168	0	0	0	0
Grader	Diesel Grader	150	1	10	0	0	0	0	80	0	0	0	0
Chain saws	2 Stroke Chain Saws >6 HP	10	2	10	0	0	0	0	160	0	0	0	0
Crane 25 ton	Diesel Cranes	130	1	7	50	80	0	0	56	400	640	0	0
Crane 350 ton	Diesel Cranes	450	2	0	40	40	0	0	0	640	640	0	0
Dewatering pump, 4-in.	Diesel Pumps	50	1	0	0	0	40	0	0	0	0	320	0
Dozer	Diesel Crawler Tractor/Dozer	200	1	0	0	0	82	0	0	0	0	656	0
Dozer	Diesel Crawler Tractor/Dozer	75	1	19	0	0	0	0	152	0	0	0	0
Brush Chipper	Diesel Chippers/Stump Grinders	130	1	10	0	0	0	0	80	0	0	0	0
Excavator	Diesel Excavators	130	1	0	367	344	624	0	0	2,936	2,752	4,992	0
Backhoe	Diesel Tractors/Loaders/Backhoes	50	1	0	0	0	10	0	0	0	0	80	0
Loader, skid steer	Diesel Skid Steer Loaders	30	1	0	100	100	100	0	0	800	800	800	0
Forklift	Diesel Forklift	50	1	0	100	100	100	0	0	800	800	800	0
Roller, compactor	Diesel Rollers	80	1	0	0	0	82	0	0	0	0	656	0
Dump Truck, 20 cy (soils)	Diesel Dumpers/Tenders	500	1	0.28	0	22	44	98	2	0	175	351	781
Waste Haul Truck, 20 cy (debris)	Diesel Highway Truck	500	1	0	8	20	20	0	0	60	156	156	0
Dump Truck, 8 cy	Diesel Dumpers/Tenders	220	1	0	0	0	82	0	0	0	0	656	0
Pickup Truck	Diesel Off-highway Trucks	400	4	100	200	200	200	50	1,600	3,200	3,200	3,200	800
Pressure Washer	Diesel Pressure Washers	10	1	0	25	50	50	0	0	200	400	400	0

Assumptions:

Field construction is projected to start in mid-2021 and be completed by early 2025.

Estimated hours of construction per working day: 8

Estimated hours for pickup truck per working day: 4 Assume pickup trucks are used for the transport of tools and workers for half of the working day. Assume pickup trucks are "off" when not in use and do not idle.

Estimated equipment, average rated HP, and number of units were provided by this Proposed Project's design team.

For a conservative estimate, equipment fuel was assumed to be diesel.

Truck Trip Tables:

Anticipated Truck Trips and Material Quantity Transported

Materials	Total Quantity (tons each year)					Average Quantity per Truckload		Average No. of Trips to Export/Dispose of Total Quantity					Driving Hours to Disposal or Site		Total Hours Operated					Total Days Operated				
EXPORTS																								
	2021	**2022**	**2023**	**2024**	**2025**			**2021**	**2022**	**2023**	**2024**	**2025**			**2021**	**2022**	**2023**	**2024**	**2025**	**2021**	**2022**	**2023**	**2024**	**2025**
Grubbing and Clearing Debris	30	0	0	0	0	20	Tons	2	0	0	0	0	1.5	Hours	2.25	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00
Concrete	0	0	1280	1280	0	20	Tons	0	0	64	64	0	1.5	Hours	0.00	0.00	96.00	96.00	0.00	0.00	0.00	12.00	12.00	0.00
Other Demolition Materials (piping, steel, electrical, etc.)	0	806	806	806	0	20	Tons	0	40	40	40	0	1.5	Hours	0.00	60.45	60.45	60.45	0.00	0.00	7.56	7.56	7.56	0.00
Excavated Soils	0	0	2337	4673	0	20	Tons	0	0	117	234	0	1.5	Hours	0.00	0.00	175.25	350.50	0.00	0.00	0.00	21.91	43.81	0.00
TOTAL EXPORT TRUCKLOADS	**30**	**806**	**4423**	**6759**	**0**	**-**	**-**	**2**	**40**	**221**	**338**	**0**		**-**	**2.25**	**60.45**	**331.70**	**506.95**	**0.00**	**0.28**	**7.56**	**41.46**	**63.37**	**0.00**
IMPORTS																								
	2021	**2022**	**2023**	**2024**	**2025**			**2021**	**2022**	**2023**	**2024**	**2025**			**2021**	**2022**	**2023**	**2024**	**2025**	**2021**	**2022**	**2023**	**2024**	**2025**
Imported Soils and Aggregates	0	0	0	0	7077	14	Tons	-	-	-	-	506	1.5	Hours	-	-	-	-	758.25	-	-	-	-	94.78
Trees and Native Plantings	0	0	0	0	60	4	Units	-	-	-	-	15	1.5	Hours	-	-	-	-	22.50	-	-	-	-	2.81
TOTAL IMPORT TRUCKLOADS	**0**	**0**	**0**	**0**	**7137**	**-**	**-**	**0**	**0**	**0**	**0**	**520.5**		**-**	**0.00**	**0.00**	**0.00**	**0.00**	**780.75**	**0.00**	**0.00**	**0.00**	**0.00**	**97.59**

Assumptions:

Estimated typical hours of construction per day: 8

Estimated a total of 30 tons of grubbing and clearing debris during site preparation.

Estimated 60 tons of trees and plantings would be imported.

Exported materials are estimated to be in 20 cy waste containers on dump trucks. Clean soil is estimated to be imported in a 20 cy dump truck that is able to hold approximatly 14 cy of soil per trip.

Estimates from 'Waste Transportation Assessment Final Redline 12-11-18" are in tables 1-1 to 1-4 below. (\\ARLINGTON\Arlington\DCS\Projects\ENV\60332981_SM-1_Decom\900-Work\930-979-other working documents\Task 9\405-Env-NEPA\Background Info\SM-1 Docs\DP and Related Docs)

Table 1-1, Building Debris Waste Volume Estimate

Area	Material Type	Waste Volume (Cubic Yards)	Waste Containers [a]
Unrestricted Area	Walls, Floors, and Roof	1,060	53

The total volume of backfill soil required for restoration is assumed equal to the waste soil volume from Table 1-3 (7,010 CY) and two-thirds of the concrete waste volume from Table 1-2 (67 CY).

The average commercial dump truck holds up to 14 CY. Therefore, it is possible that restoration of the SM-1 site may require trucking 400 to 500 loads of clean soil through the 300 Area to the SM-1 site. Site restoration activities are expected to take place over a period of approximately 6 months with backfill soil deliveries for at least half of that time. Therefore, during a three–month peak site restoration period, as many as 8 to 10 trucks may be delivering soil to the site per day.

Construction Equipment Air Quality Emission Factors

SM-1

Equipment	Type	Average Rated HP[1]	Loading Factors[2]	Emission Factors (lb/1000 HP-hr)[2]							Emission Factors (lb/hr)[3]						
				CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e	CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e
Asphalt paver	Diesel Pavers	130	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	3.65E-01	8.22E-01	6.90E-02	6.75E-02	6.44E-02	6.44E-02	93.85
Asphalt roller	Diesel Rollers	130	59%	5.78	11.09	1.01	0.99	0.97	0.86	1224	4.43E-01	8.51E-01	7.75E-02	7.59E-02	7.44E-02	6.60E-02	93.85
Grader	Diesel Graders	150	59%	3.33	10.05	0.75	0.68	0.66	0.82	1195	2.95E-01	8.89E-01	6.64E-02	6.02E-02	5.84E-02	7.26E-02	105.72
Chain saws	2 Stroke Chain Saws >6 HP	10	70%	779.31	2.12	165.53	21.52	19.80	0.31	1541	5.46E+00	1.48E-02	1.16E+00	1.51E-01	1.39E-01	2.17E-03	10.79
Crane 25 ton	Diesel Cranes	130	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	1.69E-01	6.74E-01	4.70E-02	3.58E-02	3.47E-02	4.58E-02	66.28
Crane 350 ton	Diesel Cranes	450	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	5.84E-01	2.33E+00	1.63E-01	1.24E-01	1.20E-01	1.59E-01	229.45
Dewatering pump, 4-in.	Diesel Pumps	50	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.49E-01	3.03E-01	3.78E-02	2.95E-02	2.84E-02	1.89E-02	27.12
Dozer	Diesel Crawler Tractor/Dozer	200	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	5.31E-01	1.31E+00	9.09E-02	8.61E-02	8.38E-02	9.91E-02	141.48
Dozer	Diesel Crawler Tractor/Dozer	75	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	1.99E-01	4.91E-01	3.41E-02	3.23E-02	3.14E-02	3.72E-02	53.06
Brush Chipper	Diesel Chippers/Stump Grinders	130	43%	5.67	13.69	1.39	1.08	1.06	0.84	1226	3.17E-01	7.65E-01	7.77E-02	6.04E-02	5.93E-02	4.70E-02	68.52
Excavator	Diesel Excavators	130	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	2.88E-01	7.69E-01	5.75E-02	5.45E-02	5.22E-02	6.44E-02	92.32
Backhoe	Diesel Tractors/Loaders/Backhoes	50	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	1.54E-01	1.64E-01	3.59E-02	2.48E-02	2.38E-02	1.06E-02	15.46
Loader, skid steer	Diesel Skid Steer Loaders	30	21%	19.58	16.01	4.85	3.11	3.02	1.06	1533	1.23E-01	1.01E-01	3.06E-02	1.96E-02	1.90E-02	6.68E-03	9.66
Forklift	Diesel Forklifts	50	59%	6.50	9.97	0.90	0.90	0.88	0.88	1275	1.92E-01	2.94E-01	2.66E-02	2.66E-02	2.60E-02	2.60E-02	37.61
Roller, compactor	Diesel Rollers	80	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	2.73E-01	5.23E-01	4.77E-02	4.67E-02	4.58E-02	4.06E-02	58.70
Dump Truck, 20 cy (soils)	Diesel Dumpers/Tenders	500	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.97E+00	1.73E+00	5.26E-01	3.27E-01	3.15E-01	1.09E-01	158.84
Waste Haul Truck, 20 cy (debris)	Diesel Dumpers/Tenders	500	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.97E+00	1.73E+00	5.26E-01	3.27E-01	3.15E-01	1.09E-01	158.84
Dump Truck, 8 cy	Diesel Dumpers/Tenders	220	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	8.66E-01	7.59E-01	2.31E-01	1.44E-01	1.39E-01	4.80E-02	69.89
Pickup Truck	Diesel Off-highway Trucks	400	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	8.64E-01	2.66E+00	1.51E-01	1.35E-01	1.30E-01	1.94E-01	281.40
Pressure Washer	Diesel Pressure Washers	10	43%	6.33	14.18	1.83	1.12	1.1	0.86	1232	2.72E-02	6.10E-02	7.87E-03	4.82E-03	4.73E-03	3.70E-03	5.30

1. Average horsepower ratings were obtained from Proposed Project's design team.
2. Loading factors and emission factors from USAFCEE *Air Emissions Guide For Air Force Mobile Sources* , July 2016, Section 4 and 5.
3. Emission Factors (lbs./hr.) = (Average Rated HP X Loading Factors X Emission Factors (lbs./1000 HP-hr.)) / 1000
4. ND = No Data available

Projected Emissions for CY 2022
Construction Equipment
SM-1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 25 ton	400	67.53	269.66	18.78	14.31	13.86	18.34	26,513.82
Crane 350 ton	640	374.00	1,493.51	104.03	79.26	76.78	101.55	146,845.76
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	2936	844.47	2,258.67	168.89	159.89	153.13	189.16	271,062.65
Backhoe	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, skid steer	800	98.68	80.69	24.44	15.67	15.22	5.34	7,725.72
Forklift	800	153.40	235.29	21.24	21.24	20.77	20.77	30,085.99
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 20 cy (soils)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Haul Truck, 20 cy (debris)	60	118.95	104.29	31.80	19.74	19.04	6.60	9,601.80
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck	3200	2,764.03	8,511.10	483.33	430.46	415.36	619.26	900,492.93
Pressure Washer	200	5.44	12.19	1.57	0.96	0.95	0.74	1,059.83
Total Emissions	**(lb./yr.):**	**4,426.5**	**12,965.4**	**854.1**	**741.5**	**715.1**	**961.8**	**1,393,388.5**
Total Emissions	**(tpy)**	**2.21**	**6.48**	**0.43**	**0.37**	**0.36**	**0.48**	**696.69**
Total Emissions	**(Metric Tons/yr.)**							**632.03**

Projected Emissions for CY 2023
Construction Equipment
SM-1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 25 ton	640	108.04	431.46	30.05	22.90	22.18	29.34	42,422.11
Crane 350 ton	640	374.00	1,493.51	104.03	79.26	76.78	101.55	146,845.76
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	2752	791.54	2,117.12	158.31	149.87	143.53	177.31	254,075.07
Backhoe	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, skid steer	800	98.68	80.69	24.44	15.67	15.22	5.34	7,725.72
Forklift	800	153.40	235.29	21.24	21.24	20.77	20.77	30,085.99
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 20 cy (soils)	175	344.84	302.33	92.19	57.23	55.20	19.14	27,836.49
Waste Haul Truck, 20 cy (debris)	156	307.85	269.90	82.30	51.09	49.28	17.08	24,850.32
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck	3200	2,764.03	8,511.10	483.33	430.46	415.36	619.26	900,492.93
Pressure Washer	400	10.89	24.39	3.15	1.93	1.89	1.48	2,119.66
Total Emissions	**(lb./yr.):**	**4,953.3**	**13,465.8**	**999.0**	**829.6**	**800.2**	**991.3**	**1,436,454.0**
Total Emissions	**(tpy)**	**2.48**	**6.73**	**0.50**	**0.41**	**0.40**	**0.50**	**718.23**
Total Emissions	**(Metric Tons/yr.)**							**651.56**

Projected Emissions for CY 2024
Construction Equipment
SM-1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 25 ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 350 ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	320	47.61	96.94	12.11	9.43	9.08	6.05	8,677.81
Dozer	656	348.34	858.45	59.60	56.51	54.96	65.02	92,812.19
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	4992	1,435.82	3,840.35	287.16	271.85	260.36	321.62	460,880.36
Backhoe	80	12.30	13.11	2.87	1.98	1.91	0.85	1,237.13
Loader, skid steer	800	98.68	80.69	24.44	15.67	15.22	5.34	7,725.72
Forklift	800	153.40	235.29	21.24	21.24	20.77	20.77	30,085.99
Roller, compactor	656	178.97	343.38	31.27	30.65	30.03	26.63	38,508.00
Dump Truck, 20 cy (soils)	351	689.68	604.67	184.38	114.46	110.41	38.27	55,672.98
Waste Haul Truck, 20 cy (debris)	156	307.85	269.90	82.30	51.09	49.28	17.08	24,850.32
Dump Truck, 8 cy	656	567.96	497.95	151.84	94.26	90.92	31.52	45,847.22
Pickup Truck	3200	2,764.03	8,511.10	483.33	430.46	415.36	619.26	900,492.93
Pressure Washer	400	10.89	24.39	3.15	1.93	1.89	1.48	2,119.66
Total Emissions	**(lb./yr.):**	**6,615.5**	**15,376.2**	**1,343.7**	**1,099.5**	**1,060.2**	**1,153.9**	**1,668,910.3**
Total Emissions	**(tpy)**	**3.31**	**7.69**	**0.67**	**0.55**	**0.53**	**0.58**	**834.46**
Total Emissions	**(Metric Tons/yr.)**							**757.00**

Projected Emissions for CY 2025
Construction Equipment
SM-1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 25 ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane 350 ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, skid steer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forklift	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 20 cy (soils)	781	1,536.28	1,346.91	410.71	254.95	245.94	85.26	124,013.35
Waste Haul Truck, 20 cy (debris)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck	800	691.01	2,127.78	120.83	107.62	103.84	154.82	225,123.23
Pressure Washer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Emissions	**(lb./yr.):**	**2,227.3**	**3,474.7**	**531.5**	**362.6**	**349.8**	**240.1**	**349,136.6**
Total Emissions	**(tpy)**	**1.11**	**1.74**	**0.27**	**0.18**	**0.17**	**0.12**	**174.57**
Total Emissions	**(Metric Tons/yr.)**							**158.37**

Projected Emissions for CY 2021 to 2025
Construction Worker POV
SM-1

					Emission Factor (lbs/mile)							Emissions (lbs/year)						
Year (Analysis Year)	**Type**	**No. of POVs**	**No. of commuting days**	**Miles per day**	**VOC**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**	**VOC**	**CO**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**
2021 (2016)	light-duty diesel tucks	5	130.5	40	9.24E-04	1.28E-02	1.41E-03	1.10E-05	1.76E-05	1.54E-05	1.18E+00	9.24E-02	1.28E+00	1.41E-01	1.10E-03	1.76E-03	1.54E-03	117.61
	light-duty gas passenger	20	130.5	40	9.77E-04	9.27E-03	1.03E-03	1.54E-05	2.43E-05	2.20E-05	7.88E-01	3.91E-01	3.71E+00	4.11E-01	6.17E-03	9.70E-03	8.82E-03	315.12
	Total 2021 POV Emission (tpy)											**2.42E-04**	**2.49E-03**	**2.76E-04**	**3.64E-06**	**5.73E-06**	**5.18E-06**	**2.16E-01**
2022 (2017)	light-duty diesel tucks	5	261	40	8.05E-04	1.17E-02	1.23E-03	8.82E-06	1.54E-05	1.54E-05	1.12E+00	1.61E-01	2.35E+00	2.45E-01	1.76E-03	3.09E-03	3.09E-03	224.25
	light-duty gas passenger	20	261	40	8.49E-04	8.57E-03	7.63E-04	4.41E-06	2.20E-05	1.76E-05	7.70E-01	6.79E-01	6.86E+00	6.10E-01	3.53E-03	1.76E-02	1.41E-02	616.33
	Total 2022 POV Emission (tpy)											**4.20E-04**	**4.60E-03**	**4.28E-04**	**2.65E-06**	**1.04E-05**	**8.60E-06**	**4.20E-01**
2023 (2018)	light-duty diesel tucks	5	261	40	6.92E-04	1.09E-02	1.08E-03	8.82E-06	1.54E-05	1.54E-05	1.07E+00	1.38E-01	2.19E+00	2.16E-01	1.76E-03	3.09E-03	3.09E-03	213.96
	light-duty gas passenger	20	261	40	7.45E-04	8.08E-03	6.50E-04	4.41E-06	1.98E-05	1.76E-05	7.52E-01	5.96E-01	6.46E+00	5.20E-01	3.53E-03	1.59E-02	1.41E-02	601.47
	Total 2023 POV Emission (tpy)											**3.67E-04**	**4.32E-03**	**3.68E-04**	**2.65E-06**	**9.48E-06**	**8.60E-06**	**4.08E-01**
2024 (2019)	light-duty diesel tucks	5	261	40	6.11E-04	1.02E-02	9.46E-04	8.82E-06	1.54E-05	1.54E-05	1.02E+00	1.22E-01	2.03E+00	1.89E-01	1.76E-03	3.09E-03	3.09E-03	204.58
	light-duty gas passenger	20	261	40	6.70E-04	7.63E-03	5.58E-04	4.41E-06	1.76E-05	1.54E-05	7.32E-01	5.36E-01	6.10E+00	4.46E-01	3.53E-03	1.41E-02	1.23E-02	585.67
	Total 2024 POV Emission (tpy)											**3.29E-04**	**4.07E-03**	**3.18E-04**	**2.65E-06**	**8.60E-06**	**7.72E-06**	**3.95E-01**
2025 (2020)	light-duty diesel tucks	1	261	40	5.42E-04	9.54E-03	8.36E-04	8.82E-06	1.54E-05	1.32E-05	9.80E-01	2.17E-02	3.81E-01	3.34E-02	3.53E-04	6.17E-04	5.29E-04	39.20
	light-duty gas passenger	5	65.25	40	6.08E-04	7.24E-03	4.83E-04	4.41E-06	1.54E-05	1.32E-05	7.11E-01	3.04E-02	3.62E-01	2.41E-02	2.20E-04	7.72E-04	6.61E-04	35.56
	Total 2024 POV Emission (tpy)											**2.61E-05**	**3.72E-04**	**2.88E-05**	**2.87E-07**	**6.94E-07**	**5.95E-07**	**3.74E-02**

Working days/year = 261
g to lbs conversion = 453.592

Assumptions:

To provide conservative estimates, it was assumed no POVs would be new models. Therefore, emisson factors from 5-years prior were used.

Assumed an estimated 25 vehicles (5 diesel trucks and 20 gasoline passenger) would commute to the work site each working day, except in 2025 when the number of required workers decreases.

Assumed workers commute to site 5 days/week for 261 days/year. Assume the workers commute every working day in 2022-2024. Based on predicted constrction start and end dates, assume they commute for six months in 2021 and three months in 2025.

Assumed workers are traveling from home locations that are local and an estimated 20 miles away.

Emission factors are from the 2016 and 2018 USAFCEE *Air Emissions Guide For Air Force Mobile Sources* (Section 5, July 2016 and Section 5, August 2018). Emission factors provided in grams/mile were divided by the conversion factor for pounds/mile.

Fugitive Dust Emissions (Site Preparation)
SM-1

CY 2021	
Description:	
Square feet of land disturbed:	156,800
Total acres of land disturbed:	3.6
Assumed number of 8-hr days:	29
Assumed equivalent acres/day:	0.124

Equation for Fugitive Dust Emissions (PM_{10})[1]
E_{PM10} (lb./yr.) = 20 lb/acre-day * Total Acres Disturbed * Number of 8-Hour Days

Calculation

E_{PM10} (lb./yr.) = 20 * 3.6 acres * 29 days

E_{PM10} = 2087.78 lb./yr.

1.04E+00 tpy

Assumptions:

[1]Emission factors and methodology from USAFCEE *Air Emissions Guide For Air Force Transitory Sources* (Section 4, August 2018).

Note: Assume PM= PM_{10}=$PM_{2.5}$

Fugitive Dust Emissions - Rock/Soil Export in CY 2021
SM-1

Input Parameters:

Soil moved during exporting =	30	cy	
Soil moved during exporting =	49	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3}$ / $(M/2)^{1.4}$]	**3.34E-04**	**lbs./ton**	**PM**
	1.58E-04	**lbs./ton**	**PM_{10}**
	2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

0.02	lbs./yr.	**8.10E-06**	**tons/yr.**	**PM**	**E1**
0.01	lbs./yr.	**3.83E-06**	**tons/yr.**	**PM_{10}**	**E1**
0.00	lbs./yr.	**5.80E-07**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

8.10E-07	**tons/yr.**	**PM**	**E2**
3.83E-07	**tons/yr.**	**PM_{10}**	**E2**
5.80E-08	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/year of excavated soil)/(truck load))*(average distance traveled each way)

VMT = ((30 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 1.8 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

12	lbs./yr.	**5.87E-03**	**tons/yr.**	**PM**
3	lbs./yr.	**1.58E-03**	**tons/yr.**	**PM_{10}**
0	lbs./yr.	**1.58E-04**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2021 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

5.87E-04	**tons/yr.**	**PM**	**E2**
1.58E-04	**tons/yr.**	**PM_{10}**	**E2**
1.58E-05	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

5.87E-04	**tons/yr.**	**PM**
1.59E-04	**tons/yr.**	**PM_{10}**
1.59E-05	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2022
SM-1

Input Parameters:

Soil moved during exporting =	-	cy	
Soil moved during exporting =	-	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$	**3.34E-04**	**lbs./ton**	**PM**
	1.58E-04	**lbs./ton**	**PM_{10}**
	2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 200

$EF = [k(s/12)^{a}\ (W/3)^{b}][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/year of excavated soil)/(truck load))*(average distance traveled each way)

VMT = ((0 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 0 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2022 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

0.00E+00	**tons/yr.**	**PM**
0.00E+00	**tons/yr.**	**PM_{10}**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2023
SM-1

Input Parameters:

Soil moved during exporting =	2,337	cy	
Soil moved during exporting =	3,785	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**3.34E-04**	**lbs./ton**	**PM**
	1.58E-04	**lbs./ton**	**PM_{10}**
	2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

1.26	lbs./yr.	**6.31E-04**	**tons/yr.**	**PM**	**E1**
0.60	lbs./yr.	**2.99E-04**	**tons/yr.**	**PM_{10}**	**E1**
0.09	lbs./yr.	**4.52E-05**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

6.31E-05	**tons/yr.**	**PM**	**E2**
2.99E-05	**tons/yr.**	**PM10**	**E2**
4.52E-06	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365\text{-}p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/year of excavated soil)/(truck load))*(average distance traveled each way)

VMT = ((2,337 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 140.22 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

914	lbs./yr.	**4.57E-01**	**tons/yr.**	**PM**
247	lbs./yr.	**1.23E-01**	**tons/yr.**	**PM_{10}**
25	lbs./yr.	**1.23E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2023 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

4.57E-02	**tons/yr.**	**PM**	**E2**
1.23E-02	**tons/yr.**	**PM_{10}**	**E2**
1.23E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

4.58E-02	**tons/yr.**	**PM**
1.24E-02	**tons/yr.**	**PM_{10}**
1.24E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2024
SM-1

Input Parameters:

Soil moved during exporting =	4,673	cy	
Soil moved during exporting =	7,571	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**3.34E-04**	**lbs./ton**	**PM**
	1.58E-04	**lbs./ton**	**PM_{10}**
	2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

2.52	lbs./yr.	**1.26E-03**	**tons/yr.**	**PM**	**E1**
1.19	lbs./yr.	**5.97E-04**	**tons/yr.**	**PM_{10}**	**E1**
0.18	lbs./yr.	**9.04E-05**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.26E-04	**tons/yr.**	**PM**	**E2**
5.97E-05	**tons/yr.**	**PM_{10}**	**E2**
9.04E-06	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/year of excavated soil)/(truck load))*(average distance traveled each way)

VMT = ((4,673 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 280.38 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

1,827	lbs./yr.	**9.14E-01**	**tons/yr.**	**PM**
493	lbs./yr.	**2.47E-01**	**tons/yr.**	**PM_{10}**
49	lbs./yr.	**2.47E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2024 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

9.14E-02	**tons/yr.**	**PM**	**E2**
2.47E-02	**tons/yr.**	**PM_{10}**	**E2**
2.47E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

9.15E-02	**tons/yr.**	**PM**
2.47E-02	**tons/yr.**	**PM_{10}**
2.48E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Import in CY 2025
SM-1

Input Parameters:

Soil moved during importing =	7,077	cy	
Soil moved during importing =	11,465	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**3.34E-04**	**lbs./ton**	**PM**
	1.58E-04	**lbs./ton**	**PM_{10}**
	2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

3.82	lbs./yr.	**1.91E-03**	**tons/yr.**	**PM**	**E1**
1.81	lbs./yr.	**9.04E-04**	**tons/yr.**	**PM_{10}**	**E1**
0.27	lbs./yr.	**1.37E-04**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.91E-04	**tons/yr.**	**PM**	**E2**
9.04E-05	**tons/yr.**	**PM_{10}**	**E2**
1.37E-05	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/year of excavated soil)/(truck load))*(average distance traveled each way)

VMT = ((7,077 cy/yr.) / (14 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 606.6 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

3,954	lbs./yr.	**1.98E+00**	**tons/yr.**	**PM**
1,067	lbs./yr.	**5.34E-01**	**tons/yr.**	**PM_{10}**
107	lbs./yr.	**5.34E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Import in CY 2025 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

1.98E-01	**tons/yr.**	**PM**	**E2**
5.34E-02	**tons/yr.**	**PM_{10}**	**E2**
5.34E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal and imported backfill (tons/yr.) =

=E1+E2

1.98E-01	**tons/yr.**	**PM**
5.35E-02	**tons/yr.**	**PM_{10}**
5.35E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export CY 2021
SM-1

Input Parameters:

Concrete moved during export =	-	cy	
Concrete moved during export =	-	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**1.28E-01**	**lbs./ton**	**PM**
	6.04E-02	**lbs./ton**	**PM_{10}**
	9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/yr. of concrete/(truck load))*(average distance traveled each way)

VMT = ((0 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 0 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export CY 2021 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete demolition and import (tons/yr.) =

=E1+E2

0.00E+00	**tons/yr.**	**PM**
0.00E+00	**tons/yr.**	**PM_{10}**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2022
SM-1

Input Parameters:

Concrete moved during export =	-	cy	
Concrete moved during export =	-	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**1.28E-01**	**lbs./ton**	**PM**
	6.04E-02	**lbs./ton**	**PM_{10}**
	9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:
EF = emission factor, lbs./ton
U = mean wind speed, miles/hr. (mph)
M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**	**E1**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:
k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)
s = material silt content (%)
W = Weight of the vehicle (tons) = 40 tons
p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)
a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)
b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)
VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads
VMT = ((cy/yr. of concrete/(truck load))*(average distance traveled each way)
VMT = ((0 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)
VMT = 0 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2022 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

0.00E+00	**tons/yr.**	**PM**
0.00E+00	**tons/yr.**	**PM_{10}**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2023
SM-1

Input Parameters:

Concrete moved during export =	1,280	cy	
Concrete moved during export =	2,074	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$	**1.28E-01**	**lbs./ton**	**PM**
	6.04E-02	**lbs./ton**	**PM_{10}**
	9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

264.83	lbs./yr.	**1.32E-01**	**tons/yr.**	**PM**	**E1**
125.26	lbs./yr.	**6.26E-02**	**tons/yr.**	**PM_{10}**	**E1**
18.97	lbs./yr.	**9.48E-03**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

1.32E-02	**tons/yr.**	**PM**	**E2**
6.26E-03	**tons/yr.**	**PM_{10}**	**E2**
9.48E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365\text{-}p)/365]$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/yr. of concrete/(truck load))*(average distance traveled each way)

VMT = ((1,280 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 76.8 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

501	lbs./yr.	**2.50E-01**	**tons/yr.**	**PM**
135	lbs./yr.	**6.76E-02**	**tons/yr.**	**PM_{10}**
14	lbs./yr.	**6.76E-03**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2023 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

2.50E-02	**tons/yr.**	**PM**	**E2**
6.76E-03	**tons/yr.**	**PM_{10}**	**E2**
6.76E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

3.83E-02	**tons/yr.**	**PM**
1.30E-02	**tons/yr.**	**PM_{10}**
1.62E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2024
SM-1

Input Parameters:

Concrete moved during export =	1,280	cy	
Concrete moved during export =	2,074	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

264.83	lbs./yr.	**0.132**	**tons/yr.**	**PM**	**E1**
125.26	lbs./yr.	**0.063**	**tons/yr.**	**PM_{10}**	**E1**
18.97	lbs./yr.	**0.0095**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

1.32E-02	**tons/yr.**	**PM**	**E2**
6.26E-03	**tons/yr.**	**PM_{10}**	**E2**
9.48E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

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

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/yr. of concrete/(truck load))*(average distance traveled each way)

VMT = ((1,280 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 76.8 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

501	lbs./yr.	**2.50E-01**	**tons/yr.**	**PM**
135	lbs./yr.	**6.76E-02**	**tons/yr.**	**PM_{10}**
14	lbs./yr.	**6.76E-03**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2024 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

2.50E-02	**tons/yr.**	**PM**	**E2**
6.76E-03	**tons/yr.**	**PM_{10}**	**E2**
6.76E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete export (tons/yr.) =

=E1+E2

3.83E-02	**tons/yr.**	**PM**
1.30E-02	**tons/yr.**	**PM_{10}**
1.62E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2025
SM-1

Input Parameters:

Concrete moved during export =	-	cy	
Concrete moved during export =	-	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3}$ / $(M/2)^{1.4}$]	**1.28E-01**	**lbs./ton**	**PM**
	6.04E-02	**lbs./ton**	**PM_{10}**
	9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

-	lbs./yr.	**0.000**	**tons/yr.**	**PM**	**E1**
-	lbs./yr.	**0.000**	**tons/yr.**	**PM_{10}**	**E1**
-	lbs./yr.	**0.0000**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved areas (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

EF = $[k(s/12)^a (W/3)^b][(365-p)/36$	**6.52**	**lbs./VMT/truck**	**PM**
	1.76	**lbs./VMT/truck**	**PM_{10}**
	0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = ((cy/yr. of concrete/(truck load))*(average distance traveled each way)

VMT = ((0 cy/yr.) / (20 cy/truck))*(120 miles/round trip*1% miles/unpaved roads)

VMT = 0 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved areas =

EF *VMT

-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**PM_{10}**
-	lbs./yr.	**0.00E+00**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export in CY 2025 (Continued)
SM-1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved areas =

uncontrolled emissions * 0.1

0.00E+00	**tons/yr.**	**PM**	**E2**
0.00E+00	**tons/yr.**	**PM_{10}**	**E2**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete export (tons/yr.) =

=E1+E2

0.00E+00	**tons/yr.**	**PM**
0.00E+00	**tons/yr.**	**PM_{10}**
0.00E+00	**tons/yr.**	**$PM_{2.5}$**