Appendix C-1
Construction Emission Factors and Dust Mitigation Measures

This appendix provides additional emission factors that can be used in estimating construction emissions and quantifying the benefits of mitigation measures.

C.1 Dust Emissions (PM_{10})

See the calculation methodology in Section 4.3.2 and Table 4.3 in Chapter 4.

C.2 Employee Trip Estimation

Trip estimation for construction employees is based upon the SCAQMD CEQA Planners Handbook, 1993.

$$Tr = ER_{on\text{-}site}\left[\frac{(GSF \times CV \times ER)}{100{,}000}\right]$$

Where:

GSF =	Gross Square Feet
CV (Construction Value) =	55.70 (Single Family)
	58.73 (Multi-Family)
	59.98 (Office/Emp)
ER (Employee Rate) =	9.2
$ER_{on\text{-}site}$ (On-site Construction Employee Rate) =	.392

C.3 Asphalt Paving

Asphalt paving emissions are estimated using the factors presented in Table C.1 and multiplying by the length of the roadway or number of square feet for parking structures.

Table C.1 Emission Factors–Paving

Pavement Type	Emission Factor
Road - Per Lane	3.8 lbs/mile
Road - Two-Lane	10.2 lbs/mile
Area (Parking, etc.)	0.000024 lbs/sf
Source: CARB, SMAQMD	

C.4 Stationary Equipment

Stationary equipment emissions for each individual pollutant can be estimated by:

$$EM = (EQ \times T_{(h)} \times HP_{(ave)} \times EF)$$

Where:

EM = Emissions
EQ = Number of Equipment
$T_{(h)}$ = Daily Hours of Use
$HP_{(ave)}$ = Average Horsepower
EF = Emissions Factor (see Table B.5)

Table C.2 Emission Factors–Stationary Equipment

Fuel Type	ROG (lbs)	NO_X (lbs)	PM_{10} (lbs)
Diesel	0.0025	0.0310	0.0020
Gasoline	0.0140	0.0114	0.0007
Source: SCAQMD			

C.5 Architectural Coatings

Architectural coatings can be estimated by the following formula:

$$EM = (CT_{(sqft)} \times CT_{(layers)} \times EF)$$

Where:

EM = Emissions
$CT_{(sqft)}$ = Number of Square Feet Coated
$CT_{(layers)}$ = Number of Coats
EF = Emissions Factor (see Table C.4)

Emission factors should accurately reflect the application method and the material that will be coated.

Table C.3 Emission Factors–Architectural Coatings

	Application Method	
Surface Type	Brush/Roller (lbs/sf)	Spray (lbs/sf)
Wood/Metal/Plasterboard	0.0134	0.0205
Concrete/Masonry	0.077	0.1184
Source: CARB, SMAQMD		

C.6 Fugitive Dust Mitigation Measures

The following tables C.4 and C.5 are taken from Rule 403 of the South Coast Air Quality Management District (SCAQMD) and contain mitigation measures that may be applied under the screening criteria in sec. 4.2 of Chapter 4 to reduce fugitive dust emissions from construction activities to a less-than-significant level.

Table C.4 Best Available Fugitive Dust Control Measures

Fugitive Dust Source Category	Control Actions
Earth-moving (except construction cutting and filling areas, and mining operations)	1a. Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the District; two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations each subsequent four-hour period of active operations; OR 1a-1. For any earth-moving which is more than 100 feet from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 feet in length in any direction.
Earth-moving – construction fill areas	1b. Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the District; for areas which have an optimum moisture content for compaction of less than 12 percent, as determined by ASTM method 1557 or other equivalent method approved by the District, complete the compaction process as expeditiously as possible after achieving at least 70 percent of the optimum soil moisture content; two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations during each subsequent four-hour period of active operations.
Earth-moving – construction cut areas and mining operations	1c. Conduct watering as necessary to prevent visible emissions from extending more than 100 feet beyond the active cut or mining areas unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.
Disturbed surface areas (except completed grading areas)	2a/b. Apply dust suppression in a sufficient quantity and frequency to maintain a stabilized surface; any areas which cannot be stabilized, as evidenced by wind driven dust, must have an application of water at least twice per day to at least 80 percent of the unstabilized area.

Disturbed surface areas – completed grading areas	2c. Apply chemical stabilizers within 5 working days or grading completion; OR 2d. Take action 3a or 3c specified for inactive disturbed surface areas.
Inactive disturbed surface areas	3a. Apply water to at least 80 percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible due to excessive slope or other safety conditions; OR 3b. Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR 3c. Establish a vegetative ground cover within 21 days after active operations have ceased; ground cover must be of sufficient density to expose less than 30 percent of unstabilized ground within 90 days of planting, and at all times thereafter; OR 3d. Utilize any combination of control actions 3a, 3b and 3c such that, in total, they apply to all inactive disturbed surface areas.
Unpaved roads	4a. Water all roads used for any vehicular traffic at least once per every two hours of active operations; OR 4b. Water all roads used for any vehicular traffic once daily and restrict vehicle speed to 15 mph; OR 4c. Apply chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface.
Open storage piles	5a. Apply chemical stabilizers; OR 5b. Apply water to at least 80 percent of the surface areas of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust; OR 5c. Install a three-sided enclosure with walls with no more than 50 percent porosity that extend, at a minimum, to the top of the pile.
Track-out control	6a. Pave or apply chemical stabilization at sufficient concentration and frequency to maintain a stabilized surface starting from the point of intersection with the public paved surface, and extending for a centerline distance of at least 100 feet and width of at least 20 feet; OR 6b. Pave from the point of intersection with the public paved road surface, and extending for a centerline distance of at least 25 feet and a width of at least 20 feet, and install a track-out control device immediately adjacent to the paved surface such that exiting vehicles do not travel on any unpaved road surface after passing through the track-out control device.

All categories	7a. Any other control measures approved by the District.
Source: SCAQMD Rule 403, Tables 2 and 3.	

Table C.5 Best Available Fugitive Dust Control Measures for High Wind Conditions*

Fugitive Dust Source Category	Control Measures
Earth moving	1A. Cease all active operations, OR 2A. Apply water to soil not more than 15 minutes prior to moving such soil.
Disturbed surface areas	0B. On the last day of active operations prior to a weekend, holiday, or any other period when active operations will not occur for not more than four consecutive days: apply water with a mixture of chemical stabilizer diluted to not less than 1/20 of the concentration required to maintain a stabilized surface for a period of six months; OR 1B. Apply chemical stabilizers prior to a wind event; OR 2B. Apply water to all unstabilized disturbed areas 3 times per day; if there is any evidence of wind driven fugitive dust, watering frequency is increased to a minimum of four times per day; OR 3B. Take the actions specified in Table B.6, Item 3c; OR 4B. Utilize any combination of control actions specified in Table 1, Items 1B, 2B and 3B, such that, in total, they apply to all disturbed surfaced areas.
Unpaved roads	1C. Apply chemical stabilizers prior to a wind event; OR 2C. Apply water twice per hour during active operation; OR 3C. Stop all vehicular traffic.
Open storage piles	1D. Apply water twice per hour; OR 2D. Install temporary coverings.
Paved road track-out	1E. Cover all haul vehicles; OR 2E. Comply with the vehicle freeboard requirements of Section 23114 of the California Vehicle Code for operation on both public and private roads.
All categories	1F. Any other control measures approved by the District.
* High wind conditions means when gusts exceed 25 mph. Source: SCAQMD Rule 403, Table 1.	