

Appendix A:
Air Quality and Greenhouse Gas Analysis

Description for Appendix A: Air Quality and Greenhouse Gas Analysis

Air quality impacts associated with Project construction were assessed and quantified using the Roadway Construction Emissions Model (RCEM), Version 9.0.1. RCEM is an Excel-based model that the Sacramento Metropolitan Air Quality Management District (SMAQMD) developed to help users quantify emissions associated with linear construction projects, including emissions from off-road equipment, on-road vehicles, site grading, earth movement, and paving. The Project's RCEM output files, along with criteria pollutant and GHG emissions summary tables based on the RCEM estimates, are provided in Appendix A.

Construction emissions were estimated by inputting Project-specific construction data provided by the City, such as the construction start year, project area, and material hauling quantities, into RCEM. The Project-specific construction inputs can be found in the section titled *Road Construction Emissions Model Version 9.0.1* in Appendix A. The remaining pages provided in Appendix A are comprised of RCEM worksheets displaying the emission factors and default values used to calculate emissions, which cannot be modified by the user.

References

Sacramento Metropolitan Air Quality Management District (SMAQMD). 2018. Road Construction Emissions Model Version 9.0. May. Available: https://www.airquality.org/LandUseTransportation/Documents/RoadConstructionEmissionsModelVer9_0_0_locked.zip. Accessed: April 18, 2024.

Criteria Pollutant Emissions from Project Construction

Construction Activity	ROG	NOX	PM10
Pounds per Day			
Grubbing/Land Clearing	0.94	7.71	1.75
Grading/Excavation	3.83	42.43	3.15
Drainage/Utilities/Sub-Grade	3.27	29.33	2.61
Paving	1.43	13.92	0.68
Maximum	3.83	42.43	3.15
Significance Threshold	137	137	80
Exceeds Thresholds after mitigation?	No	No	No
Tons per Year			
Grubbing/Land Clearing	0.02	0.15	0.03
Grading/Excavation	0.34	3.78	0.28
Drainage/Utilities/Sub-Grade	0.19	1.74	0.15
Paving	0.04	0.41	0.02
Maximum (tons per phase)	0.34	3.78	0.28
Total (tons per year)	0.40	4.06	0.33
Significance Threshold	4.5	4.5	--
Exceeds Thresholds after mitigation?	No	No	N/A

GHG Emissions from Project Construction

Construction Activity	MT CO2e
Pounds per Day	
Grubbing/Land Clearing	1,978.70
Grading/Excavation	13,251.78
Drainage/Utilities/Sub-Grade	7,175.77
Paving	3,898.91
Maximum	13,251.78
Total (tons/construction project)	1,761.95
Tons per Year	
Grubbing/Land Clearing	35.54
Grading/Excavation	1,071.15
Drainage/Utilities/Sub-Grade	386.68
Paving	105.05
Maximum (tons per phase)	1,071.15
Total (tons per year)	1,065.62

Welcome to the Road Construction Emissions Model, Version 9.0.1

User Instructions

This spreadsheet system contains the following individual worksheets:

- 1 This worksheet of User Instructions
- 2 Updates
- 3 Emission Estimates
- 4 Data Entry
- 5 Non-default Off-road Equipment
- 6 EMFAC2017
- 7 On-road Mitigation EF
- 8 OFFROAD Convert
- 9 Off-road Tier 4 EF
- 10 OFFROAD HP & LF
- 11 OFFROAD EF
- 12 x-ref



The Emission Estimates worksheet calculates a project's emissions in pounds per day (and tons) by project phase and tons over the entire construction period.

The worksheet can be used to estimate emissions for both vehicle exhaust and fugitive dust. The methodology used to estimate fugitive dust emissions is a simplified methodology involving estimates of the maximum area (acreage) of land disturbed daily. Detailed fugitive dust emission estimates associated with individual materials handling operations and/or activity/vehicle types cannot be conducted with this version of the model.

The Emission Estimates worksheet cannot be modified directly, it is a protected worksheet. It can only be modified indirectly by entering information for the project in selected areas of the Data Entry worksheet.

The last seven of these worksheets - EMFAC2017, On-road Mitigation EF, OFFROAD Convert, Off-road Tier 4 EF, OFFROAD HP & LP, OFFROAD EF and x-ref - cannot be modified by the user. They are protected worksheets.

Even though all or portions of several worksheets are protected, the individual formulas used in the calculations can be seen by the user.

The Data Entry worksheet includes several areas that can be modified by the user.

User instructions in the Data Entry worksheet are highlighted in red.

On the Data Entry worksheet, the user has two options for entering project data: required data and optional data. Required data is entered in the data input section (yellow cells). That required data is then used by the worksheet to calculate default values for the project.

The user can override the default values (blue cells) calculated for a project and is encouraged to do so if project specific information is available. Due to the difficulty in developing reliable default values for road construction projects,

the user is encouraged to enter as much site specific information as is available for the project being analyzed.

The Data Entry Worksheet also includes a button that allows the user to clear previously entered data. This button is found just at the top of and to the right of the data entry portion of the worksheet.

When projects are discontinuous, the user must make adjustments to the spreadsheet manually, since the program cannot be setup to anticipate unexpected project delays.

#VALUE! <- This error message may occur during use of the spreadsheets. This occurs whenever the user enters a non numeric value, including a space character, into a cell that is used to calculate a numeric value.

Consequently, to erase values entered into the spreadsheets, use the delete key instead of the space bar!

Note: Information in this worksheet is based on conversations with knowledgeable individuals at the Sacramento Metropolitan Air Quality Management District, the California Department of Transportation, the California Air Resources Board, the U.S. EPA, and private industry involved in road construction. Also, the 26th edition of Walker's Building Estimator's Reference Book (1999) was used in the development of this spreadsheet. This spreadsheet was prepared by Jones & Stokes, TIAX LLC and Ramboll Environ with the financial support and direction of the Sacramento Metropolitan Air Quality Management District.



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Road Construction Emissions Model, Version 9.0.1

Updates Log

Changes from previous version of Road Construction Emissions Model

(Version 9.0.0 to 9.0.1)(updated by SMAQMD 8/2/22)

- 1) Updated website link on Data Entry tab for soil type maps from the Department of Conservation.

(Version 8.1.0 to 9.0.0) (updated by SMAQMD 04/22/18 with assistance from Ramboll)

- 1) Project length changed to include calendar years 2014 through 2040.
- 2) On-road vehicle emission factors have been updated to EMFAC2017 version 1.0.2.
- 3) Off-road emission rates updated to include calendar years 2014 through 2040.
- 4) Average Offroad HP by Equipment Type updated to be consistent with CalEEMod (version 2016.3.2)
- 5) Modified 'Data Entry' tab to calculate NOx start emissions from heavy duty trucks in "soil hauling", "asphalt hauling" and "water truck" section

(Version 7.1.5 to 8.1.0) (updated by SMAQMD 05/09/16 with assistance from Ramboll ENVIRON US Corporation)

- 1) Project length changed to include calendar years 2014 through 2025.
- 2) Added a new project type: Type 4: Other Linear Project Type. Note that there are no default vehicle or equipment activities available for the Project Type 4.
- 3) Emissions estimates were extended to include SOx, CH4, N2O and CO2e.
- 4) Updated off-road equipment emission factors and default average horsepower by equipment type to be consistent with CalEEMod (version 2013.2.2).
- 5) On-road vehicle emission factors have been updated to EMFAC2014.
- 6) Revised pollutant order for consistency throughout the calculator.
- 7) Added flexibility for users to specify a non-default number of working days per month.
- 8) Modified soil hauling import and export quantity and haul truck capacity data requests to allow users to specify soil hauling activity by phase.
- 9) Soil hauling emissions are now estimated separately for each construction phase.
- 10) Added a new feature to allow users to provide asphalt hauling quantities by phase in the "Data Entry" tab.
- 11) New component added where the user can specify construction start date and duration by phase.
- 12) The maximum daily emissions calculation was modified to sum emissions from overlapping construction phases.
- 13) Water truck activity can be specified and emissions estimated for the paving phase.
- 14) Mitigation options were added for on-road vehicles and off-road equipment. Emissions calculations include the effects of mitigations if a mitigation option is selected by the user.
- 15) Model allows user to estimate emissions from non-default off-road equipment for all phases and for all project types. Non-default off-road equipment specification must be included by equipment type for horsepower, number of equipment, load factor, hours of operation and emission factors in the "Non-default Off-road Equipment" tab.
- 16) New table of total project emissions with units of tons/phase was added in the "Emission Estimates" tab.
- 17) Removed table of daily emissions in metric units from the "Emission Estimates" tab.
- 18) Removed unnecessary data from all tabs.

(Version 7.1.4 to 7.1.5) (updated by SMAQMD 12/11/13 with assistance from ENVIRON Corporation)

- 1) Grubbing and Land Clearing Phase calculation of active months in 2007, 2017, 2019 fixed.
- 2) Soil Hauling Emissions calculation to select override if it exists for round trips/day.
- 3) Worker Commute Emissions calculation of starting and hot soak emissions; drainage phase PM₁₀ emission rate.
- 4) Water Truck Emissions calculation to select number of months for Grubbing and Land Clearing Phase; maximum acreage/day after 2025.

(Version 6.3.2 to Version 7.1.0, 7.1.1, 7.1.2, 7.1.3 & 7.1.4) (updated by SMAQMD 8/2/13)

- 1) EMFAC2011 emission factors added (previous EMFAC versions dropped).
- 2) OFFROAD2011 emission factors added (and fixed error).
- 3) OFFROAD2007 for categories not in OFFROAD2011 (and fixed error)
- 4) Project length changed to include calendar years 2009 through 2025.
- 5) Average Offroad HP by Equipment Type calculation updated and corrected
- 6) Load Factor Adjustment deactivated (default load factors already incorporated in ARB's calculation of emission factors)
- 7) Crawler Tractor equipment added to model
- 8) Air Compressors ROG & Default Excavators calculation on Data Entry sheet corrected.
- 9) Default equipment list updated
- 10) Corrections to Worker Commute Emissions calculations

Road Construction Emissions Model, Version 9.0.1

Daily Emission Estimates for -> P-18 and P-17B Trunkline														
Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	Fugitive Dust (lbs/day)	PM2.5 (lbs/day)	Exhaust (lbs/day)	Fugitive Dust (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	0.94	7.95	7.71	1.75	0.35	1.40	0.59	0.30	0.29	0.02	1,955.00	0.44	0.04	1,978.70
Grading/Excavation	3.83	38.52	42.43	3.15	1.75	1.40	1.71	1.42	0.29	0.13	12,953.03	2.49	0.79	13,251.78
Drainage/Utilities/Sub-Grade	3.27	32.38	29.33	2.61	1.21	1.40	1.38	1.09	0.29	0.07	7,109.88	1.57	0.09	7,175.77
Paving	1.43	18.67	13.92	0.68	0.68	0.00	0.57	0.57	0.00	0.04	3,828.60	0.76	0.17	3,898.91
Maximum (pounds/day)	3.83	38.52	42.43	3.15	1.75	1.40	1.71	1.42	0.29	0.13	12,953.03	2.49	0.79	13,251.78
Total (tons/construction project)	0.60	6.07	6.09	0.49	0.25	0.24	0.26	0.21	0.05	0.02	1,728.86	0.35	0.08	1,761.95
Notes: Project Start Year -> 2026														
Project Length (months) -> 18														
Total Project Area (acres) -> 14														
Maximum Area Disturbed/Day (acres) -> 0														
Water Truck Used? -> Yes														
Total Material Imported/Exported Volume (yd³/day)														
Daily VMT (miles/day)														
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck								
Grubbing/Land Clearing	0	0	0	0	400	40								
Grading/Excavation	800	0	1,200	0	920	40								
Drainage/Utilities/Sub-Grade	0	0	0	0	800	40								
Paving	0	134	0	210	680	40								
PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.														
Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.														
CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.														
Total Emission Estimates by Phase for -> P-18 and P-17B Trunkline														
Project Phases	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	PM10 (tons/phase)	PM10 (tons/phase)	Fugitive Dust (tons/phase)	PM2.5 (tons/phase)	Exhaust (tons/phase)	Fugitive Dust (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
(Tons for all except CO2e. Metric tonnes for CO2e)														
Grubbing/Land Clearing	0.02	0.16	0.15	0.03	0.01	0.03	0.01	0.01	0.01	0.00	38.71	0.01	0.00	35.54
Grading/Excavation	0.34	3.43	3.78	0.28	0.16	0.12	0.15	0.13	0.03	0.01	1,154.12	0.22	0.07	1,071.15
Drainage/Utilities/Sub-Grade	0.19	1.92	1.74	0.15	0.07	0.08	0.08	0.06	0.02	0.00	422.33	0.09	0.01	386.68
Paving	0.04	0.55	0.41	0.02	0.02	0.00	0.02	0.02	0.00	0.00	113.71	0.02	0.01	105.05
Maximum (tons/phase)	0.34	3.43	3.78	0.28	0.16	0.12	0.15	0.13	0.03	0.01	1154.12	0.22	0.07	1,071.15
Total (tons/construction project)	0.60	6.07	6.09	0.49	0.25	0.24	0.26	0.21	0.05	0.02	1728.86	0.35	0.08	1,598.43
PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.														
Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.														
CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.														
The CO2e emissions are reported as metric tons per phase.														

Data Entry Worksheet

Note: The program's estimates of construction period phase length can be overridden in cells D50 through D53, and F50 through F53.

Construction Periods	User Override of Construction Months	Program Calculated Months	User Override of Phase Starting Date	Program Default Phase Starting Date
Grubbing/Land Clearing		1.80		1/1/2026
Grading/Excavation		8.10		2/25/2026
Drainage/Utilities/Sub-Grade		5.40		10/30/2026
Paving		2.70		4/13/2027
Totals (Months)		18		

Note: Soil Hauling emission default values can be overridden in cells D61 through D64, and F61 through F64.

Soil Hauling Emissions		User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT					
User Input											
Miles/round trip: Grubbing/Land Clearing			30.00		0		0.00				
Miles/round trip: Grading/Excavation			30.00		40		1200.00				
Miles/round trip: Drainage/Utilities/Sub-Grade			30.00		0		0.00				
Miles/round trip: Paving			30.00		0		0.00				
Emission Rates		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)		0.41	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26	1,729.92
Grading/Excavation (grams/mile)		0.03	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26	1,729.92
Draining/Utilities/Sub-Grade (grams/mile)		0.03	0.42	3.11	0.11	0.05	0.02	1,637.93	0.00	0.26	1,714.69
Paving (grams/mile)		0.42	0.42	3.12	0.11	0.05	0.02	1,629.11	0.00	0.26	1,705.46
Grubbing/Land Clearing (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)		0.00	0.00	4.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling Emissions		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Pounds per day - Grubbing/Land Clearing		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation		0.08	1.10	8.59	0.30	0.13	0.04	4,371.73	0.00	0.69	4,576.60
Tons per const. Period - Grading/Excavation		0.01	0.10	0.77	0.03	0.01	0.00	389.52	0.00	0.06	407.77
Pounds per day - Drainage/Utilities/Sub-Grade		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Paving		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total tons per construction project		0.01	0.10	0.77	0.03	0.01	0.00	389.52	0.00	0.06	407.77

Note: Asphalt Hauling emission default values can be overridden in cells D91 through D94, and F91 through F94.

Asphalt Hauling Emissions		User Override of Miles/Round Trip	Program Estimate of Miles/Round Trip	User Override of Truck Round Trips/Day	Default Values Round Trips/Day	Calculated Daily VMT					
User Input											
Miles/round trip: Grubbing/Land Clearing			30.00		0		0.00				
Miles/round trip: Grading/Excavation			30.00		0		0.00				
Miles/round trip: Drainage/Utilities/Sub-Grade			30.00		0		0.00				
Miles/round trip: Paving			30.00		7		210.00				
Emission Rates		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)		0.03	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26	1,729.92
Grading/Excavation (grams/mile)		0.03	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26	1,729.92
Draining/Utilities/Sub-Grade (grams/mile)		0.03	0.42	3.11	0.11	0.05	0.02	1,637.93	0.00	0.26	1,714.69
Paving (grams/mile)		0.03	0.42	3.12	0.11	0.05	0.02	1,629.11	0.00	0.26	1,705.46
Grubbing/Land Clearing (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)		0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)		0.00	0.00	4.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emissions		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Pounds per day - Grubbing/Land Clearing		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grubbing/Land Clearing		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Grading/Excavation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Grading/Excavation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tons per const. Period - Drainage/Utilities/Sub-Grade		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pounds per day - Paving		0.01	0.19	1.52	0.05	0.02	0.01	754.23	0.00	0.12	789.58
Tons per const. Period - Paving		0.01	0.04	0.04	0.00	0.00	0.00	22.40	0.00	0.00	23.45
Total tons per construction project		0.00	0.01	0.04	0.00	0.00	0.00	22.40	0.00	0.00	23.45

Note: Worker commute default values can be overridden in cells D121 through D126.

Worker Commute Emissions			User Override of Worker Commute Default Values						
User Input	Default Values								
Miles/ one-way trip	20				Calculated		Calculated		
One-way trips/day	2				Daily Trips		Daily VMT		
No. of employees: Grubbing/Land Clearing	10				20		400.00		
No. of employees: Grading/Excavation	23				46		920.00		
No. of employees: Drainage/Utilities/Sub-Grade	20				40		800.00		
No. of employees: Paving	17				34		680.00		

Emission Rates		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Grubbing/Land Clearing (grams/mile)	0.01	0.72	0.05	0.05	0.05	0.02	0.00	285.85	0.00	0.01	287.41
Grading/Excavation (grams/mile)	0.01	0.72	0.05	0.05	0.05	0.02	0.00	285.85	0.00	0.01	287.41
Draining/Utilities/Sub-Grade (grams/mile)	0.01	0.69	0.05	0.05	0.05	0.02	0.00	280.13	0.00	0.00	281.62
Paving (grams/mile)	0.01	0.68	0.04	0.05	0.05	0.02	0.00	276.66	0.00	0.00	278.11
Grubbing/Land Clearing (grams/trip)	0.87	2.47	0.23	0.00	0.00	0.00	0.00	61.59	0.06	0.03	71.10
Grading/Excavation (grams/trip)	0.87	2.47	0.23	0.00	0.00	0.00	0.00	61.59	0.06	0.03	71.10
Draining/Utilities/Sub-Grade (grams/trip)	0.84	2.42	0.22	0.00	0.00	0.00	0.00	60.35	0.05	0.03	69.67
Paving (grams/trip)	0.83	2.39	0.21	0.00	0.00	0.00	0.00	59.60	0.05	0.03	68.64
Emissions		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
Pounds per day - Grubbing/Land Clearing	0.05	0.75	0.05	0.04	0.02	0.01	0.00	254.79	0.00	0.01	256.58
Tons per const. Period - Grubbing/Land Clearing	0.00	0.01	0.00	0.00	0.00	0.00	0.00	5.04	0.00	0.00	5.08
Pounds per day - Grading/Excavation	0.11	1.72	0.12	0.09	0.04	0.01	0.01	586.02	0.01	0.01	590.14
Tons per const. Period - Grading/Excavation	0.01	0.15	0.01	0.01	0.00	0.00	0.00	52.21	0.00	0.00	52.98
Pounds per day - Drainage/Utilities/Sub-Grade	0.09	1.44	0.10	0.08	0.03	0.00	0.00	499.38	0.01	0.01	502.82
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.01	0.09	0.01	0.00	0.00	0.00	0.00	29.66	0.00	0.00	29.87
Pounds per day - Paving	0.08	1.19	0.08	0.07	0.03	0.00	0.00	419.22	0.01	0.01	422.07
Tons per const. Period - Paving	0.00	0.04	0.00	0.00	0.00	0.00	0.00	12.45	0.00	0.00	12.54
Total tons per construction project	0.02	0.29	0.02	0.02	0.01	0.00	0.00	99.37	0.00	0.00	100.07

Note: Water Truck default values can be overridden in cells D153 through D156, I153 through I156, and F153 through F156.

Water Truck Emissions									
User Input	User Override of Default # Water Trucks		Program Estimate of Number of Water Trucks		User Override of Truck Round Trips/Vehicle/Day		Default Values Round Trips/Vehicle/Day		Calculated Trips/day
Grubbing/Land Clearing - Exhaust			1				5		5
Grading/Excavation - Exhaust			1				5		5
Drainage/Utilities/Subgrade			1				5		5
Paving			1				5		5
Emission Rates									
	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
Grubbing/Land Clearing (grams/mile)	0.03	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26
Grading/Excavation (grams/mile)	0.03	0.41	3.10	0.11	0.05	0.02	1,652.48	0.00	0.26
Draining/Utilities/Sub-Grade (grams/mile)	0.03	0.42	3.11	0.11	0.05	0.02	1,637.93	0.00	0.26
Paving (grams/mile)	0.03	0.42	3.12	0.11	0.05	0.02	1,629.11	0.00	0.26
Grubbing/Land Clearing (grams/trip)	0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (grams/trip)	0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00
Draining/Utilities/Sub-Grade (grams/trip)	0.00	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00
Paving (grams/trip)	0.00	0.00	4.48	0.00	0.00	0.00	0.00	0.00	0.00
Emissions									
	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
Pounds per day - Grubbing/Land Clearing	0.00	0.04	0.32	0.01	0.00	0.00	145.72	0.00	0.02
Tons per const. Period - Grubbing/Land Clearing	0.00	0.00	0.01	0.00	0.00	0.00	2.89	0.00	0.00
Pounds per day - Grading/Excavation	0.00	0.04	0.32	0.01	0.00	0.00	145.72	0.00	0.02
Tons per const. Period - Grading/Excavation	0.00	0.00	0.03	0.00	0.00	0.00	12.98	0.00	0.00
Pounds per day - Drainage/Utilities/Sub-Grade	0.00	0.04	0.32	0.01	0.00	0.00	144.44	0.00	0.02
Tons per const. Period - Drainage/Utilities/Sub-Grade	0.00	0.00	0.02	0.00	0.00	0.00	8.58	0.00	0.00
Pounds per day - Paving	0.00	0.04	0.32	0.01	0.00	0.00	143.66	0.00	0.02
Tons per const. Period - Paving	0.00	0.00	0.01	0.00	0.00	0.00	4.27	0.00	0.00
Total tons per construction project	0.00	0.01	0.06	0.00	0.00	0.00	28.72	0.00	0.00

Note: Fugitive dust default values can be overridden in cells D183 through D185.

Fugitive Dust		User Override of Max Acreage Disturbed/Day	Default Maximum Acreage/Day	PM10 pounds/day	PM10 tons/per period	PM2.5 pounds/day	PM2.5 tons/per period
Fugitive Dust - Grubbing/Land Clearing			0.14	1.40	0.03	0.29	0.01
Fugitive Dust - Grading/Excavation			0.14	1.40	0.12	0.29	0.03
Fugitive Dust - Drainage/Utilities/Subgrade			0.14	1.40	0.08	0.29	0.02

Data Entry Worksheet 7

Grading/Excavation		Default Number of Vehicles	Mitigation Option Override of Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Default Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
Override of Default Number of Vehicles		Program-estimate													
				Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0		Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		1		Model Default Tier	Crawler Tractors	0.37	2.10	3.96	0.15	0.14	0.01	758.27	0.25	0.01	766.45
				Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		3		Model Default Tier	Excavators	0.50	9.78	3.66	0.18	0.17	0.02	1,501.02	0.49	0.01	1,517.20
				Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		1		Model Default Tier	Graders	0.31	1.59	3.46	0.11	0.10	0.01	640.24	0.21	0.01	647.14
				Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pavers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Paving Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2		Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rollers	0.27	3.69	2.89	0.15	0.13	0.01	508.12	0.16	0.00	513.60
				Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		1		Model Default Tier	Rubber Tired Loaders	0.23	1.47	1.86	0.06	0.06	0.01	605.62	0.20	0.01	612.16
		2		Model Default Tier	Scrapers	1.34	10.76	12.74	0.50	0.46	0.03	2,936.30	0.95	0.03	2,967.95
		6		Model Default Tier	Signal Boards	0.34	1.81	2.16	0.08	0.08	0.00	295.88	0.03	0.00	297.39
				Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Surfing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2		Model Default Tier	Tractors/Loaders/Backhoes	0.26	4.46	2.67	0.11	0.10	0.01	604.11	0.20	0.01	610.61
				Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
User-Defined Off-road Equipment															
If non-default vehicles are used, please provide information in 'Non-default Off-road Equipment' tab															
Number of Vehicles				Equipment Tier	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day	PM2.5 pounds/day	SOx pounds/day	CO2 pounds/day	CH4 pounds/day	N2O pounds/day	CO2e pounds/day
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00				N/A	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Grading/Excavation			pounds per day	3.64	35.67	33.39	1.35	1.25	0.08	7,849.56	2.47	0.07	7,932.48
		Grading/Excavation			tons per phase	0.32	3.18	2.98	0.12	0.11	0.01	699.40	0.22	0.01	706.78

Data Entry Worksheet 9

Paving	Default		Mitigation Option		ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	Number of Vehicles	Override of	Default	Type										
	Override of Default Number of Vehicles	Default Equipment Tier (applicable only when "Tier 4 Mitigation" Option Selected)	Equipment Tier	Type	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day	pounds/day
			Model Default Tier	Aerial Lifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Air Compressors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Bore/Drill Rigs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cement and Mortar Mixers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Concrete/Industrial Saws	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Cranes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crawler Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Crushing/Proc. Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Excavators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Generator Sets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Graders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Tractors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Off-Highway Trucks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Construction Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other General Industrial Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Other Material Handling Equipm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1		Model Default Tier	Pavers	0.17	2.90	1.58	0.07	0.07	0.00	454.99	0.15	0.00	459.90
	1		Model Default Tier	Paving Equipment	0.15	2.55	1.26	0.06	0.06	0.00	394.32	0.13	0.00	398.57
			Model Default Tier	Plate Compactors	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pressure Washers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3		Model Default Tier	Rollers	0.41	5.54	4.33	0.22	0.20	0.01	762.19	0.25	0.01	770.40
			Model Default Tier	Rough Terrain Forklifts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Dozers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Rubber Tired Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Scrapers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6		Model Default Tier	Signal Boards	0.34	1.81	2.16	0.08	0.08	0.00	295.88	0.03	0.00	297.39
			Model Default Tier	Skid Steer Loaders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Surfacing Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Sweepers/Scrubbers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2		Model Default Tier	Tractors/Loaders/Backhoes	0.26	4.46	2.67	0.11	0.10	0.01	604.11	0.20	0.01	610.61
			Model Default Tier	Trenchers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Model Default Tier	Welders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
User-Defined Off-road Equipment														
If non-default vehicles are used, please provide information in "Non-default Off-road Equipment" tab														
	Number of Vehicles		Equipment Tier	Type	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00		N/A		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Paving		pounds per day	1.34	17.25	12.00	0.55	0.51	0.03	2,511.49	0.75	0.02	2,536.87
		Paving		tons per phase	0.04	0.51	0.36	0.02	0.02	0.00	74.59	0.02	0.00	75.34
Total Emissions all Phases (tons per construction period) =>					0.57	5.67	5.19	0.21	0.19	0.01	1,188.85	0.34	0.01	1,200.60

Equipment default values for horsepower and hours/day can be overridden in cells D403 through D436 and F403 through F436.

Equipment	User Override of Horsepower	Default Values Horsepower	User Override of Hours/day	Default Values Hours/day
Aerial Lifts		63		8
Air Compressors		78		8
Bore/Drill Rigs		221		8
Cement and Mortar Mixers		9		8
Concrete/Industrial Saws		81		8
Cranes		231		8
Crawler Tractors		212		8
Crushing/Proc. Equipment		85		8
Excavators		158		8
Forklifts		89		8
Generator Sets		84		8
Graders		187		8
Off-Highway Tractors		124		8
Off-Highway Trucks		402		8
Other Construction Equipment		172		8
Other General Industrial Equipment		88		8
Other Material Handling Equipment		168		8
Pavers		130		8
Paving Equipment		132		8
Plate Compactors		8		8
Pressure Washers		13		8
Pumps		84		8
Rollers		80		8
Rough Terrain Forklifts		100		8
Rubber Tired Dozers		247		8
Rubber Tired Loaders		203		8
Scrapers		367		8
Signal Boards		6		8
Skid Steer Loaders		65		8
Surfacing Equipment		263		8
Sweepers/Scrubbers		64		8
Tractors/Loaders/Backhoes		97		8
Trenchers		78		8
Welders		46		8

END OF DATA ENTRY SHEET

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