

5. Onroad Mobile Sources

5.1 Introduction

Onroad mobile source emissions have been calculated for particulate matter for the 2008 Periodic Emissions Inventory for the Maricopa County area. For the purposes of this particulate matter inventory, the following pollutants were included: PM₁₀, PM_{2.5}, nitrogen oxides (NO_x), sulfur dioxides (SO₂), and ammonia (NH₃). PM₁₀ refers to all particles less than or equal to 10 micrometers in diameter and PM_{2.5} refers to particles less than or equal to 2.5 micrometers in diameter.

Onroad mobile source emissions were estimated for the PM₁₀ nonattainment area (NAA) (approximately 3,000 sq. mi.), as well as for Maricopa County (approximately 9,000 sq. mi.). Emission factors were calculated using the Motor Vehicle Emission Simulator (MOVES2010a) model, the most recent model developed by the U.S. EPA for the purpose of estimating motor vehicle emission factors, and AP-42, which is the EPA Compilation of Air Pollutant Emission Factors. AP-42 emission factors were used to calculate fugitive dust emissions, while MOVES2010a was used to estimate emissions from exhaust, tire wear, and brake wear.

The MOVES2010a modeling accounted for the oxygenated fuel and the Arizona Vehicle Inspection/Maintenance (I/M) programs applied in Maricopa County in 2008. The fuel use assumptions, including oxygen content and Reid Vapor Pressure (RVP), were derived from the 2008 fuel inspection results provided by the Arizona Department of Weights and Measures.

In order to develop the 2008 onroad mobile source emissions, the 2008 vehicle miles of travel (VMT) estimates by facility type and road type were derived from the 2008 Highway Performance Monitoring System (HPMS) data provided by the Arizona Department of Transportation (ADOT). The distribution of VMT by vehicle type is based on the July 2008 vehicle registration data for Maricopa County provided by ADOT. The VMT by vehicle type was provided as local input data for MOVES2010a to produce onroad exhaust, tire wear, and brake wear emissions.

Paved road fugitive dust emission estimates were derived from the AP-42 equation published by EPA in January 2011. The 2008 VMTs for freeways, high traffic arterials, and low traffic arterials were derived from the 2008 traffic assignment produced by the MAG travel demand model. Low traffic arterials carry less than 10,000 vehicles on an average weekday, while high traffic arterials carry 10,000 or more vehicles on an average weekday. These traffic assignment VMTs were normalized to 2008 HPMS VMTs and multiplied by the appropriate particulate emission factors derived from the AP-42 equation for paved roads. The 2008 benefits of the committed measures in the MAG 2007 Five Percent Plan for the Maricopa County PM₁₀ Nonattainment Area (MAG, 2007) were applied to estimate 2008 paved road particulate emissions for the PEI.

Unpaved road VMT was derived from the MAG 2009 Unpaved Road Inventory (MAG, 2010). Unpaved alley VMT was derived from a GIS analysis of 2009 aerial photographs conducted by MAG. The unpaved road and alley VMTs were multiplied by the appropriate AP-42 emission factors. The 2008 benefits of the committed measures in the MAG 2007 Five Percent Plan were applied to estimate 2008 unpaved road and alley particulate emissions for this inventory.

The main references for preparing the onroad mobile source portion of the 2008 emissions inventory were:

- Emission Inventory Requirements for Ozone State Implementation Plans (EPA, 1991);
- Procedures for Emission Inventory Preparation Volume IV: Mobile Sources (EPA, 1992a);
- Compilation of Air Pollutant Emissions Factors, AP-42 (EPA, 2006);
- Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity (EPA, 2010a);
- User's Guide for the SMOKE-MOVES Integration Tool (EPA, 2010b); and
- Motor Vehicle Emission Simulator (MOVES) - User Guide for MOVES2010a, (EPA, 2010c).

5.2 Exhaust, tire wear, and brake wear emissions

Vehicle exhaust emission factors for PM₁₀, PM_{2.5}, NO_x, SO₂, and NH₃, as well as tire wear and brake wear emission factors for PM₁₀ and PM_{2.5}, were calculated using MOVES2010a. The exhaust PM₁₀ and PM_{2.5} estimates include the components of sulfate and carbon (organic and elemental). The MOVES2010a runs were executed by MAG. The contact person for the MOVES2010a emission estimates is Ieesuck Jung (602-254-6300).

5.2.1 MOVES2010a model

The emissions not related to fugitive dust were calculated using MOVES2010a, the U.S. EPA's state-of-the-art emissions modeling tool, which replaces EPA's previous mobile source emissions model, MOBILE6.2. MOVES2010a is intended for official use to estimate national, state, and county level inventories of criteria air pollutants from highway vehicles. The user of MOVES2010a is allowed to specify vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types for the particular scenario to be modeled by creating a Run Specification (RunSpec).

In order to calculate vehicle emissions for the calendar year 2008, MOVES2010a was executed using local input data for each month of the year and each geographical area (Maricopa County and the PM₁₀ NAA). Each scenario was created using the County Domain/Scale and the Inventory Calculation Type. The specific MOVES2010a model RunSpec and RunSpec summaries are described in Appendix 5.

5.2.2 MOVES2010a local input data

Compared with MOBILE6.2, MOVES2010a requires a more detailed level of local data, including fuel data, I/M program, meteorological data, vehicle population, source type age distribution, annual VMT, monthly/daily/hourly VMT fractions, road type distribution, average speed distribution, and ramp fraction.

5.2.2.1 Fuel data

Regarding the fuel local input data, MOVES2010a provides two MOVES tables, which are [fuelsupply] and [fuelformulation]. The fuel data for each month were derived from the 2008 fuel inspection results in Maricopa County provided by the Arizona Department of Weights and Measures. The fuel data for Maricopa County were also applied to the PM₁₀ NAA. The specific MOVES tables for fuel data are presented in Appendix 5.

5.2.2.2 I/M programs

MOVES2010a has an [IMCoverage] table for I/M programs; this table was prepared using MOBILE6.2 input. This table reflects the actual proportions of vehicles subject to the specified levels of inspection. The term “I/M vehicles” denotes vehicles which are required to undergo an emission test and/or inspection under the Vehicle Inspection/Maintenance Program. It is important to note that participation in the I/M program is required for all vehicles registered in the PM₁₀ NAA, with the exception of certain model years and vehicle classes. However, it is assumed that 91.6 percent of the vehicles operating within the PM₁₀ NAA and Maricopa County participate in the I/M program and the remaining 8.4 percent do not participate in the program. These percentages reflect the control measures “Tougher Enforcement of Vehicle Registration and Emissions Test Compliance” and “Expansion of Area A Boundaries,” described in the MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area (MAG, 2009). This percentage is directly applied to the Compliance Factor in the [IMCoverage] table. The same I/M programs were applied for Maricopa County and the PM₁₀ NAA. The specific MOVES table for I/M programs is presented in Appendix 5.

5.2.2.3 Meteorological data

MOVES2010a requires hourly temperature and relative humidity data by specific month of the year. Meteorological data for the Phoenix Sky Harbor International Airport in 2008 were obtained from the National Climatic Data Center (http://www7.ncdc.noaa.gov/IPS/lcd/lcd.html?page=1&state=AZ&wban=23183&_target2=Next+%3E). The same hourly average temperature and relative humidity data for each month were applied for Maricopa County and the PM₁₀ NAA. The specific MOVES table [ZoneMonthHour] for meteorological data is presented in Appendix 5.

5.2.2.4 Vehicle population

In order to capture start, evaporative, and extended idle emissions, MOVES2010a introduced a new mobile source emission category called off-network emissions. In MOVES2010a, these off-network emissions are directly determined by the population of vehicles in an area. The vehicle population in Maricopa County was obtained from the July 2008 vehicle registration data provided by ADOT. The vehicle population data were allocated to the 28 MOBILE6.2 vehicle types based on MOBILE6.2 VMT fractions for 2008. Then, the vehicle population data allocated to the 28 MOBILE6.2 vehicle types were assigned to the 13 MOVES source types using the match-up table (Table A.1) in the EPA’s technical guidance (EPA, 2010a). The vehicle population in the PM₁₀ NAA was estimated by applying the population ratio of the two geographical areas to the vehicle population in Maricopa County. The population ratio for 2008 was derived from the MAG socioeconomic data, which is 4,005,000 people for the PM₁₀ NAA and 3,988,000 people for Maricopa County. The specific MOVES table [SourceTypeYear] for vehicle population is presented in Appendix 5.

5.2.2.5 Source type age distribution

MOVES2010a categorizes vehicles according to different vehicle classes and model years. The source type age distribution was prepared using EPA's data converter that takes the registration distribution input file created for MOBILE6.2 and converts it to the appropriate MOVES age distribution input table [SourceTypeAgeDistribution]. The same source type age distribution was applied for Maricopa County and the PM₁₀ NAA. The specific MOVES table for source type age distribution is presented in Appendix 5.

5.2.2.6 Annual VMT

The 2008 daily VMTs by facility type were used to estimate onroad exhaust, tire wear, and brake wear emissions. The 2008 VMT distributions by facility type for the PM₁₀ NAA and Maricopa County were obtained from the 2008 Maricopa County Estimates of Daily Vehicle Travel by Highway Functional Classification provided by ADOT. The 2008 VMT distributions were multiplied by the 2008 HPMS VMT for the PM₁₀ NAA and Maricopa County. The resultant VMT estimates by facility type for the PM₁₀ NAA and Maricopa County are shown in Table 5.2-1.

Table 5.2-1. 2008 daily VMT by facility type (annual average daily traffic).

Facility Type		PM ₁₀ NAA (thousand miles/day)	Maricopa County (thousand miles/day)
Rural	Interstate	2,581	3,223
	Other Principal Arterial	1,035	1,293
	Minor Arterial	529	661
	Major Collector	1,347	1,682
	Minor Collector	164	205
	Local	630	787
Urban	Interstate	10,606	10,939
	Other Freeway/Expressway	19,158	19,760
	Other Principal Arterial	21,961	22,651
	Minor Arterial	14,476	14,930
	Collector	4,717	4,865
	Local	9,949	10,261
Totals:		87,153	91,257

Since MOVES2010a requires annual VMTs by HPMS vehicle type as a local input, the daily VMTs by HPMS vehicle type were derived from the 2008 traffic assignment data provided by the MAG Transportation Modeling Group in March 2011 and the daily VMTs by facility type and the estimated percentages of daily vehicle travel by vehicle type and highway functional classification provided by ADOT. Then, the daily VMTs by HPMS vehicle type were multiplied by 366 days to obtain the annual VMTs by HPMS vehicle type. The specific MOVES table [HPMSvTypeYear] for annual VMT is presented in Appendix 5.

5.2.2.7 Road type distribution

MOVES2010a requires the distribution of VMTs by road type as a local input. The road type VMT distribution by HPMS vehicle type was derived from the 2008 traffic assignment data and the daily VMTs by HPMS vehicle type mentioned in the previous section. As suggested in EPA's technical guidance (EPA, 2010a), the same road type distribution by HPMS vehicle type was used for all MOVES source types within an HPMS vehicle class. The specific MOVES table [RoadTypeDistribution] for road type distribution is presented in Appendix 5.

5.2.2.8 VMT fraction

Since VMT varies by month, day of week, and hour, MOVES2010a requires month/day/hour VMT fractions as a local input in order to derive hourly VMT for each weekday/weekend and month from the annual VMT. The month/day/hour VMT fractions were developed from data recorded by continuous traffic counters on freeways (ADOT Freeway Management System) and arterials (Phoenix Automatic Traffic Recorders) during the year 2007. The specific MOVES tables [MonthVMTFraction], [DayVMTFraction], and [HourVMTFraction] for VMT fractions are presented in Appendix 5.

5.2.2.9 Average speed distribution

In MOVES2010a, vehicle power, speed, and acceleration have a significant effect on vehicle emissions for all pollutants. MOVES2010a estimates those emission effects by assigning activity to operating mode distributions, which are determined by the distribution of vehicle hours traveled (VHT) by average speed. As recommended in EPA's technical guidance (EPA, 2010a), local estimates of average speed were developed by post-processing the output from the 2008 traffic assignment data provided by the MAG Transportation Modeling Group in March 2011. To develop the average speed distribution, VHTs in sixteen speed bins were accumulated separately for each hour of the day, source type, and road type in Maricopa County. Then, the average speed distribution was calculated by normalizing VHTs in sixteen speed bins for each hour of the day, source type, and road type. The same methodology was applied to develop the speed estimates for the PM₁₀ NAA. The specific MOVES table [AvgSpeedDistribution] for the average speed distribution is presented in Appendix 5.

5.2.2.10 Ramp fraction

MOVES2010a requires the ramp fraction, which represents the percent of VHT on ramps, on both rural restricted roads (road type 2) and urban restricted roads (road type 4). The fraction of VHT on ramps was derived by dividing the total VHTs on ramps by the total VHTs for each restricted road type. Those VHTs were obtained from the 2008 traffic assignment data provided by the MAG Transportation Modeling Group in March 2011. The specific MOVES table [RoadType] for ramp fractions is presented in Appendix 5.

5.2.3 MOVES2010a outputs

MOVES2010a was executed with the RunSpec files described in Appendix 5 to obtain exhaust, tire wear, and brake wear emissions for PM₁₀, PM_{2.5}, NO_x, SO₂, and NH₃. These values were obtained for the following twelve vehicle classes: light duty gasoline vehicles (LDGV), light duty gasoline trucks 1 & 2 (LDGT1), light duty gasoline trucks 3 and 4 (LDGT2), heavy duty gasoline vehicles 2B thru 8B and gasoline buses (HDGV), motorcycles (MC), light duty diesel vehicles (LDDV), light duty diesel trucks 1 thru 4 (LDDT), heavy duty diesel vehicles class 2B (2BHDDV), heavy duty diesel vehicles class 3, 4, and 5 (LHDDV), heavy duty diesel vehicles class 6 and 7 (MHDDV), heavy duty diesel vehicles class 8A and 8B (HHDDV), and heavy duty diesel buses (BUSES); by the following thirteen facility types: rural interstate, rural principal arterial, rural minor arterial, rural major collector, rural minor collector, rural local, urban interstate, urban freeway/expressway, urban principal arterial, urban minor arterial, urban collector, urban local, and off-network, which was newly added in MOVES2010a; by weekdays and weekend days; by month.

5.2.4 MOVES2010a emission estimates

MOVES2010a was used to generate onroad emissions by vehicle class, facility type, weekdays/weekend days, and month. The annual emissions were calculated by aggregating monthly on-road emissions derived by adding monthly weekday emissions, which is the product of daily weekday emissions estimated by MOVES2010a and the number of weekdays for a given month, and monthly weekend emissions, which is the product of daily weekend emissions estimated by MOVES2010a and the number of weekend days for a given month. The average daily emissions were calculated by dividing the annual emissions by 366 days.

Tables 5.2–2 and 5.2–3 show the calculated annual and average daily PM₁₀, PM_{2.5}, NO_x, SO₂, and NH₃ emissions by facility type and vehicle class in the PM₁₀ NAA and Maricopa County, respectively. Emission estimates for PM₁₀ and PM_{2.5} in these tables represent exhaust, tire wear, and brake wear emissions.

Table 5.2–2. Annual and average daily onroad mobile source emissions by facility type and vehicle class in the PM₁₀ NAA.

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Rural Interstate	LDGV	2201001110	4.03	2.36	113.80	1.39	8.47	PM ₁₀	PM _{2.5}	621.8	7.6	46.3
	LDGT1	2201020110	9.97	6.47	416.37	3.27	15.05	54.5	35.3	2,275.3	17.9	82.2
	LDGT2	2201040110	5.13	3.33	214.49	1.68	7.75	28.1	18.2	1,172.1	9.2	42.4
	HDGV	2201070110	2.16	1.30	116.05	0.71	2.44	11.8	7.1	634.1	3.9	13.4
	MC	2201080110	0.27	0.24	6.28	0.05	0.34	1.5	1.3	34.3	0.3	1.9
	LDDV	2230001110	0.05	0.05	0.73	0.00	0.01	0.3	0.2	4.0	0.0	0.0
	LDDT	2230060110	1.69	1.58	26.36	0.02	0.19	9.2	8.6	144.0	0.1	1.0
	2BHDDV	2230071110	0.71	0.66	11.70	0.01	0.08	3.9	3.6	63.9	0.1	0.5
	LHDDV	2230072110	4.12	3.85	62.48	0.05	0.44	22.5	21.1	341.4	0.3	2.4
	MHDDV	2230073110	14.60	13.06	299.34	0.24	0.99	79.8	71.4	1,635.7	1.3	5.4
HHDDV	2230074110	46.97	42.91	1,072.87	0.84	2.54	256.7	234.5	5,862.7	4.6	13.9	
BUSES	2230075110		2.08	1.90	43.45	0.02	0.08	11.3	10.4	237.4	0.1	0.5
Rural Principal Arterial	LDGV	2201001130	4.47	2.00	99.90	1.25	6.86	24.4	10.9	545.9	6.9	37.5
	LDGT1	2201020130	6.17	3.02	206.39	1.67	6.98	33.7	16.5	1,127.8	9.1	38.2
	LDGT2	2201040130	3.18	1.55	106.32	0.86	3.60	17.4	8.5	581.0	4.7	19.7
	HDGV	2201070130	1.03	0.52	40.56	0.27	0.99	5.6	2.9	221.6	1.5	5.4
	MC	2201080130	0.43	0.36	11.30	0.09	0.56	2.3	2.0	61.8	0.5	3.1
	LDDV	2230001130	0.04	0.03	0.76	0.00	0.00	0.2	0.2	4.2	0.0	0.0
	LDDT	2230060130	0.94	0.85	15.35	0.01	0.09	5.1	4.7	83.9	0.1	0.5
	2BHDDV	2230071130	0.40	0.36	6.84	0.01	0.04	2.2	2.0	37.4	0.0	0.2
	LHDDV	2230072130	2.29	2.09	36.25	0.03	0.20	12.5	11.4	198.1	0.1	1.1
	MHDDV	2230073130	3.51	3.04	62.16	0.05	0.21	19.2	16.6	339.7	0.3	1.2
HHDDV	2230074130	10.16	9.00	188.59	0.15	0.44	55.5	49.2	1,030.6	0.8	2.4	
BUSES	2230075130		0.86	0.76	15.40	0.01	0.03	4.7	4.2	84.1	0.0	0.2

Table 5.2–2. Annual and average daily onroad mobile source emissions by facility type and vehicle class in the PM₁₀ NAA (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Rural Minor Arterial	LDGV	2201001150	4.34	1.94	97.07	1.22	6.66	23.7	10.6	530.4	6.7	36.4
	LDGT1	2201020150	5.99	2.93	200.55	1.62	6.79	32.7	16.0	1,095.9	8.9	37.1
	LDGT2	2201040150	3.09	1.51	103.31	0.83	3.50	16.9	8.3	564.6	4.6	19.1
	HDGV	2201070150	1.00	0.51	39.41	0.26	0.96	5.5	2.8	215.4	1.4	5.2
	MC	2201080150	0.42	0.35	10.98	0.09	0.55	2.3	1.9	60.0	0.5	3.0
	LDDV	2230001150	0.04	0.03	0.74	0.00	0.00	0.2	0.2	4.1	0.0	0.0
	LDDT	2230060150	0.91	0.83	14.92	0.01	0.08	5.0	4.5	81.5	0.1	0.5
	2BHDDV	2230071150	0.39	0.35	6.64	0.00	0.04	2.1	1.9	36.3	0.0	0.2
	LHDDV	2230072150	2.23	2.03	35.23	0.03	0.20	12.2	11.1	192.5	0.1	1.1
	MHDDV	2230073150	3.41	2.96	60.40	0.05	0.21	18.7	16.2	330.1	0.3	1.1
HHDDV	2230074150	9.87	8.75	183.26	0.14	0.43	54.0	47.8	1,001.4	0.8	2.3	
BUSES	2230075150	0.83	0.74	14.96	0.01	0.03	4.6	4.1	81.8	0.0	0.2	
Rural Major Collector	LDGV	2201001170	0.81	0.36	18.09	0.23	1.24	4.4	2.0	98.9	1.2	6.8
	LDGT1	2201020170	1.12	0.55	37.38	0.30	1.27	6.1	3.0	204.3	1.6	6.9
	LDGT2	2201040170	0.58	0.28	19.26	0.16	0.65	3.1	1.5	105.2	0.8	3.6
	HDGV	2201070170	0.19	0.09	7.35	0.05	0.18	1.0	0.5	40.1	0.3	1.0
	MC	2201080170	0.08	0.06	2.05	0.02	0.10	0.4	0.4	11.2	0.1	0.6
	LDDV	2230001170	0.01	0.01	0.14	0.00	0.00	0.0	0.0	0.8	0.0	0.0
	LDDT	2230060170	0.17	0.15	2.78	0.00	0.02	0.9	0.8	15.2	0.0	0.1
	2BHDDV	2230071170	0.07	0.07	1.24	0.00	0.01	0.4	0.4	6.8	0.0	0.0
	LHDDV	2230072170	0.42	0.38	6.57	0.00	0.04	2.3	2.1	35.9	0.0	0.2
	MHDDV	2230073170	0.64	0.55	11.26	0.01	0.04	3.5	3.0	61.5	0.0	0.2
HHDDV	2230074170	1.84	1.63	34.16	0.03	0.08	10.1	8.9	186.7	0.1	0.4	
BUSES	2230075170	0.16	0.14	2.79	0.00	0.01	0.9	0.8	15.2	0.0	0.0	
Rural Minor Collector	LDGV	2201001190	0.19	0.08	4.19	0.05	0.29	1.0	0.5	22.9	0.3	1.6
	LDGT1	2201020190	0.26	0.13	8.65	0.07	0.29	1.4	0.7	47.3	0.4	1.6
	LDGT2	2201040190	0.13	0.07	4.46	0.04	0.15	0.7	0.4	24.4	0.2	0.8
	HDGV	2201070190	0.04	0.02	1.70	0.01	0.04	0.2	0.1	9.3	0.1	0.2
	MC	2201080190	0.02	0.02	0.47	0.00	0.02	0.1	0.1	2.6	0.0	0.1
	LDDV	2230001190	0.00	0.00	0.03	0.00	0.00	0.0	0.0	0.2	0.0	0.0
	LDDT	2230060190	0.04	0.04	0.64	0.00	0.00	0.2	0.2	3.5	0.0	0.0
	2BHDDV	2230071190	0.02	0.02	0.29	0.00	0.00	0.1	0.1	1.6	0.0	0.0
	LHDDV	2230072190	0.10	0.09	1.52	0.00	0.01	0.5	0.5	8.3	0.0	0.0
	MHDDV	2230073190	0.15	0.13	2.61	0.00	0.01	0.8	0.7	14.2	0.0	0.0
HHDDV	2230074190	0.43	0.38	7.91	0.01	0.02	2.3	2.1	43.2	0.0	0.1	
BUSES	2230075190	0.04	0.03	0.65	0.00	0.00	0.2	0.2	3.5	0.0	0.0	
Rural Local	LDGV	2201001210	1.96	0.88	43.76	0.55	3.00	10.7	4.8	239.1	3.0	16.4
	LDGT1	2201020210	2.70	1.32	90.41	0.73	3.06	14.8	7.2	494.0	4.0	16.7
	LDGT2	2201040210	1.39	0.68	46.57	0.38	1.58	7.6	3.7	254.5	2.1	8.6
	HDGV	2201070210	0.45	0.23	17.77	0.12	0.43	2.5	1.3	97.1	0.7	2.4
	MC	2201080210	0.19	0.16	4.95	0.04	0.25	1.0	0.9	27.0	0.2	1.4
	LDDV	2230001210	0.02	0.01	0.33	0.00	0.00	0.1	0.1	1.8	0.0	0.0
	LDDT	2230060210	0.41	0.37	6.73	0.00	0.04	2.2	2.0	36.7	0.0	0.2
	2BHDDV	2230071210	0.17	0.16	3.00	0.00	0.02	1.0	0.9	16.4	0.0	0.1
	LHDDV	2230072210	1.00	0.92	15.88	0.01	0.09	5.5	5.0	86.8	0.1	0.5
	MHDDV	2230073210	1.54	1.33	27.23	0.02	0.09	8.4	7.3	148.8	0.1	0.5
HHDDV	2230074210	4.45	3.94	82.61	0.06	0.19	24.3	21.6	451.4	0.4	1.1	
BUSES	2230075210	0.38	0.33	6.74	0.00	0.01	2.1	1.8	36.9	0.0	0.1	

Table 5.2–2. Annual and average daily onroad mobile source emissions by facility type and vehicle class in the PM₁₀ NAA (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Urban Interstate	LDGV	2201001230	34.07	19.77	826.32	10.12	59.49	186.2	108.0	4,515.4	55.3	325.1
	LDGT1	2201020230	61.65	38.52	2,159.31	17.31	76.76	336.9	210.5	11,799.5	94.6	419.4
	LDGT2	2201040230	31.76	19.84	1,112.37	8.92	39.54	173.6	108.4	6,078.5	48.7	216.1
	HDGV	2201070230	13.64	7.78	662.41	4.08	12.90	74.5	42.5	3,619.7	22.3	70.5
	MC	2201080230	4.11	3.60	78.03	0.65	4.24	22.4	19.6	426.4	3.5	23.2
	LDDV	2230001230	0.43	0.38	5.36	0.01	0.04	2.4	2.1	29.3	0.0	0.2
	LDDT	2230060230	9.50	8.78	145.30	0.12	0.92	51.9	48.0	794.0	0.6	5.1
	2BHDDV	2230071230	4.02	3.70	64.53	0.05	0.41	21.9	20.2	352.6	0.3	2.3
	LHDDV	2230072230	23.20	21.48	344.36	0.27	2.17	126.8	117.4	1,881.8	1.5	11.8
	MHDDV	2230073230	84.59	74.53	1,618.55	1.29	5.20	462.2	407.3	8,844.5	7.1	28.4
	HHDDV	2230074230	238.30	214.02	4,871.28	3.82	11.30	1,302.2	1,169.5	26,619.0	20.9	61.7
	BUSES	2230075230	18.04	16.38	348.55	0.19	0.65	98.6	89.5	1,904.6	1.0	3.5
Urban Freeway And Expressway	LDGV	2201001250	35.75	20.74	866.95	10.62	62.41	195.3	113.3	4,737.5	58.0	341.0
	LDGT1	2201020250	64.69	40.41	2,265.51	18.16	80.53	353.5	220.8	12,379.8	99.2	440.1
	LDGT2	2201040250	33.32	20.82	1,167.08	9.35	41.49	182.1	113.8	6,377.5	51.1	226.7
	HDGV	2201070250	14.31	8.16	694.98	4.28	13.53	78.2	44.6	3,797.7	23.4	74.0
	MC	2201080250	4.31	3.77	81.87	0.68	4.45	23.6	20.6	447.4	3.7	24.3
	LDDV	2230001250	0.45	0.40	5.63	0.01	0.04	2.5	2.2	30.7	0.0	0.2
	LDDT	2230060250	9.97	9.21	152.44	0.12	0.97	54.5	50.3	833.0	0.7	5.3
	2BHDDV	2230071250	4.21	3.88	67.70	0.05	0.43	23.0	21.2	370.0	0.3	2.4
	LHDDV	2230072250	24.34	22.53	361.30	0.28	2.27	133.0	123.1	1,974.3	1.5	12.4
	MHDDV	2230073250	88.75	78.19	1,698.15	1.36	5.45	485.0	427.3	9,279.5	7.4	29.8
	HHDDV	2230074250	250.02	224.55	5,110.85	4.00	11.85	1,366.2	1,227.0	27,928.1	21.9	64.8
	BUSES	2230075250	18.92	17.19	365.69	0.20	0.68	103.4	93.9	1,998.3	1.1	3.7
Urban Principal Arterial	LDGV	2201001270	112.79	45.15	1,898.68	24.98	123.71	616.3	246.7	10,375.3	136.5	676.0
	LDGT1	2201020270	150.63	61.39	3,540.67	31.15	114.87	823.1	335.5	19,347.9	170.2	627.7
	LDGT2	2201040270	77.59	31.63	1,823.98	16.05	59.17	424.0	172.8	9,967.1	87.7	323.4
	HDGV	2201070270	26.09	10.35	725.63	5.36	16.59	142.6	56.5	3,965.2	29.3	90.7
	MC	2201080270	6.29	5.08	130.89	1.31	6.61	34.4	27.8	715.2	7.1	36.1
	LDDV	2230001270	0.86	0.64	16.10	0.02	0.07	4.7	3.5	88.0	0.1	0.4
	LDDT	2230060270	20.07	17.65	336.50	0.22	1.35	109.7	96.4	1,838.8	1.2	7.4
	2BHDDV	2230071270	8.56	7.50	149.81	0.10	0.60	46.8	41.0	818.7	0.5	3.3
	LHDDV	2230072270	49.11	43.37	797.14	0.49	3.16	268.3	237.0	4,356.0	2.7	17.3
	MHDDV	2230073270	93.47	77.13	1,474.01	1.15	3.96	510.8	421.5	8,054.7	6.3	21.6
	HHDDV	2230074270	268.61	229.65	4,055.08	3.18	7.98	1,467.8	1,254.9	22,158.9	17.4	43.6
	BUSES	2230075270	20.39	17.43	301.38	0.16	0.50	111.4	95.2	1,646.9	0.9	2.7
Urban Minor Arterial	LDGV	2201001290	57.33	22.95	965.09	12.70	62.88	313.3	125.4	5,273.7	69.4	343.6
	LDGT1	2201020290	76.56	31.20	1,799.71	15.83	58.39	418.4	170.5	9,834.5	86.5	319.1
	LDGT2	2201040290	39.44	16.08	927.12	8.16	30.08	215.5	87.8	5,066.2	44.6	164.4
	HDGV	2201070290	13.26	5.26	368.83	2.72	8.43	72.5	28.7	2,015.5	14.9	46.1
	MC	2201080290	3.20	2.58	66.53	0.66	3.36	17.5	14.1	363.6	3.6	18.3
	LDDV	2230001290	0.44	0.33	8.18	0.01	0.04	2.4	1.8	44.7	0.1	0.2
	LDDT	2230060290	10.20	8.97	171.04	0.11	0.68	55.7	49.0	934.6	0.6	3.7
	2BHDDV	2230071290	4.35	3.81	76.15	0.05	0.31	23.8	20.8	416.1	0.3	1.7
	LHDDV	2230072290	24.96	22.05	405.18	0.25	1.61	136.4	120.5	2,214.1	1.4	8.8
	MHDDV	2230073290	47.51	39.20	749.23	0.58	2.01	259.6	214.2	4,094.2	3.2	11.0
	HHDDV	2230074290	136.53	116.73	2,061.18	1.62	4.06	746.1	637.9	11,263.3	8.8	22.2
	BUSES	2230075290	10.37	8.86	153.19	0.08	0.25	56.6	48.4	837.1	0.5	1.4

Table 5.2–2. Annual and average daily onroad mobile source emissions by facility type and vehicle class in the PM₁₀ NAA (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Urban Collector	LDGV	2201001310	11.20	4.48	188.48	2.48	12.28	61.2	24.5	1,029.9	13.6	67.1
	LDGT1	2201020310	14.95	6.09	351.47	3.09	11.40	81.7	33.3	1,920.6	16.9	62.3
	LDGT2	2201040310	7.70	3.14	181.06	1.59	5.87	42.1	17.2	989.4	8.7	32.1
	HDGV	2201070310	2.59	1.03	72.03	0.53	1.65	14.2	5.6	393.6	2.9	9.0
	MC	2201080310	0.62	0.50	12.99	0.13	0.66	3.4	2.8	71.0	0.7	3.6
	LDDV	2230001310	0.09	0.06	1.60	0.00	0.01	0.5	0.3	8.7	0.0	0.0
	LDDT	2230060310	1.99	1.75	33.40	0.02	0.13	10.9	9.6	182.5	0.1	0.7
	2BHDDV	2230071310	0.85	0.74	14.87	0.01	0.06	4.6	4.1	81.3	0.1	0.3
	LHDDV	2230072310	4.87	4.31	79.13	0.05	0.31	26.6	23.5	432.4	0.3	1.7
	MHDDV	2230073310	9.28	7.66	146.32	0.11	0.39	50.7	41.8	799.6	0.6	2.1
	HHDDV	2230074310	26.66	22.80	402.53	0.32	0.79	145.7	124.6	2,199.6	1.7	4.3
	BUSES	2230075310	2.02	1.73	29.92	0.02	0.05	11.1	9.5	163.5	0.1	0.3
Urban Local	LDGV	2201001330	54.04	21.63	909.78	11.97	59.28	295.3	118.2	4,971.5	65.4	323.9
	LDGT1	2201020330	72.17	29.42	1,696.57	14.93	55.04	394.4	160.7	9,270.9	81.6	300.8
	LDGT2	2201040330	37.18	15.15	873.99	7.69	28.35	203.2	82.8	4,775.9	42.0	154.9
	HDGV	2201070330	12.50	4.96	347.69	2.57	7.95	68.3	27.1	1,900.0	14.0	43.4
	MC	2201080330	3.01	2.44	62.72	0.63	3.17	16.5	13.3	342.7	3.4	17.3
	LDDV	2230001330	0.41	0.31	7.71	0.01	0.03	2.2	1.7	42.1	0.1	0.2
	LDDT	2230060330	9.62	8.46	161.24	0.10	0.65	52.5	46.2	881.1	0.6	3.5
	2BHDDV	2230071330	4.10	3.59	71.79	0.05	0.29	22.4	19.6	392.3	0.3	1.6
	LHDDV	2230072330	23.53	20.78	381.96	0.24	1.51	128.6	113.6	2,087.2	1.3	8.3
	MHDDV	2230073330	44.79	36.96	706.29	0.55	1.90	244.7	202.0	3,859.5	3.0	10.4
	HHDDV	2230074330	128.71	110.04	1,943.05	1.52	3.82	703.3	601.3	10,617.8	8.3	20.9
	BUSES	2230075330	9.77	8.35	144.41	0.08	0.24	53.4	45.6	789.1	0.4	1.3
Off-Network	LDGV	2201001000	69.77	64.25	4,540.27	6.29	0.00	381.3	351.1	24,810.2	34.4	0.0
	LDGT1	2201020000	20.34	18.73	1,572.71	1.46	0.00	111.2	102.4	8,594.0	8.0	0.0
	LDGT2	2201040000	10.48	9.65	810.18	0.75	0.00	57.3	52.7	4,427.2	4.1	0.0
	HDGV	2201070000	3.97	3.66	251.38	0.22	0.00	21.7	20.0	1,373.7	1.2	0.0
	MC	2201080000	0.08	0.07	2.31	0.02	0.00	0.4	0.4	12.6	0.1	0.0
	LDDV	2230001000	6.41	6.22	18.94	0.01	0.00	35.0	34.0	103.5	0.0	0.0
	LDDT	2230060000	1.48	1.44	28.27	0.01	0.00	8.1	7.9	154.5	0.0	0.0
	2BHDDV	2230071000	0.53	0.51	12.31	0.00	0.00	2.9	2.8	67.3	0.0	0.0
	LHDDV	2230072000	3.33	3.23	66.71	0.02	0.00	18.2	17.6	364.5	0.1	0.0
	MHDDV	2230073000	2.24	2.18	147.44	0.03	0.00	12.3	11.9	805.7	0.2	0.0
	HHDDV	2230074000	31.74	30.79	2,629.48	0.44	0.00	173.4	168.2	14,368.7	2.4	0.0
	BUSES	2230075000	0.24	0.24	4.00	0.01	0.00	1.3	1.3	21.9	0.0	0.0

Table 5.2–3. Annual and average daily onroad mobile source emissions by facility type and vehicle class in Maricopa County.

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Rural Interstate	LDGV	2201001110	4.06	2.41	122.38	1.47	9.05	22.2	13.2	668.8	8.0	49.5
	LDGT1	2201020110	12.43	8.28	561.77	4.35	20.14	67.9	45.2	3,069.8	23.8	110.1
	LDGT2	2201040110	6.40	4.26	289.40	2.24	10.38	35.0	23.3	1,581.4	12.2	56.7
	HDGV	2201070110	2.48	1.56	135.09	0.84	3.05	13.6	8.6	738.2	4.6	16.7
	MC	2201080110	0.33	0.29	7.83	0.06	0.44	1.8	1.6	42.8	0.3	2.4
	LDDV	2230001110	0.05	0.05	0.77	0.00	0.01	0.3	0.3	4.2	0.0	0.0
	LDDT	2230060110	2.17	2.03	34.87	0.03	0.25	11.8	11.1	190.6	0.2	1.4
	2BHDDV	2230071110	0.91	0.86	15.47	0.01	0.11	5.0	4.7	84.5	0.1	0.6
	LHDDV	2230072110	5.28	4.96	82.73	0.07	0.59	28.9	27.1	452.1	0.4	3.2
	MHDDV	2230073110	16.74	15.10	362.98	0.29	1.15	91.5	82.5	1,983.5	1.6	6.3
	HHDDV	2230074110	62.15	57.25	1,498.95	1.17	3.49	339.6	312.8	8,191.0	6.4	19.1
BUSES	2230075110	2.07	1.90	44.50	0.02	0.08	11.3	10.4	243.1	0.1	0.5	
Rural Principal Arterial	LDGV	2201001130	4.94	2.22	111.37	1.40	7.66	27.0	12.1	608.6	7.6	41.9
	LDGT1	2201020130	7.96	3.93	270.70	2.18	9.19	43.5	21.5	1,479.2	11.9	50.2
	LDGT2	2201040130	4.10	2.02	139.45	1.12	4.73	22.4	11.1	762.0	6.1	25.9
	HDGV	2201070130	1.33	0.68	52.65	0.35	1.29	7.3	3.7	287.7	1.9	7.1
	MC	2201080130	0.54	0.45	14.17	0.12	0.71	2.9	2.4	77.4	0.6	3.9
	LDDV	2230001130	0.04	0.04	0.85	0.00	0.00	0.2	0.2	4.6	0.0	0.0
	LDDT	2230060130	1.22	1.11	19.83	0.01	0.11	6.6	6.1	108.4	0.1	0.6
	2BHDDV	2230071130	0.52	0.47	8.83	0.01	0.05	2.8	2.6	48.3	0.0	0.3
	LHDDV	2230072130	2.97	2.71	46.80	0.03	0.27	16.2	14.8	255.7	0.2	1.5
	MHDDV	2230073130	4.71	4.10	85.77	0.07	0.29	25.7	22.4	468.7	0.4	1.6
	HHDDV	2230074130	14.61	13.03	286.25	0.22	0.68	79.8	71.2	1,564.2	1.2	3.7
BUSES	2230075130	1.09	0.97	19.60	0.01	0.04	5.9	5.3	107.1	0.1	0.2	
Rural Minor Arterial	LDGV	2201001150	4.80	2.16	108.22	1.36	7.45	26.2	11.8	591.4	7.4	40.7
	LDGT1	2201020150	7.74	3.82	263.05	2.12	8.93	42.3	20.9	1,437.4	11.6	48.8
	LDGT2	2201040150	3.99	1.97	135.51	1.09	4.60	21.8	10.8	740.5	6.0	25.1
	HDGV	2201070150	1.29	0.66	51.17	0.34	1.26	7.0	3.6	279.6	1.9	6.9
	MC	2201080150	0.52	0.43	13.77	0.11	0.69	2.8	2.4	75.2	0.6	3.8
	LDDV	2230001150	0.04	0.03	0.82	0.00	0.00	0.2	0.2	4.5	0.0	0.0
	LDDT	2230060150	1.18	1.08	19.27	0.01	0.11	6.5	5.9	105.3	0.1	0.6
	2BHDDV	2230071150	0.50	0.46	8.58	0.01	0.05	2.7	2.5	46.9	0.0	0.3
	LHDDV	2230072150	2.89	2.64	45.48	0.03	0.26	15.8	14.4	248.5	0.2	1.4
	MHDDV	2230073150	4.57	3.98	83.34	0.07	0.28	25.0	21.7	455.4	0.4	1.5
	HHDDV	2230074150	14.20	12.66	278.16	0.22	0.66	77.6	69.2	1,520.0	1.2	3.6
BUSES	2230075150	1.06	0.94	19.04	0.01	0.04	5.8	5.1	104.1	0.1	0.2	
Rural Major Collector	LDGV	2201001170	0.89	0.40	20.17	0.25	1.39	4.9	2.2	110.2	1.4	7.6
	LDGT1	2201020170	1.44	0.71	49.03	0.40	1.66	7.9	3.9	267.9	2.2	9.1
	LDGT2	2201040170	0.74	0.37	25.26	0.20	0.86	4.1	2.0	138.0	1.1	4.7
	HDGV	2201070170	0.24	0.12	9.54	0.06	0.23	1.3	0.7	52.1	0.3	1.3
	MC	2201080170	0.10	0.08	2.57	0.02	0.13	0.5	0.4	14.0	0.1	0.7
	LDDV	2230001170	0.01	0.01	0.15	0.00	0.00	0.0	0.0	0.8	0.0	0.0
	LDDT	2230060170	0.22	0.20	3.59	0.00	0.02	1.2	1.1	19.6	0.0	0.1
	2BHDDV	2230071170	0.09	0.08	1.60	0.00	0.01	0.5	0.5	8.7	0.0	0.1
	LHDDV	2230072170	0.54	0.49	8.48	0.01	0.05	2.9	2.7	46.3	0.0	0.3
	MHDDV	2230073170	0.85	0.74	15.53	0.01	0.05	4.7	4.1	84.9	0.1	0.3
	HHDDV	2230074170	2.65	2.36	51.84	0.04	0.12	14.5	12.9	283.3	0.2	0.7
BUSES	2230075170	0.20	0.18	3.55	0.00	0.01	1.1	1.0	19.4	0.0	0.0	

Table 5.2–3. Annual and average daily onroad mobile source emissions by facility type and vehicle class in Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Rural Minor Collector	LDGV	2201001190	0.21	0.09	4.67	0.06	0.32	1.1	0.5	25.5	0.3	1.8
	LDGT1	2201020190	0.33	0.16	11.35	0.09	0.39	1.8	0.9	62.0	0.5	2.1
	LDGT2	2201040190	0.17	0.08	5.85	0.05	0.20	0.9	0.5	32.0	0.3	1.1
	HDGV	2201070190	0.06	0.03	2.21	0.01	0.05	0.3	0.2	12.1	0.1	0.3
	MC	2201080190	0.02	0.02	0.59	0.00	0.03	0.1	0.1	3.2	0.0	0.2
	LDDV	2230001190	0.00	0.00	0.04	0.00	0.00	0.0	0.0	0.2	0.0	0.0
	LDDT	2230060190	0.05	0.05	0.83	0.00	0.00	0.3	0.3	4.5	0.0	0.0
	2BHDDV	2230071190	0.02	0.02	0.37	0.00	0.00	0.1	0.1	2.0	0.0	0.0
	LHDDV	2230072190	0.12	0.11	1.96	0.00	0.01	0.7	0.6	10.7	0.0	0.1
	MHDDV	2230073190	0.20	0.17	3.60	0.00	0.01	1.1	0.9	19.7	0.0	0.1
HHDDV	2230074190	0.61	0.55	12.00	0.01	0.03	3.3	3.0	65.6	0.1	0.2	
BUSES	2230075190	0.05	0.04	0.82	0.00	0.00	0.2	0.2	4.5	0.0	0.0	
Rural Local	LDGV	2201001210	2.16	0.97	48.79	0.61	3.36	11.8	5.3	266.6	3.3	18.3
	LDGT1	2201020210	3.49	1.72	118.58	0.96	4.02	19.1	9.4	648.0	5.2	22.0
	LDGT2	2201040210	1.80	0.89	61.09	0.49	2.07	9.8	4.8	333.8	2.7	11.3
	HDGV	2201070210	0.58	0.30	23.07	0.15	0.57	3.2	1.6	126.0	0.8	3.1
	MC	2201080210	0.23	0.20	6.21	0.05	0.31	1.3	1.1	33.9	0.3	1.7
	LDDV	2230001210	0.02	0.02	0.37	0.00	0.00	0.1	0.1	2.0	0.0	0.0
	LDDT	2230060210	0.53	0.49	8.69	0.01	0.05	2.9	2.7	47.5	0.0	0.3
	2BHDDV	2230071210	0.23	0.21	3.87	0.00	0.02	1.2	1.1	21.1	0.0	0.1
	LHDDV	2230072210	1.30	1.19	20.50	0.01	0.12	7.1	6.5	112.0	0.1	0.6
	MHDDV	2230073210	2.06	1.79	37.57	0.03	0.13	11.3	9.8	205.3	0.2	0.7
HHDDV	2230074210	6.40	5.71	125.39	0.10	0.30	35.0	31.2	685.2	0.5	1.6	
BUSES	2230075210	0.48	0.42	8.59	0.00	0.02	2.6	2.3	46.9	0.0	0.1	
Urban Interstate	LDGV	2201001230	35.00	20.31	849.09	10.40	61.12	191.2	111.0	4,639.9	56.8	334.0
	LDGT1	2201020230	63.55	39.72	2,226.82	17.85	79.15	347.3	217.0	12,168.4	97.5	432.5
	LDGT2	2201040230	32.74	20.46	1,147.15	9.19	40.77	178.9	111.8	6,268.6	50.2	222.8
	HDGV	2201070230	14.10	8.04	686.11	4.22	13.33	77.1	43.9	3,749.2	23.1	72.8
	MC	2201080230	4.24	3.71	80.48	0.67	4.37	23.2	20.3	439.8	3.7	23.9
	LDDV	2230001230	0.44	0.39	5.51	0.01	0.04	2.4	2.1	30.1	0.0	0.2
	LDDT	2230060230	9.80	9.05	149.81	0.12	0.95	53.5	49.5	818.7	0.7	5.2
	2BHDDV	2230071230	4.14	3.82	66.53	0.05	0.43	22.6	20.8	363.6	0.3	2.3
	LHDDV	2230072230	23.92	22.14	355.07	0.28	2.24	130.7	121.0	1,940.3	1.5	12.2
	MHDDV	2230073230	87.96	77.50	1,683.69	1.35	5.40	480.7	423.5	9,200.5	7.4	29.5
HHDDV	2230074230	248.09	222.83	5,074.27	3.98	11.77	1,355.7	1,217.7	27,728.2	21.7	64.3	
BUSES	2230075230	18.74	17.02	362.14	0.20	0.67	102.4	93.0	1,978.9	1.1	3.7	
Urban Freeway And Express way	LDGV	2201001250	36.72	21.31	890.85	10.91	64.12	200.6	116.4	4,868.1	59.6	350.4
	LDGT1	2201020250	66.67	41.67	2,336.34	18.72	83.04	364.3	227.7	12,766.9	102.3	453.8
	LDGT2	2201040250	34.35	21.47	1,203.57	9.65	42.78	187.7	117.3	6,576.9	52.7	233.8
	HDGV	2201070250	14.79	8.43	719.85	4.43	13.99	80.8	46.1	3,933.6	24.2	76.4
	MC	2201080250	4.45	3.89	84.44	0.70	4.59	24.3	21.3	461.4	3.8	25.1
	LDDV	2230001250	0.46	0.41	5.78	0.01	0.04	2.5	2.2	31.6	0.0	0.2
	LDDT	2230060250	10.28	9.50	157.18	0.13	1.00	56.2	51.9	858.9	0.7	5.5
	2BHDDV	2230071250	4.34	4.00	69.81	0.06	0.45	23.7	21.9	381.5	0.3	2.4
	LHDDV	2230072250	25.10	23.23	372.53	0.29	2.35	137.1	126.9	2,035.7	1.6	12.8
	MHDDV	2230073250	92.29	81.32	1,766.50	1.41	5.67	504.3	444.3	9,653.0	7.7	31.0
HHDDV	2230074250	260.29	233.79	5,323.82	4.17	12.35	1,422.3	1,277.6	29,091.9	22.8	67.5	
BUSES	2230075250	19.66	17.86	379.95	0.21	0.70	107.5	97.6	2,076.2	1.1	3.8	

Table 5.2–3. Annual and average daily onroad mobile source emissions by facility type and vehicle class in Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Urban Principal Arterial	LDGV	2201001270	116.26	46.54	1,955.75	25.74	127.42	635.3	254.3	10,687.2	140.7	696.3
	LDGT1	2201020270	155.34	63.31	3,649.06	32.11	118.39	848.9	345.9	19,940.2	175.5	646.9
	LDGT2	2201040270	80.03	32.61	1,879.82	16.54	60.99	437.3	178.2	10,272.2	90.4	333.3
	HDGV	2201070270	26.96	10.68	750.02	5.54	17.12	147.3	58.4	4,098.5	30.3	93.6
	MC	2201080270	6.49	5.24	134.88	1.35	6.81	35.4	28.7	737.1	7.4	37.2
	LDDV	2230001270	0.88	0.66	16.58	0.02	0.07	4.8	3.6	90.6	0.1	0.4
	LDDT	2230060270	20.69	18.19	346.70	0.22	1.39	113.0	99.4	1,894.5	1.2	7.6
	2BHDDV	2230071270	8.82	7.73	154.36	0.10	0.62	48.2	42.2	843.5	0.5	3.4
	LHDDV	2230072270	50.62	44.71	821.30	0.51	3.26	276.6	244.3	4,488.0	2.8	17.8
	MHDDV	2230073270	97.03	80.06	1,530.08	1.19	4.11	530.2	437.5	8,361.1	6.5	22.5
HHDDV	2230074270	278.56	238.17	4,204.75	3.30	8.27	1,522.2	1,301.5	22,976.8	18.0	45.2	
BUSES	2230075270	21.19	18.11	313.11	0.17	0.51	115.8	99.0	1,711.0	0.9	2.8	
Urban Minor Arterial	LDGV	2201001290	59.09	23.65	994.10	13.08	64.77	322.9	129.3	5,432.2	71.5	353.9
	LDGT1	2201020290	78.96	32.18	1,854.80	16.32	60.18	431.5	175.8	10,135.5	89.2	328.8
	LDGT2	2201040290	40.68	16.58	955.50	8.41	31.00	222.3	90.6	5,221.3	46.0	169.4
	HDGV	2201070290	13.70	5.43	381.23	2.82	8.70	74.9	29.7	2,083.2	15.4	47.6
	MC	2201080290	3.30	2.67	68.56	0.68	3.46	18.0	14.6	374.6	3.7	18.9
	LDDV	2230001290	0.45	0.34	8.43	0.01	0.04	2.5	1.8	46.1	0.1	0.2
	LDDT	2230060290	10.51	9.25	176.23	0.11	0.71	57.5	50.5	963.0	0.6	3.9
	2BHDDV	2230071290	4.48	3.93	78.46	0.05	0.32	24.5	21.5	428.7	0.3	1.7
	LHDDV	2230072290	25.73	22.72	417.46	0.26	1.65	140.6	124.2	2,281.2	1.4	9.0
	MHDDV	2230073290	49.32	40.70	777.73	0.61	2.09	269.5	222.4	4,249.9	3.3	11.4
HHDDV	2230074290	141.59	121.06	2,137.26	1.68	4.20	773.7	661.5	11,679.0	9.2	23.0	
BUSES	2230075290	10.77	9.20	159.15	0.09	0.26	58.9	50.3	869.7	0.5	1.4	
Urban Collector	LDGV	2201001310	11.54	4.62	194.14	2.56	12.65	63.1	25.2	1,060.9	14.0	69.1
	LDGT1	2201020310	15.42	6.28	362.23	3.19	11.75	84.3	34.3	1,979.4	17.4	64.2
	LDGT2	2201040310	7.94	3.24	186.60	1.64	6.05	43.4	17.7	1,019.7	9.0	33.1
	HDGV	2201070310	2.68	1.06	74.45	0.55	1.70	14.6	5.8	406.8	3.0	9.3
	MC	2201080310	0.64	0.52	13.39	0.13	0.68	3.5	2.8	73.2	0.7	3.7
	LDDV	2230001310	0.09	0.07	1.65	0.00	0.01	0.5	0.4	9.0	0.0	0.0
	LDDT	2230060310	2.05	1.81	34.42	0.02	0.14	11.2	9.9	188.1	0.1	0.8
	2BHDDV	2230071310	0.88	0.77	15.32	0.01	0.06	4.8	4.2	83.7	0.1	0.3
	LHDDV	2230072310	5.02	4.44	81.53	0.05	0.32	27.5	24.2	445.5	0.3	1.8
	MHDDV	2230073310	9.63	7.95	151.89	0.12	0.41	52.6	43.4	830.0	0.6	2.2
HHDDV	2230074310	27.65	23.64	417.39	0.33	0.82	151.1	129.2	2,280.8	1.8	4.5	
BUSES	2230075310	2.10	1.80	31.08	0.02	0.05	11.5	9.8	169.8	0.1	0.3	
Urban Local	LDGV	2201001330	55.71	22.30	937.13	12.33	61.05	304.4	121.8	5,120.9	67.4	333.6
	LDGT1	2201020330	74.44	30.33	1,748.50	15.39	56.73	406.8	165.8	9,554.7	84.1	310.0
	LDGT2	2201040330	38.35	15.63	900.74	7.93	29.22	209.5	85.4	4,922.1	43.3	159.7
	HDGV	2201070330	12.92	5.12	359.38	2.65	8.20	70.6	28.0	1,963.8	14.5	44.8
	MC	2201080330	3.11	2.51	64.63	0.65	3.26	17.0	13.7	353.2	3.5	17.8
	LDDV	2230001330	0.42	0.32	7.95	0.01	0.03	2.3	1.7	43.4	0.1	0.2
	LDDT	2230060330	9.91	8.72	166.13	0.11	0.66	54.2	47.6	907.8	0.6	3.6
	2BHDDV	2230071330	4.23	3.70	73.96	0.05	0.30	23.1	20.2	404.2	0.3	1.6
	LHDDV	2230072330	24.25	21.42	393.54	0.24	1.56	132.5	117.1	2,150.5	1.3	8.5
	MHDDV	2230073330	46.49	38.36	733.16	0.57	1.97	254.1	209.6	4,006.3	3.1	10.8
HHDDV	2230074330	133.47	114.12	2,014.77	1.58	3.96	729.4	623.6	11,009.7	8.6	21.7	
BUSES	2230075330	10.15	8.68	150.03	0.08	0.25	55.5	47.4	819.8	0.4	1.3	

Table 5.2–3. Annual and average daily onroad mobile source emissions by facility type and vehicle class in Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Off-Network	LDGV	2201001000	69.48	63.97	4,520.99	6.27	0.00	379.6	349.6	24,704.9	34.3	0.0
	LDGT1	2201020000	20.26	18.65	1,566.03	1.46	0.00	110.7	101.9	8,557.5	8.0	0.0
	LDGT2	2201040000	10.44	9.61	806.74	0.75	0.00	57.0	52.5	4,408.4	4.1	0.0
	HDGV	2201070000	3.96	3.64	250.31	0.22	0.00	21.6	19.9	1,367.8	1.2	0.0
	MC	2201080000	0.08	0.07	2.30	0.02	0.00	0.4	0.4	12.6	0.1	0.0
	LDDV	2230001000	6.38	6.19	18.86	0.01	0.00	34.9	33.8	103.1	0.0	0.0
	LDDT	2230060000	1.48	1.43	28.15	0.01	0.00	8.1	7.8	153.8	0.0	0.0
	2BHDDV	2230071000	0.53	0.51	12.26	0.00	0.00	2.9	2.8	67.0	0.0	0.0
	LHDDV	2230072000	3.31	3.22	66.42	0.02	0.00	18.1	17.6	363.0	0.1	0.0
	MHDDV	2230073000	2.34	2.27	155.73	0.03	0.00	12.8	12.4	851.0	0.2	0.0
	HHDDV	2230074000	33.61	32.61	2,787.80	0.46	0.00	183.7	178.2	15,233.9	2.5	0.0
	BUSES	2230075000	0.24	0.24	3.99	0.01	0.00	1.3	1.3	21.8	0.0	0.0

5.3 Fugitive dust emissions

While exhaust, tire wear, and brake wear emissions were calculated using the EPA MOVES-2010a model, fugitive dust emissions from paved and unpaved roads were calculated using the equations found in sections 13.2.1 and 13.2.2 of the EPA Compilation of Air Pollutant Emission Factors, AP-42 (EPA, 2006). The new AP-42 equation published by EPA in January 2011 has been applied to estimate the PM₁₀ and PM_{2.5} emissions from paved roads. The contact person for the fugitive dust emission estimates is Cathy Arthur (602-254-6300).

5.3.1 Paved road fugitive dust emissions

In the AP-42 equation, paved road emissions are a function of silt loading values and the average weight of vehicles traveling on paved road surfaces. Paved roads have been classified as free-ways, high-traffic arterials, and low-traffic arterials to reflect different silt loading assumptions. An arterial carrying a traffic volume of less than 10,000 vehicles per average weekday is classified as low-traffic; all other roads that are not freeways are classified as high-traffic arterials. The silt loading levels, in grams per square meter, are 0.02 for freeways, 0.067 for high-traffic arterials, and 0.23 for low-traffic arterials. The silt loadings were derived from paved road samples collected in Maricopa County by an EPA contractor (US EPA, 1993). The average vehicle weights were derived from July 1, 2010 vehicle registrations for Maricopa County provided by the Arizona Department of Transportation. The fugitive dust emission factors for paved roads were derived by applying the following AP-42 equation:

$$E = k \times sL^{0.91} \times W^{1.02} \times (1 - P/4N)$$

- where: E = annual average particulate emission factor (g/mile),
 k = particle size multiplier for particle size range (1.0 g/mile for PM₁₀ and 0.25 g/mile for PM_{2.5}),
 sL = road surface silt loading (0.02 g/m² for freeways, 0.067 g/m² for high-traffic arterials, and 0.23 g/m² for low-traffic arterials),
 W = average weight of the vehicles traveling on the roads (3.53 tons on freeways and 2.65 tons on arterials),

- P = annual number of “wet” days with at least 0.254 mm (0.01 in) of precipitation (39 days³ in 2008), and
 N = annual number of days (366 days in 2008).

The annual average PM₁₀ and PM_{2.5} emission factors for paved roads derived from the AP-42 equation are presented in Table 5.3–1.

The 2008 VMTs by silt loading category were used to estimate paved road fugitive dust emissions. Daily VMTs by silt loading category for the PM₁₀ NAA and Maricopa County are shown in Table 5.3–2. The VMTs were derived by applying geographic information systems (GIS) to a 2008 traffic assignment output by the MAG travel demand model, TransCAD. The 2008 week-day traffic volumes output by TransCAD were normalized to 2008 HPMS VMTs for the PM₁₀ NAA and Maricopa County to produce the VMTs by silt loading category shown in Table 5.3–2.

Table 5.3–1. 2008 fugitive dust emission factors for paved roads.

Silt Loading Category	Emission factors (g/mile)	
	PM ₁₀	PM _{2.5}
Freeways	0.10	0.03
High Traffic Arterials	0.22	0.06
Low Traffic Arterials	0.69	0.17

Table 5.3–2. 2008 VMT by silt loading category for paved roads.

Silt Loading Category	Daily VMT	
	PM ₁₀ NAA	Maricopa County
Freeways	30,835,329	32,526,693
High Traffic Arterials	42,498,543	43,586,568
Low Traffic Arterials	13,819,127	15,143,740
Totals:	87,153,000	91,257,000

Applying the emission factors in Table 5.3–1 to the VMTs in Table 5.3–2 and converting to pounds per day produces the 2008 uncontrolled particulate emissions from paved roads for the PM₁₀ NAA and Maricopa County, shown in Table 5.3–3. These uncontrolled emissions do not include the 2008 emission reductions attributed to the committed measures in the MAG 2007 Five Percent Plan.

Table 5.3–3. 2008 uncontrolled fugitive dust emissions from paved roads.

Silt Loading Category	PM ₁₀ NAA (lbs/day)		Maricopa County (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Freeways	6,798.0	2,039.4	7,170.8	2,151.3
High Traffic Arterials	20,612.3	5,621.5	21,140.0	5,765.5
Low Traffic Arterials	21,021.3	5,179.2	23,036.3	5,675.6
Totals:	48,431.6	12,840.1	51,347.1	13,592.4

The MAG 2007 Five Percent Plan contains a number of committed measures that reduce paved road fugitive dust emissions in the PM₁₀ NAA. Five committed measures that reduce paved road particulate emissions were quantified in the MAG 2007 Five Percent Plan. Table 5.3–4 shows the emission reductions attributed to these committed measures based on their implementation

³ Precipitation data for 2008 were obtained from National Oceanic and Atmospheric Administration (NOAA) in the form of local climatological data at Phoenix Sky Harbor Airport.

status in 2008. In addition, Table 5.3–4 includes emission reduction credit for 97 PM₁₀-certified street sweepers purchased by December 31, 2007 with FY 2001–2006 MAG Congestion Mitigation and Air Quality Improvement (CMAQ) funds. Reductions for the sweepers that were purchased with FY 2001–2006 CMAQ funds were also applied to base case uncontrolled paved road emissions in the MAG 2007 Five Percent Plan.

The emission benefits in Table 5.3–4 were subtracted from the uncontrolled PM₁₀ emissions in Table 5.3–3. The total 2008 PM₁₀ emission reduction of 11,851.1 pounds per day in the PM₁₀ NAA represents 24.5 percent of the uncontrolled PM₁₀ emissions of 48,431.6 pounds per day. This percent reduction was applied to the uncontrolled PM_{2.5} emissions in the PM₁₀ NAA; then the absolute reduction in PM_{2.5} emissions due to the control measures was applied to the uncontrolled PM_{2.5} emissions in Maricopa County. The controlled emissions in tons per year and pounds per day are shown in Table 5.3–5.

Table 5.3–4. 2008 benefits of measures that reduce paved road fugitive dust in the PM₁₀ NAA⁴.

Committed Measures in the MAG 2007 Five Percent Plan	PM ₁₀ emission reduction	
	Annual (tons/year)	Average daily (lbs/day) ⁵
1. Public education and outreach program (Measure 1) ⁶	7.7	42.2
2. Reduce trackout onto paved roads (Measures 14/15/17)	579.9	3,169.0
3. Sweep streets with PM ₁₀ -certified sweepers (Measure 24)	166.9	911.9
4. Pave or stabilize existing unpaved shoulders (Measure 28)	233.3	1,274.6
5. Additional \$5M in FY07 MAG TIP for paving roads/shoulders (Measure 43) ⁷	8.2	44.8
97 PM₁₀-certified sweepers purchased with FY 2001–2006 CMAQ funds:	1,172.8	6,408.6
Total 2008 PM₁₀ emission reductions for paved roads:	2,168.8	11,851.1

Table 5.3–5. Annual controlled fugitive dust emissions from paved roads.

Geographic Area	Annual emissions (tons/year)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
PM ₁₀ NAA	6,694.2	1,774.8	36,580.5	9,698.1
Maricopa County	7,227.8	1,912.4	39,496.0	10,450.4

5.3.2 Unpaved road fugitive dust emissions

AP-42 emission factors were applied to unpaved road and alley VMTs to estimate fugitive dust emissions (US EPA, 2006). The unpaved road and alley particulate emission factors were derived from the following AP-42 equation for publicly accessible unpaved roads, assuming a silt content of 11.9%, a soil moisture content of 0.5%, and an average speed of 25 miles per hour on unpaved roads and 10 miles per hour on unpaved alleys:

⁴ The 2008 benefits of the committed measures in the Five Percent Plan have been reduced by 61 percent to reflect the new AP-42 equation for paved road dust released by EPA in January 2011.

⁵ 366 days were used to convert tons per year to pounds per day in 2008.

⁶ Measure benefit reflects a 0.1% reduction in 2008 uncontrolled paved road emissions in the MAG 2007 Five Percent Plan.

⁷ Measure benefit includes only the projects that paved unpaved shoulders in 2008.

$$E = \left[\frac{k \left(\frac{S}{12}\right)^1 \left(\frac{S}{30}\right)^{0.5}}{\left(\frac{M}{0.5}\right)^{0.2}} - C \right] \left(1 - \frac{P}{N}\right)$$

where: E = annual average particulate emission factor extrapolated for natural mitigation (lb/mile),

k = particle size multiplier for particle size range (1.8 lb/mile for PM_{10} and 0.18 lb/mile for $PM_{2.5}$),

s = surface material silt content (11.9%),

S = mean vehicle speed (25 mph for unpaved roads and 10 mph for unpaved alleys),

M = surface material moisture content (0.5%),

C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear (0.00047 lb/mile for PM_{10} and 0.00036 lb/mile for $PM_{2.5}$),

P = annual number of “wet” days with at least 0.254 mm (0.01 in) of precipitation (39 days in 2008), and

N = annual number of days (366 days in 2008).

The unpaved road emission factors resulting from the above equation are 1.4554 pounds per mile for PM_{10} and 0.1453 pounds per mile for $PM_{2.5}$. The unpaved alley emission factors are 0.9203 pounds per mile for PM_{10} and 0.0918 pounds per mile for $PM_{2.5}$.

The 2008 daily VMTs on unpaved roads and alleys in the PM_{10} NAA and Maricopa County are shown in Table 5.3–6. The 2008 VMT for unpaved roads in the PM_{10} NAA was derived from the MAG 2009 Unpaved Road Inventory (MAG, 2010). The 2008 VMT for unpaved alleys was derived by multiplying a MAG GIS-derived estimate of 650 miles of dirt alleys by an annual average daily traffic estimate of 9.1 vehicles per day.

The 2008 Maricopa County VMT was obtained by applying a ratio of 1.047 to the PM_{10} NAA VMT in Table 5.3–6. This ratio represents 2008 VMT on all roads in Maricopa County to 2008 VMT on all roads in the PM_{10} NAA, as derived in Table 5.3–7. The VMTs in Table 5.3–7 represent 2008 HPMS data submitted to the Federal Highway Administration by ADOT in August 2009.

Table 5.3–6. 2008 VMT on unpaved roads in the PM_{10} NAA and Maricopa County.

Geographic Area	2008 Annual Average Daily VMT	
	Unpaved Roads	Unpaved Alleys
PM_{10} NAA	47,984	5,915
Maricopa County	50,239	6,193

Table 5.3–7. 2008 VMT on all roads in the PM10 NAA and Maricopa County.

Geographic Area	2008 Annual Average Daily VMT	Ratio to 2008 Annual Average
	(in thousands)	Daily VMT in the PM ₁₀ NAA
PM ₁₀ NAA	87,153	1.000
Maricopa County	91,257	1.047

Multiplying the unpaved road emission factors by the VMTs in Table 5.3–6 results in the uncontrolled emissions shown in Table 5.3–8. These uncontrolled emissions do not include the 2008 emission reductions attributed to the committed measures in the MAG 2007 Five Percent Plan for PM₁₀.

Table 5.3–8. Daily uncontrolled unpaved road and alley fugitive dust emissions.

Geographic Area	PM ₁₀ (lbs/day)		PM _{2.5} (lbs/day)	
	Unpaved Roads	Unpaved Alleys	Unpaved Roads	Unpaved Alleys
PM ₁₀ NAA	69,835.9	5,443.6	6,972.1	543.0
Maricopa County	73,117.8	5,699.4	7,299.7	568.5

The MAG 2007 Five Percent Plan contains a number of committed measures that reduce unpaved road and alley fugitive dust emissions in the PM₁₀ NAA (MAG, 2007). Four committed measures that reduce unpaved road and alley PM₁₀ emissions were quantified in the MAG 2007 Five Percent Plan. The 2008 emission reductions attributed to these measures are shown in Table 5.3–9.

Table 5.3–9. 2008 benefits of measures that reduce unpaved road and alley fugitive dust in the PM10 NAA.

Committed Measures in the MAG 2007 Five Percent Plan	PM ₁₀ emission reductions	
	Annual (tons/year)	Average daily (lbs/day) ⁸
1. Public education and outreach program (Measure 1) ⁹	17.5	95.6
2. Pave or stabilize existing public dirt roads and alleys (Measure 26)	1,488.0	8,131.2
3. Limit speeds to 15 mph on high-traffic dirt roads (Measure 27)	390.4	2,133.4
4. Additional \$5M in FY07 MAG TIP for paving roads/shoulders (Measure 43) ¹⁰	169.5	926.2
Total 2008 PM₁₀ emission reductions for unpaved roads:	2,065.4	11,286.4

The reductions in Table 5.3–9 were subtracted from the uncontrolled PM₁₀ emissions in Table 5.3–8. The total 2008 PM₁₀ emission reduction of 11,286.4 pounds per day represents 15.0 percent of the total uncontrolled unpaved road and alley PM₁₀ emissions of 75,279.5 pounds per day in the PM₁₀ NAA. This percent reduction was applied to the uncontrolled PM_{2.5} emissions in the PM₁₀ NAA; then the absolute reduction in PM_{2.5} emissions due to the control measures was applied to the uncontrolled PM_{2.5} emissions in Maricopa County. The controlled emissions in tons per year and pounds per day are shown in Table 5.3–10.

Table 5.3–10. Annual and average daily controlled fugitive dust emissions from unpaved roads.

Area	Annual emissions (tons/year)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
PM ₁₀ NAA	11,710.70	1,169.00	63,993.1	6,387.8
Maricopa County	12,358.20	1,233.60	67,530.9	6,741.0

⁸ 366 days were used to convert tons per year to pounds per day in 2008.

⁹ Measure benefit reflects a 0.1% reduction in 2008 uncontrolled paved road emissions in the MAG 2007 Five Percent Plan.

¹⁰ Measure benefit includes only the projects that paved unpaved roads in 2008.

5.4 Summary of particulate emissions from onroad mobile sources

Table 5.4–1 summarizes the annual emissions and the average daily emissions for PM₁₀, PM_{2.5}, NO_x, SO₂, and NH₃ from all onroad mobile sources in Maricopa County in 2008. Similar data for the PM₁₀ NAA are presented in Table 5.4–2.

Table 5.4–1. Annual and average daily emissions from all onroad mobile sources in Maricopa County.

Emission Category	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Exhaust, tire wear, and brake wear	3,295.74	2,417.89	75,033.94	314.45	1,294.12	18,009.2	13,212.4	410,021.3	1,718.2	7,072.1
Paved road fugitive dust	7,227.77	1,912.42	—	—	—	39,496.0	10,450.4	—	—	—
Unpaved road and alley fugitive dust	12,358.20	1,233.60	—	—	—	67,530.9	6,741.0	—	—	—
Totals:	22,881.71	5,563.91	75,033.94	314.45	1,294.12	125,036.1	30,403.8	410,021.3	1,718.2	7,072.1

Table 5.4–2. Annual and average daily emissions from all onroad mobile sources in the PM10 NAA.

Emission Category	Annual emissions (tons/year)					Average daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO ₂	NH ₃
Exhaust, tire wear, and brake wear	3,144.17	2,300.80	71,444.20	300.66	1,235.28	17,181.3	12,572.9	390,405.5	1,643.0	6,750.5
Paved road fugitive dust	6,694.22	1,774.76	—	—	—	36,580.5	9,698.1	—	—	—
Unpaved road and alley fugitive dust	11,710.70	1,169.00	—	—	—	63,993.1	6,387.8	—	—	—
Totals:	21,549.09	5,244.56	71,444.20	300.66	1,235.28	117,754.9	28,658.8	390,405.5	1,643.0	6,750.5

5.5 Quality assurance process

5.5.1 VMT estimates

Normal quality assurance procedures, including automated and manual consistency checks, were conducted by MAG in developing the 2008 TransCAD traffic assignment network used to generate the VMT data. The VMT estimates using the MAG travel demand model have been validated against approximately 2,200 traffic counts collected in 2006–2008.

5.5.2 Emission estimates

The quality assurance process performed on the MOVES2010a analyses included accuracy, completeness, and reasonableness checks. For accuracy and completeness, all calculations were checked by an independent reviewer. Any errors found were corrected and the changes were then rechecked by the reviewer.

5.5.3 Draft particulate matter emissions inventory

The draft onroad mobile source portion of the 2008 periodic PM₁₀ emissions inventory was reviewed using published EPA quality review guidelines for base year emission inventories (EPA, 1992b). The procedure review (Levels I, II, and III) included checks for completeness, consistency, and the correct use of appropriate procedures.

5.6 References

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