

## HAUL ROAD EMISSIONS

### Date Initiated:

October 5, 1998

### Dates Modified / Updated:

**PROCESS DESCRIPTIONS:** On site vehicle traffic can produce a significant amount of particulate emissions for some industries. Sections 13.2.1 (10/97) and 13.2.2 (1/95) of AP-42 provide empirical procedures for estimating overall haul road particulate releases from both paved and unpaved surfaces. In general, the particulate emissions are proportional to the number of vehicle miles traveled, road surface silt conditions, vehicle speed, and vehicle weight. Haul road dust that is generated will contain several trace metals at PPMW levels. Default trace metal concentrations for San Diego County have been developed by analyzing multiple haul road silt samples taken from several mineral products industry sites. The empirical EPA methods are;

Paved Haul Road Emission Estimation Techniques:

$$E_a = (VMT)[(k)(sL/2)^{0.65}(W/3)^{1.5}](C_i)(1 - e)$$

$$E_h = E_a / (D_a \times H)$$

Where:

**E<sub>a</sub>** = Annual emissions of each contaminant, (lbs/year)

**E<sub>h</sub>** = Maximum hourly emissions of each contaminant, (lbs/hour)

**VMT** = Vehicle miles traveled on site, (miles/year)

**k** = Particle size multiplier, (dimensionless)

**sL** = Paved haul road surface silt loading, (g/m<sup>2</sup>)

**W** = Average vehicle weight, (tons)

**C<sub>i</sub>** = Concentration of each listed substance in the haul road dust, (lbs/lb)

**D<sub>a</sub>** = Active days during reporting period, (days/year)

**H** = Daily hours of operation, (hours/day)

e = Control efficiency, if applicable, (%)

### DEFAULT VALUES - PAVED HAUL ROADS

Variable	Variable Description	Default Values and Ranges
k	PM30 particle size multiplier (lbs/VMT)	0.082 (PM30, from AP-42 table 13.2-1.1)
k	PM10 particle size multiplier (lbs/VMT)	0.016 (PM10, from AP-42 table 13.2-1.1)
sL	Road surface silt loading	13.6 g/m2 (Usually 7 to 70, test data)
sL	Road surface silt loading	0.40 oz./yd2 (typical range is 0.21 to 2.1)
e	Control efficiency	80% (for water spray on roads)
e	Control efficiency	80% (for water spray and surfactant)
e	Control efficiency	0% (if sweeping only, note: sweeping is accounted for in the site specific sL)

Note: The current AP-42 procedure was modified 10/97 and is different than the methodology agreed upon between the District and the Mineral Products Industry on 4/9/96. The net effect of the updated procedure is to reduce estimated paved road dust emissions by ~25% from the previously agreed upon method. Since the previous method has been removed from AP-42 (11.2.2), this new procedure will be used until further modified.

Unpaved Haul Road Emission Estimation Techniques:

$$Ea = (VMT)[(k)(5.9)(s/12)(S/30)(W/3)0.7(w/4)0.5(365-p/365)](Ci)(1 - e)$$

$$Eh = Ea / (Da \times H)$$

Where:

**Ea** = Annual emissions of each contaminant, (lbs/year)

**Eh** = Maximum hourly emissions of each contaminant, (lbs/hour)

**VMT** = Vehicle miles traveled on site, (miles/year)

**k** = Particle size multiplier, (dimensionless)

**s** = Unpaved haul road surface material silt content, (weight %)

**S** = Mean vehicle speed, (miles/hour)

**W** = Mean vehicle weight, (tons)

**w** = Number of vehicle wheels, (dimensionless)

**p** = Days with precipitation, (days/year)

**C<sub>i</sub>** = Concentration of each listed substance in haul road emissions, (lbs/lb)

**D<sub>a</sub>** = Active days during reporting period, (days/year)

**H** = Daily hours of operation, (hours/day)

**e** = Control efficiency, if applicable, (%)

### DEFAULT VALUES - UNPAVED HAUL ROADS

Variable	Variable Description	Default Values and Ranges
k	P30 particle size multiplier (lbs/VMT)	0.80 (PM30, from AP-42, Section 13.2.2)
k	PM10 particle size multiplier (lbs/VMT)	0.36 (PM10, from AP-42, Section 13.2.2)
s	Surface material silt content	15% (Usually 4 to 20%, test data)
p	Annual precipitation >0.01 in.	40 days/year (for San Diego County)
e	Control efficiency	80% (for water spray on roads)
e	Control efficiency	80% (for water spray with surfactant)

Typical haul road trace metal dust concentrations for San Diego County are as follows;

### HAUL ROAD DUST TRACE METAL CONCENTRATIONS

Trace Metals	Range Detected in SD County (ppmw)	Suggested Default Value
Arsenic	1 to 50	20
Beryllium	0.5 to 2	1
Cadmium	1 to 1.5	1
Chromium (total)	5 to 60	50
Copper	20 to 650	100
Lead	5 to 120	50
Manganese	200 to 1200	500
Mercury	0 to 10	5
Nickel	3 to 25	20
Selenium	3 to 5	5
Silica (crystalline)	10% to 75%	10%
Zinc	30 to 300	200
Asbestos	Not Detected	0

## **EMISSIONS INFORMATION:**

Haul road particulate emissions are nearly impossible to quantify through source testing procedures. EPA and its contractors appear to have developed an empirical procedure to estimate emissions and then 'fitted' critical variables to the predicted curve. Theoretically, this procedure is applicable to both low speed plant haul roads and high speed freeways. Typical controlled emission rates for plant haul roads range from 0.5 to 2.5 lbs PM10 / vehicle mile traveled. Higher estimates usually fail to account for control efficiencies associated with wetting the road surface. Lower estimates usually indicate an underestimated silt loading value for the facility's on-site haul road. It is often more difficult to obtain accurate information regarding vehicle types, weights, haul road lengths, and number of trips than it is to decide upon representative emission estimation technique default variables.

## **ASSUMPTIONS / LIMITATIONS:**

- Use site specific test data instead of default values as appropriate. Default values should be used where site specific data is highly questionable.
- The current (10/97) paved road procedure ignores vehicle speed, number of wheels, and rainy days. Additional revisions to this procedure may be forthcoming.
- The current (1/95) unpaved road procedure quantifies silt content (as weight %) but does not adequately evaluate silt loading (lbs per area). Additional revisions to this procedure may be forthcoming.
- No additional control efficiency should be granted for activities which are already accounted for by the silt loading value (i.e.; sweeping, etc.).
- While the use of mean vehicle weights and speeds may be acceptable for freeway estimates, these values tend to highly distort the quantification of emissions from facility haul roads. Haul road information should be collected and processed separately for each distinct vehicle type and function.
- The total number of vehicle trips and associated carrying capacities should coincide with the reported material imports and exports.
- Vehicle exhaust pipe emissions are not quantified by this procedure. An accurate estimate of tail pipe emissions depends upon representative fuel combustion emission factors for the vehicles and fuels used. These emissions must be quantified separately from haul road dust.
- Some District emission estimation techniques already include miscellaneous vehicular traffic in the default particulate emission factors. Care should be taken not to "double count or omit" on-site vehicles.

**FORMS:**

Haul road emissions should be estimated for each distinct vehicle type and function. Quantification of emission per vehicle type allows proper modeling for possible AQIA or HRA purposes. Other appropriate forms should be used for separate distinct processes located at each site.