

Appendix D

Air Quality Calculations

Formulas and Assumptions for Calculation of Dust Particle Emissions during Project Operation

To estimate the amount of dust generated from the traffic during the Operation phase of the Project, calculations using EPA Emission Factors for unpaved and paved roads were made.

Compilation of Air Pollutant Emission Factors, Volume I (EPA, 2006) contains the following equation for light-duty vehicles traveling on publicly accessible unpaved roads (Equation 1b in the document):

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

where k, a, c and d are empirical constants provided in the document and:

- E = size-specific emission factor in pounds per vehicle mile traveled (lb/VMT),
- s = surface material silt content (percent),
- M = surface material moisture content (percent),
- S = mean vehicle speed (mph), and
- C = emission factor for 1980s vehicle fleet exhaust, brake wear, and tire wear.

To account for rainfall, which naturally mitigates dust generation, the following equation was then applied:

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

where:

- E_{ext} = annual size-specific emission factor extrapolated for natural mitigation (lb/VMT);
- E = emission factor from Equation above; and
- P = number of days in a year with at least 0.01 inches (0.254 millimeters) of precipitation.

For paved roads, the following formula was used:

$$E_{ext} = \left[k \left(\frac{sL}{2} \right)^{0.65} \left(\frac{W}{3} \right)^{1.5} - C \right] \left(1 - \frac{P}{4N} \right)$$

where:

- E_{ext} = annual or other long-term average emission factor in the same units as k;
- k = particle size multiplier for particle size range and units of interest;
- sL = road surface silt loading (grams per square meter [g/m^2]);
- W = average weight (tons) of the vehicles traveling the road;
- C = emission factor for 1980s vehicle fleet exhaust, brake wear and tire wear;
- P = number of “wet” days with at least 0.01 inches (0.254 millimeters) of precipitation during the averaging period; and
- N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

For purposes of the above calculations, the following estimates and assumptions were made:

- Weight for passenger vehicles used by employees is two tons; average weight (full versus empty) for supply/delivery truck is ten tons; and average weight of resin truck (full versus empty) is 20 tons;
- Distance of unpaved roads is equal to 19 miles; speed limit of passenger vehicles is 35 mph and delivery and resin trucks are 15 mph;
- Resin trucks make 70 trips a year; delivery trucks make weekly trips (52 a year);
- For employees, it was assumed that 70 percent would be commuting from Casper, and 30 percent from Rawlins; 87 employees would carpool in 33 vehicles, driving 240 days each year (the number of work days, taking holidays and vacations into account);
- Emissions were calculated for the Operation phase only.