CHAPTER 3

EMISSIONS INVENTORY

Emissions Inventory Development

Future-Year Emissions

Future Year Controlled Emissions

EMISSIONS INVENTORY DEVELOPMENT

Sources of Emissions

There are a variety of activities that can contribute to PM_{10} emissions. These activities can be grouped into two general categories, stationary sources and mobile sources. Stationary sources can be further differentiated into "point" and "area" sources. Point sources have one or more permitted pieces of equipment in an identified fixed location. Area sources consist of numerous small facilities or stationary sources of emissions with locations that are not specifically identified in the emissions data base. Mobile sources can also be differentiated into two major categories, "on-road" and "other" mobile sources. On-road mobile sources include light-duty automobiles; light-, medium-, and heavy-duty trucks; and motorcycles. Examples of "other" mobile sources include aircraft, locomotives, mobile equipment, and off-road recreational vehicles.

Significant progress has been made since the adoption of the 94-CVSIP to improve the PM_{10} fugitive dust emissions inventory. The following sections summarize the progress and the results for a variety of projects related to emissions inventory improvement.

Fugitive Dust Inventory Updates

As part of the 1994 AQMP process, it was recognized that the fugitive dust inventory should be reviewed and revised, if necessary, prior to the development of the 1997 AQMP. Since that time, the District has participated in a number of fugitive dust emission projects, as well as following projects by other sponsors. Based on the results of these studies and more recent activity level information, the District has prepared updated 1995 fugitive dust emission inventories.

Best Available Control Measure (BACM) Working Group

The District, through the cooperative efforts of the BACM Working Group, embarked on an accelerated program to correct previously identified fugitive dust inventory deficiencies. The BACM Working Group is an ongoing task force comprised of representative from EPA Region IX, ARB, South Coast AQMD, San Joaquin Valley APCD, Great Basin APCD, Mojave Desert AQMD, Clark County Nevada, Washoe County Nevada, Maricopa County Arizona, Arizona Department of Environmental Quality, USDA Soil Conservation Service, Coachella Valley Association of Governments, and WESTAR (Western States Air Resources Council). The emission inventory projects included studies aimed at improving emission factors for such fugitive dust sources as paved roads and construction, as well as quantifying previously un-inventoried sources. Emission factors for entrained paved road dust and construction were significantly lower than previous estimates. Previously un-inventoried sources,

such as entrained leaf blower and unpaved shoulder dust, were generally found to be small contributors to the overall inventory.

PM_{10} Technical Enhancement Program (PTEP)

The results from three emission inventory projects from the District's PM_{10} Technical Enhancement Program (PTEP) have been used to update the fugitive dust inventory. The Fugitive Dust Integration project summarized previous inventory development and current and past emission factor studies. It also provided recommendations for the best available emission methodology, emission factors, and activity estimates for each fugitive dust category. These recommendations were used by District staff in the development of the fugitive dust inventory.

Emission Estimates for Non-Fugitive Dust Sources

For the purpose of estimating emissions from stationary, mobile, and natural sources, the most current data available for PM emission rates, PM_{10}/PM ratios, and source activity data were used in the calculations. Emissions data for major point sources (emissions greater than 10 tons per year of criteria pollutants) were obtained directly from the sources. For minor point sources and area sources, emission levels were estimated by using area wide activity levels, available socioeconomic data, and the results of special studies. Emissions from mobile sources were estimated using emission factors from the California Air Resources Board (ARB) model EMFAC7G, and activity data derived directly from the Transportation Demand Model for the South Coast Air Basin, and the Transportation Model TRANPLAN for the Coachella Valley.

Fugitive Dust Emission Estimates

Fugitive dust area source emission levels were estimated for the Coachella Valley. The area sources include building and road construction, entrained dust from paved and unpaved roads, landfill operations, windblown dust and farming operations. The fugitive dust baseline emission data presented in this chapter is based on average annual day emissions (i.e., total annual emissions divided by 365). The 1995 inventory was derived using emissions from the 1993 base year including the impact of District, ARB, and local municipality rules and regulations adopted by December 31, 1994. SCAG's demographic growth factors used to grow 1993 emissions to 1995 for each source category, as specified by the ARB. The updated 1995 fugitive dust inventory is much smaller (~19%) than the 1987 inventory reported in 1994-CVSIP. Overall, the full implementation of the 90-CVSIP control measures, coupled with reduced emission factors, activity levels for several categories, a smaller study, and more accurately defined study area and recessionary impacts have contributed to a lower fugitive dust emission estimate. ARB's methodologies were used to estimate the fugitive dust area source emissions; however, the latest emission factors and activity levels were used in these methodologies.

The Coachella Valley, as described for federal purposes and used in this Maintenance Plan, is approximately 35% of Riverside County's land area and approximately 77% of the study area reported in the 1994-CVSIP. The emissions inventory prepared for the previous SIP included the San Jacinto study area, in addition to the Coachella Valley. Where possible, emissions from the San Jacinto study area have been removed from the current inventory because this portion of the Salton Sea Air Basin is not within the official boundaries of the Coachella Valley as defined by District Rule 103. The improved emission factors for construction and entrained paved road dust (as developed through the efforts of the BACM Working Group) are significantly lower than previous estimates. Use of these lower emission factors along with the smaller study area and recessionary impacts on the construction activity resulted in emissions that are lower than previous reported for construction and entrained road dust.

Crop-specific acreage data for Coachella Valley were obtained from the County Agricultural Commissioner's Office and were used to estimate the activity for farming operations. In the 94-CVSIP, agricultural activity was estimated from the dollar value of the crops grown in the study area, not the actual crop acreage. This resulted in an inaccurate estimation of emissions. The use of crop-specific acreage data increased the accuracy of the current activity and emissions estimates.

Emissions due to windblown dust were estimated for the following sources; agricultural lands, unpaved roads and other disturbed lands. (Natural emissions from undisturbed lands are not included in this anthropogenic inventory.) Crop specific data were used to estimate the acreage of agricultural land subject to windblown dust. The more accurate crop data and the smaller study area again resulted in lower emissions than previously reported. The acreage of disturbed land was estimated as the sum of construction acreage, landfill/mining sites, and off-road vehicle activities and unpaved shoulders. Disturbed lands from off-road vehicles are difficult to estimate and are typically confined to specific locales. The miles of off-road activity were assumed to be equivalent to the miles of unpaved roads (city, county, BLM and USFS). The miles of unpaved roads were obtained from SCAG's Geographical Information System database. Mileage derived from the use of spatially-resolved data is deemed more accurate than the mileage previously reported. Miles of unpaved shoulders in the Coachella Valley were compiled for the BACM study of emissions from previously un-inventoried sources.

Landfill operations are a previously un-inventoried category The methodology to estimate the emissions from landfills was developed through the BACM Working Group. Landfill operations were found to be a small contributor to the overall base year inventory.

1995 Emissions Summary

Table 3-1 represents the annual average and 24-hour PM_{10} baseline emissions contributed by major source categories in 1995. Annual average estimates represent PM_{10} emission levels experienced on an average day while 24-hour values represent the PM_{10} emissions occurring on a worst-case windy day (wind speed exceeded 60 miles per hour). Specifically, the 24-hour values for windblown dust categories were calculated using a lognormal distribution to estimate wind events, and the AP-42 emission factor for windblown emissions from erodible surfaces Based on these calculations, it is estimated that 20 percent of the entire annual average emissions from windblown dust occur on one day when wind speeds exceed 60 miles per hour and a major desert dust storm occurs. The details of the calculations are presented in the 94-CVSIP. This analysis agrees with CMB results, which show that over 95% of the total loading on severe dust storm days is attributable to the geological component.

As indicated in Table 3-1, about 50 tons of PM_{10} were emitted on an average day in the Coachella Valley. Approximately 48 tons/day (~ 95% of the total) were fugitive dust emissions from wind erosion of disturbed sources, entrained road dust, construction and demolition activity, and farming operations. Windblown dust from disturbed desert soils accounts for ~11 tons per day; windblown dust from agricultural lands accounts for ~16 tons/day. About 1.6 tons of primary PM_{10} emissions are emitted by mobile sources in the study area, with heavy-duty diesel trucks accounting for over half of the total. However, mobile sources contribute to PM_{10} exceedances through entrained paved road dust (~9 tons per day) and entrained unpaved road dust (~5 tons per day).

FUTURE YEAR EMISSIONS

A future year (2010) emissions inventory was developed based on a specific set of projected growth rates for population, industry, and motor vehicle activity in the Coachella Valley. As discussed in Chapter 1, the year 2010 was selected because U.S. EPA guidance requires a Maintenance Plan to demonstrate future attainment of the standards for 10 years after redesignation. The projected growth rates were determined by the SCAG and are assigned to emission categories by ARB. This forecast presumes that no additional controls will be adopted for the Coachella Valley. Table 3-2 presents the future-year uncontrolled emissions inventory.

TABLE 3-1

1995 PM_{10} Emission Inventory by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
STATIONARY SOURCES - POINT SOURCES		
Fuel Combustion		
Other Mfg./Industrial	0.07	0.07
Other Service/Commerce	0.01	0.01
Residential	0.12	0.12
Total Fuel Combustion	**0.20**	**0.20**
Waste Burning		
Agricultural Debris	0.04	0.04
Range Management/other	0.03	0.03
Total Waste Burning	**0.07**	**0.07**
Industrial Processes		
Food & Agriculture	0.12	0.12
Mineral Processes	0.0	0.0
Metal Processes	0.0	0.0
Wood & Paper	0.10	0.10
Total Industrial Processes	**0.22**	**0.22**
Total Point Sources	**0.49**	**0.49**
STATIONARY SOURCES - AREA SOURCES		
Farming Operation	1.02	1.02
Construction & Demolition	1.34	1.34
Entrained Road Dust/Paved	9.27	9.27
Entrained Road Dust/Unpaved	5.44	5.44
Unplanned Fires	0.03	0.03
Municipal Solid Waste Disposal	0.02	0.02
Windblown Dust: Ag. Land	15.95	1,164.3
Windblown Dust: Dist. Land	11.15	813.9
Windblown Dust: Unpaved Roads	4.21	307.3
Total Area Sources	**48.43**	**2,302.62**
Total Stationary Sources	**48.92**	**2,303.11**

TABLE 3-1 (Continued)

1995 PM_{10} Emission Inventory by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
MOBILE SOURCES		
On-Road Vehicles		
Light-Duty Passenger	0.23	0.23
Lt.- & Med.- Duty Trucks	0.08	0.08
Heavy-Duty Gas Trucks	0.03	0.03
Heavy-Duty Diesel Trucks	1.03	1.03
Total On-Road Vehicles	**1.38**	**1.38**
Other Mobile		
Off-Road	0.02	0.02
Trains	0.15	0.15
Aircraft/Government	0.0	0.0
Aircraft/Other	0.0	0.0
Mobile Equipment	0.07	0.07
Utility Equipment	0.01	0.01
Total Other Mobile	**0.26**	**0.26**
Total Mobile Sources	**1.64**	**1.64**
Total All Sources	**50.56**	**2,304.75**

TABLE 3-2

2010 PM_{10} Emission Inventory by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
STATIONARY SOURCES - POINT SOURCES		
Fuel Combustion		
Other Mfg./Industrial	0.10	0.10
Other Service/Commerce	0.01	0.01
Residential	0.22	0.22
Total Fuel Combustion	**0.34**	**0.34**
Waste Burning		
Agricultural Debris	0.04	0.04
Range Management/other	0.03	0.03
Total Waste Burning	**0.07**	**0.07**
Industrial Processes		
Food & Agriculture	0.14	0.14
Mineral Processes	0.00	0.00
Metal Processes	0.00	0.00
Wood & Paper	0.12	0.12
Total Industrial Processes	**0.27**	**0.27**
Total Point Sources	**0.68**	**0.68**
STATIONARY SOURCES - AREA SOURCES		
Farming Operation	0.87	0.87
Construction & Demolition	2.20	2.20
Entrained Road Dust/Paved	12.80	12.80
Entrained Road Dust/Unpaved	5.44	5.44
Unplanned Fires	0.04	0.04
Municipal Solid Waste Disposal	0.03	0.03
Windblown Dust: Ag. Land	15.95	1,164.3
Windblown Dust: Dist. Land	11.15	813.9
Windblown Dust: Unpaved Roads	4.21	307.3
Total Area Sources	**52.69**	**2,306.88**
Total Stationary Sources	**53.37**	**2,307.56**

TABLE 3-2 (Continued)

2010 PM_{10} Emission Inventory by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
MOBILE SOURCES		
On-Road Vehicles		
Light-Duty Passenger	0.24	0.24
Lt.- & Med.- Duty Trucks	0.09	0.09
Heavy-Duty Gas Trucks	0.06	0.06
Heavy-Duty Diesel Trucks	0.54	0.54
Total On-Road Vehicles	**0.93**	**0.93**
Other Mobile		
Off-Road	0.04	0.04
Trains	0.15	0.15
Aircraft/Government	0.00	0.01
Aircraft/Other	0.00	0.00
Mobile Equipment	0.10	1.00
Utility Equipment	0.01	0.01
Total Other Mobile	**0.30**	**0.30**
Total Mobile Sources	**1.27**	**1.27**
Total All Sources	**54.64**	**2,308.83**

FUTURE YEAR CONTROLLED EMISSIONS

A future year (2010) controlled emissions inventory was developed based on implementation of an enhanced street sweeping program in the Coachella Valley. [Note that the modeling demonstration also accounts for the reduction in the transport of secondary PM_{10} emissions from the South Coast Air Basin due to the projected decreases in PM_{10} levels there.] The following paragraphs described the emission reductions. The remaining emissions in 2010 after the implementation of future controls are presented in Table 3-3.

Enhanced Street Sweeping Program

Previous studies have documented that routine street sweeping is not effective in reducing ambient PM_{10} concentrations and, in fact, broom sweepers resuspend as many particles as they remove.[1] A recent study, however, documented that vacuum-based, PM_{10}-efficient street sweepers represented an 80 percent reduction in resuspended PM_{10} emissions when compared with mechanical broom sweepers. The study also documented that these PM_{10}-efficient street sweepers removed 99 percent of street surface silt loading.[2] Together, the reduction in resuspended emissions and improved collection efficiency of PM_{10}-efficient street sweepers is estimated to result in a control effectiveness of 79 percent on the day of street sweeping (.99 x .80 = 79%). Presuming that street silt loading returns to equilibrium 3 days after they are cleaned, the control effectiveness for days 2 and 3 is estimated at 53 and 26 percent, respectively (based on a linear interpolation). If street sweeping occurs an average of twice per month (24 days/year) the overall control effectiveness of the measure is estimated at 10 percent [(.79 x 24 + .53 x 24 x .26 x 24)/365 = .10]. The enhanced street sweeping program is targets higher use roadways, therefore, the control factor is only applied to collector and major streets in the Coachella Valley.

Transport of Secondary Emissions

Transport of secondary particulates and emissions into the Coachella Valley from the South Coast Air Basin is expected to decrease through the year 2010 due to control in that area. The District's 1997 AQMP outlines an overall control strategy that will ultimately achieve ambient air quality standards in the South Coast Air Basin. Short- and intermediate-term measures are proposed that make use of available technologies and management practices between the years 1997 and 2005. These measures are designed to satisfy the federal Clean Air Act requirement of reasonably available control technologies and the California Clean Air Act. Long-term measures will rely on the advancement of technologies and control methods that can be reasonably be expected to occur between 2000 and 2010. The impact of these controls will reduce the amount of transported particulates into the Coachella Valley. A full discussion of the emissions that originate in the South Coast Air Basin can be found in the 1997 AQMP (Chapter 3 and Appendix III).

[1] Chow, et. al., Evaluation of Regenerative-Air Vacuum Street Sweeping on Geologic Contributions to PM_{10}, Desert Research Institute, 1989.

[2] CE-CERT (UC Riverside, College of Engineering - Center for Environmental Research and Technology), Measurement of Street Sweeper Collection Efficiency and PM_{10} Generation, 1995.

TABLE 3-3

2010 PM_{10} Controlled Emission Inventories by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
STATIONARY SOURCES - POINT SOURCES		
Fuel Combustion		
Other Mfg./Industrial	0.10	0.10
Other Service/Commerce	0.01	0.01
Residential	0.22	0.22
Total Fuel Combustion	**0.34**	**0.34**
Waste Burning		
Agricultural Debris	0.04	0.04
Range Management/other	0.03	0.03
Total Waste Burning	**0.07**	**0.07**
Industrial Processes		
Food & Agriculture	0.14	0.14
Mineral Processes	0.00	0.00
Metal Processes	0.00	0.00
Wood & Paper	0.12	0.12
Total Industrial Processes	**0.27**	**0.27**
Total Point Sources	**0.68**	**0.68**
STATIONARY SOURCES - AREA SOURCES		
Farming Operation	0.87	0.87
Construction & Demolition	2.20	2.20
Entrained Road Dust/Paved	11.76	11.76
Entrained Road Dust/Unpaved	5.44	5.44
Unplanned Fires	0.04	0.04
Municipal Solid Waste Disposal	0.03	0.03
Windblown Dust: Ag. Land	15.95	1,164.30
Windblown Dust: Dist. Land	11.15	813.90
Windblown Dust: Unpaved Roads	4.21	307.30
Total Area Sources	**51.65**	**2,305.84**
Total Stationary Sources	**52.33**	**2,306.52**

TABLE 3-3 (Continued)

2010 PM_{10} Controlled Emission Inventory by Major Source Category
Coachella Valley Study Area
(tons/day)

Source Category	Ann. Avg.	24-hour
MOBILE SOURCES		
On-Road Vehicles		
Light-Duty Passenger	0.23	0.23
Lt.- & Med.- Duty Trucks	0.08	0.08
Heavy-Duty Gas Trucks	0.06	0.06
Heavy-Duty Diesel Trucks	0.54	0.54
Total On-Road Vehicles	**0.91**	**0.91**
Other Mobile		
Off-Road	0.04	0.04
Trains	0.15	0.15
Aircraft/Government	0.00	0.00
Aircraft/Other	0.00	0.00
Mobile Equipment	0.10	0.10
Utility Equipment	0.01	0.01
Total Other Mobile	**0.30**	**0.30**
Total Mobile Sources	**1.21**	**1.21**
Total All Sources	**53.54**	**2,307.72**