



2017 PERIODIC EMISSIONS INVENTORY FOR PM10

For the Maricopa County, Arizona, PM10 Nonattainment Area

Table of Contents

I.	List of Figures	ii
II.	List of Tables	ii
III.	List of Appendices	iv
IV.	Introduction	1
	1.1 Overview	
	1.2 Comparison of PEIs	
	1.3 Temporal scope	
	1.4 Geographic scope	
	1.5 Overview of local demographic and land use data	
	1.6 Emissions overview by source category	
	1.7 Summary of all source categories	
	1.8 Agencies responsible for the emissions inventory	
V.	Point Sources	10
	2.1 Introduction and scope	
	2.2 Identifying point sources	
	2.3 Procedures for estimating emissions from point sources	
	2.4 Detailed overview of point source emissions	
	2.5 Emission reduction credits (ERCs)	
	2.6 Quality assurance/quality control procedures	
	2.7 Summary of all point source emissions	
	2.8 References	
VI.	Nonpoint Sources	17
	3.1 Introduction and scope	
	3.2 Emission Calculation Methodology	
	3.3 Emission Allocation Methodology	
	3.4 Quality assurance/quality control procedures	
	3.5 Summary of all nonpoint source emissions	
	3.6 References	
VII.	Nonroad Mobile Sources	43
	4.1 Introduction	
	4.2 Emission calculation methodology	
	4.3 Emission allocation methodology	
	4.4 Quality assurance procedures	
	4.5 Summary of nonroad mobile source emissions	

4.6	References	
VIII.	Onroad Mobile Sources	53
5.1	Introduction	
5.2	Exhaust, tire wear, and brake wear emissions calculation	
5.3	Fugitive dust emissions	
5.4	Quality assurance process	
5.5	Summary of all onroad mobile source emissions	
5.6	References	
IX.	Biogenic Sources	68
6.1	Introduction	
6.2	Modeling domain	
6.3	Input data	
6.4	Emission estimation	
6.5	Summary of all biogenic source emissions	
6.6	References	

List of Figures

Figure 1.2–1.	Chart of PM ₁₀ emissions (tons/year) within Maricopa County by source category in 2011, 2014, and 2017.	2
Figure 1.2–2.	Chart of PM _{2.5} emissions (tons/year) within Maricopa County by source category in 2011, 2014, and 2017.	2
Figure 1.4–1.	Map of Maricopa County and the PM ₁₀ nonattainment area.	3
Figure 2.6–1.	Data flow for annual point source emissions inventory reporting.	15
Figure 3.2–1.	Location of land use categories within Maricopa County and the PM ₁₀ nonattainment area capable of producing windblown dust.	25
Figure 6.2–1.	The WRF 4-km × 4-km grid (white), MEGAN 4-km × 4-km grid (yellow), the PM ₁₀ nonattainment area (blue), and Maricopa County (grid cells within the brown boundary)....	69
Figure 6.3–1.	WRF modeled daily average and daily maximum values of temperature at 2 meters above surface, soil temperature, PAR, air pressure, wind speed at 10 meters above the ground, water vapor mixing ratio at 2 meters above the ground, soil moisture, and 24-hour accumulated precipitation.	71
Figure 6.3–2.	Locations of DS472 and AZMET meteorological stations.	72
Figure 6.3–3.	Paired hourly modeled and observed data in 2017 from NWS and AZMET stations for temperature at 2 meters above the surface, water vapor mixing ratio at 2 meters above the ground, wind speed at 10 meters above the ground, and surface solar radiation.	73
Figure 6.4–1.	Daily biogenic NO _x emissions in 2017 and annual mean diurnal cycles of NO _x emissions for Maricopa County and the PM ₁₀ nonattainment area.	74

List of Tables

Table 1.5–1.	Demographic profile of Maricopa County and the PM ₁₀ NAA.	4
Table 1.5–2.	Land use categories used to apportion emissions for Maricopa County and the PM ₁₀ NAA. .	5

Table 1.6–1.	Annual and typical daily emissions from point source facilities, emission reduction credits (ERCs), and potential ERCs in Maricopa County and the PM ₁₀ NAA.....	5
Table 1.6–2.	Annual and typical daily emissions from nonpoint(area) sources in Maricopa County.....	6
Table 1.6–3.	Annual and typical daily emissions from nonpoint sources in the PM ₁₀ NAA.....	6
Table 1.6–4.	Annual and typical daily emissions from nonroad mobile sources in Maricopa County.....	6
Table 1.6–5.	Annual and typical daily emissions from nonroad mobile sources in the PM ₁₀ NAA.....	7
Table 1.6–6.	Annual and typical daily emissions from onroad mobile sources in Maricopa County.....	7
Table 1.6–7.	Annual and typical daily emissions from onroad mobile sources in the PM ₁₀ NAA.	7
Table 1.6–8.	Annual and typical daily emissions from biogenic sources in Maricopa County and the PM ₁₀ NAA.	8
Table 1.7–8.	Annual and typical daily emissions from all sources in Maricopa County (including emission reduction credits).....	8
Table 1.7–9.	Annual and typical daily emissions from all sources in the PM ₁₀ NAA (including emission reduction credits).....	8
Table 1.8–1.	Chapter authors and quality assurance/quality control (QA/QC) contacts.....	9
Table 2.2–1.	Name and location of all point sources in Maricopa County.....	11
Table 2.4–1.	Annual emissions from point sources by facility.....	12
Table 2.4–2.	Daily emissions from point sources by facility.	13
Table 2.5–1.	Available Emissions Reduction Credits (ERCs) as of December 31, 2019.	13
Table 2.5–2.	Potential Emissions Reduction Credits (ERCs) as of December 31, 2019.....	14
Table 2.7–1.	Annual and typical daily point source emissions (including all emission reduction credits)...	16
Table 3.2–1.	Calculation method for all nonpoint (area)sources.....	17
Table 3.2–2.	Prescribed fires in Maricopa County during 2017.....	21
Table 3.2–3.	Wildfire incidence, acreage burned, and material burned in 2017.....	22
Table 3.2–4.	Maricopa County and PM ₁₀ nonattainment area acreage totals within each land use category capable of producing windblown dust.	25
Table 3.2–5.	Vertical flux PM ₁₀ emission factors for the stable and disturbed portions of each land use category, by wind speed bin.....	26
Table 3.2–6.	Annual 2017 counts of hourly average wind speeds and actual/interpolated five-minute average wind speeds, by meteorological station and wind speed bin.....	27
Table 3.2–7.	Pre-standardized PM ₁₀ emissions from windblown dust in Maricopa County and the PM ₁₀ nonattainment area in 2017.....	28
Table 3.2–8.	Percentages of 2017 PM ₁₀ concentrations associated with five-minute average wind speeds greater than or equal to 12 mph at 15 Maricopa County monitors.....	29
Table 3.2–9.	Standardized, 2017 annual and daily PM ₁₀ and PM _{2.5} emissions from windblown dust in Maricopa County, by land use category.	30
Table 3.2–10.	Standardized, 2017 annual and daily PM ₁₀ and PM _{2.5} emissions from windblown dust in the PM ₁₀ nonattainment area, by land use category.....	30
Table 3.2–11.	Maricopa County burn permit activity in 2017.....	30
Table 3.2–12.	Emission and fuel loading factors for open burning.	31
Table 3.3–1.	Calculation and allocation method for all nonpoint (area) sources.....	31
Table 3.5–1.	Annual and typical daily emissions from all nonpoint sources in Maricopa County.	35
Table 3.5–2.	Annual and typical daily emissions from all nonpoint sources in the PM ₁₀ nonattainment area.	37
Table 4.2–1.	Calculation method for all nonroad mobile sources.....	44
Table 4.2.3–1.	Annual airport operations (by aircraft category) and related data sources.....	47
Table 4.2.3–2.	Aircraft type activity distribution at Chandler Municipal airport.....	48
Table 4.2.3–3.	EPA’s generic PM ₁₀ and PM _{2.5} emission factors for aircraft.	49
Table 4.3–1.	Calculation and allocation method for nonroad mobile sources.....	49
Table 4.5–1.	Annual and annual-day emissions from nonroad mobile sources in Maricopa County.	51
Table 4.5–2.	Annual and annual-day emissions from nonroad mobile sources in the PM ₁₀ NAA.	51
Table 5.2–1.	Annual and average daily onroad mobile source emissions in Maricopa County, by road and vehicle type.	57
Table 5.2–2.	Annual and average daily onroad mobile source emissions in the PM ₁₀ nonattainment area, by road and source type.....	59

Table 5.3-1.	2017 fugitive dust emission factors for paved roads.	61
Table 5.3-2.	2017 VMT by silt loading category for paved roads.....	61
Table 5.3-3.	2017 uncontrolled fugitive dust emissions from paved roads.....	62
Table 5.3-4.	2017 controlled fugitive dust emissions from paved roads.	62
Table 5.3-5.	2017 VMT on unpaved roads in Maricopa County and the PM ₁₀ nonattainment area.	64
Table 5.3-6.	2017 VMT on all roads in Maricopa County and the PM ₁₀ nonattainment area.	64
Table 5.3-7.	Daily uncontrolled unpaved road and alley fugitive dust emissions.	64
Table 5.3-8.	Annual and average daily controlled fugitive dust emissions from unpaved roads and alleys.	65
Table 5.5-1.	Annual and typical daily emissions from all onroad mobile sources in Maricopa County.....	65
Table 5.5-2.	Annual and typical daily emissions from all onroad mobile sources in the PM ₁₀ nonattainment area.....	66
Table 6.2-1.	The 4-km grid modeling domain defined in the LCC coordinate system.....	68
Table 6.4-1.	Average monthly (tons/month) and daily biogenic emissions (lbs/day) by month in 2017 for Maricopa County and the PM ₁₀ nonattainment area.	74
Table 6.5-1.	Annual and typical daily biogenic NO _x emissions in 2017 for Maricopa County and the PM ₁₀ nonattainment area.	74

List of Appendices

Appendix A	Instructions for Reporting 2017 Annual Air Pollution Emissions.....	A-1
Appendix B	Rule Effectiveness (RE) Studies	
	B.1 Introduction	B-1
	B.2 Calculating Rule Effectiveness Rates for Title V and Non-Title V Facilities.....	B-2
	B.3 Calculating Rule Effectiveness Rates for Rules 310, 310.01, and 316	B-3
	B.3.1 Calculating Rule Effectiveness for Sources Subject to Rule 310.....	B-4
	B.3.2 Calculating Rule Effectiveness for Sources Subject to Rule 310.01	B-5
	B.3.3 Calculating Rule Effectiveness for Sources Subject to Rule 316.....	B-5
	B.4 References.....	B-5
Appendix C	MOVES2014b Local Input Data and RunSpecs	
	MOVES2014b RunSpec Summary (Maricopa County, Sept 11 2018)	C-2
	MOVES2014b RunSpec (Maricopa County, Sept 11 2018).....	C-4
	MOVES2014b Local Input Data (Maricopa County, Sept 11 2018).....	C-7
Appendix D	Emissions from Facilities treated as Area Sources in the 2017 Periodic Emissions Inventory	D-1
Appendix E	Responsiveness Summary	E-1

Introduction

1.1 Overview

This 2017 periodic PM₁₀ emissions inventory was developed to meet requirements set forth in Title I of the Clean Air Act Amendments of 1990, which requires the development of a baseline emission inventory and periodic revisions for areas that fail to meet the National Ambient Air Quality Standards (NAAQS). A portion of Maricopa County is classified as serious nonattainment for PM₁₀.

PM₁₀ is defined as particulate matter less than or equal to ten micrometers in diameter. This inventory includes primary emissions of particulate matter 10 micrometers or less (PM₁₀) and 2.5 microns or less (PM_{2.5}) as well as three particulate matter precursors: nitrogen oxides (NO_x), sulfur oxides (SO_x) and ammonia (NH₃). The inventory provides emission estimates from point, area, nonroad mobile, onroad mobile, and biogenic sources. Note that totals shown in tables may not differ slightly from the sum of individual values due to independent rounding.

1.2 Comparison of PEIs

This section will provide an analysis between Periodic Emissions Inventory (PEI) years to show changes in emissions and explain differences. It is important to note that methodologies to calculate emissions and emissions models can change substantially over time. There will always be slight variations in emissions that are due to the changes in assumptions and estimating methodology. Emission estimating methodologies will continue to improve over time as we obtain more accurate local information. Overall, the Maricopa County 2017 PEI gives total annual PM₁₀ of 52,855 tons and PM_{2.5} of 12,760 tons, where emissions decreased from the 2014 PEI respectively by 8.7% and 5.2%. This is in contrast to the total 2017 PEI emissions for the Maricopa County PM₁₀ nonattainment area (NAA) where emission of PM₁₀ and PM_{2.5}, 38,252 and 10,315 tons respectively, increased from 2014 to 2017 by 9.0% and 0.7% respectively. Figures 1.2-1 and 1.2-2 present the PM₁₀ and PM_{2.5} emissions from all sources in Maricopa County from the 2011, 2014, and 2017 PEIs.

From 2014 to 2017, point source emissions of PM₁₀ increased by 48% (246 tons), while PM_{2.5} point source emissions decreased by 2.4% (11.1 tons), showing point source emissions increased but were a minor contributor to particulate matter emissions relative to the total inventory.

In Figures 1.2-1 and 1.2-2, the decrease in nonpoint source emissions from 2014 to 2017 for PM₁₀ and PM_{2.5} is being driven in large part by a 53.2% (8,800 tons) and 53.2% (881 tons) respective decrease in fugitive dust emissions from offroad recreational vehicles within the nonpoint source categories; this occurred due to a reduction of land classified as vacant from 2.05 to 1.16 million acres from 2014 to 2017. Even though area source emissions overall decreased for PM₁₀ and PM_{2.5}, emissions from some nonpoint sources did show an increase; e.g., livestock emissions, 2,093 tons and 420 tons, and wildfire emissions, 526 tons and 451 tons, respectively from 2014 to 2017.

It is important to note that the 2017 onroad mobile sources and nonroad mobile sources emissions were calculated using Motor Vehicle Emissions Simulator (MOVES2014b), which is the latest model developed by the U.S. Environmental Protection Agency (US EPA). In Figures 1.2-1 and 1.2-2, it can be seen that the 2014 to 2017 change in PM₁₀ and PM_{2.5} emissions from nonroad mobile sources was an increase of 0.9% and 0.5%

respectively, remaining relatively unchanged. In contrast, onroad mobile source emissions increased from 2014 to 2017 for PM₁₀ and PM_{2.5} by 28.3% and 10.8% respectively. This increase in onroad emissions can be attributed to an increase in vehicle miles traveled, as well as increased exhaust, tire wear, and brake wear. More information on the calculation methodology for nonroad and onroad emissions can be found in Chapter 4 and 5, respectively.

Figure 1.2–1. Chart of PM₁₀ emissions (tons/year) within Maricopa County by source category in 2011, 2014, and 2017.

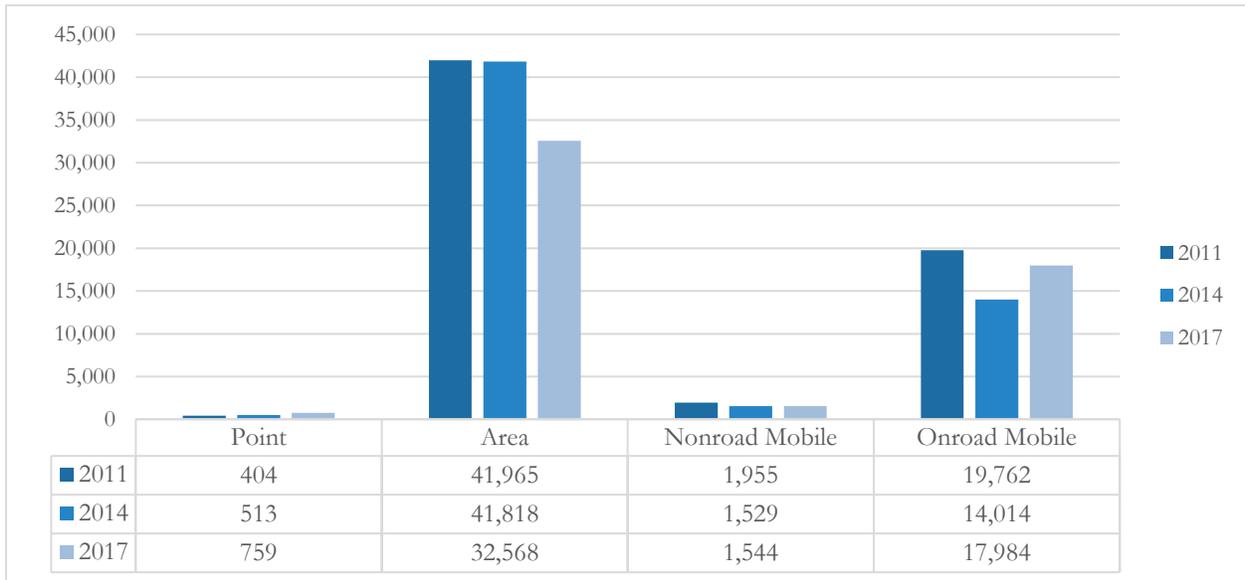
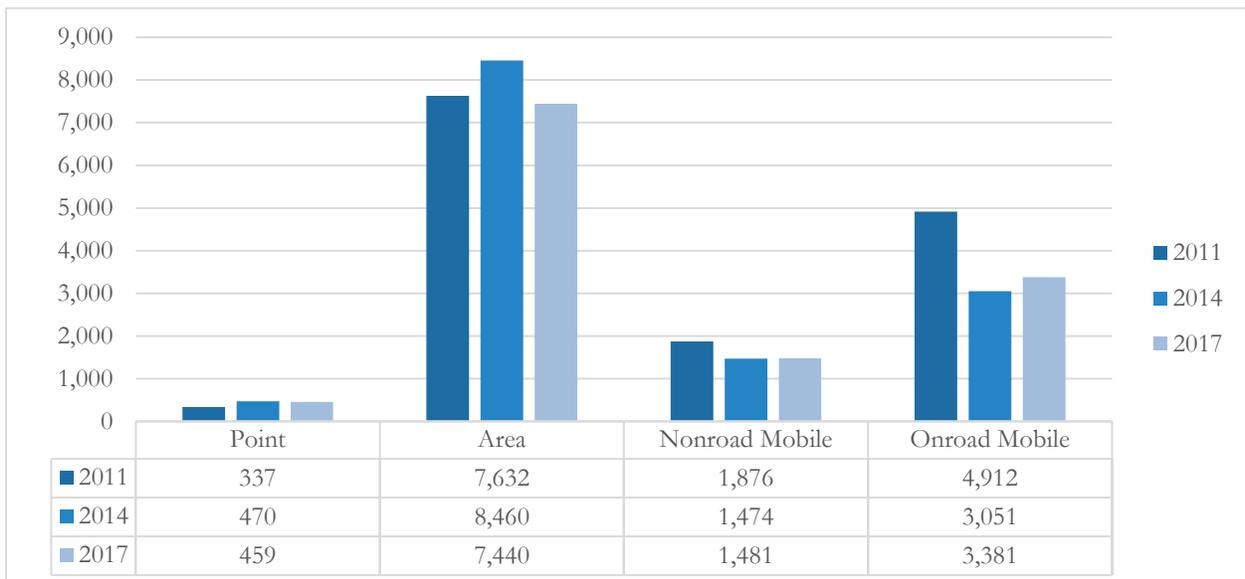


Figure 1.2–2. Chart of PM_{2.5} emissions (tons/year) within Maricopa County by source category in 2011, 2014, and 2017.



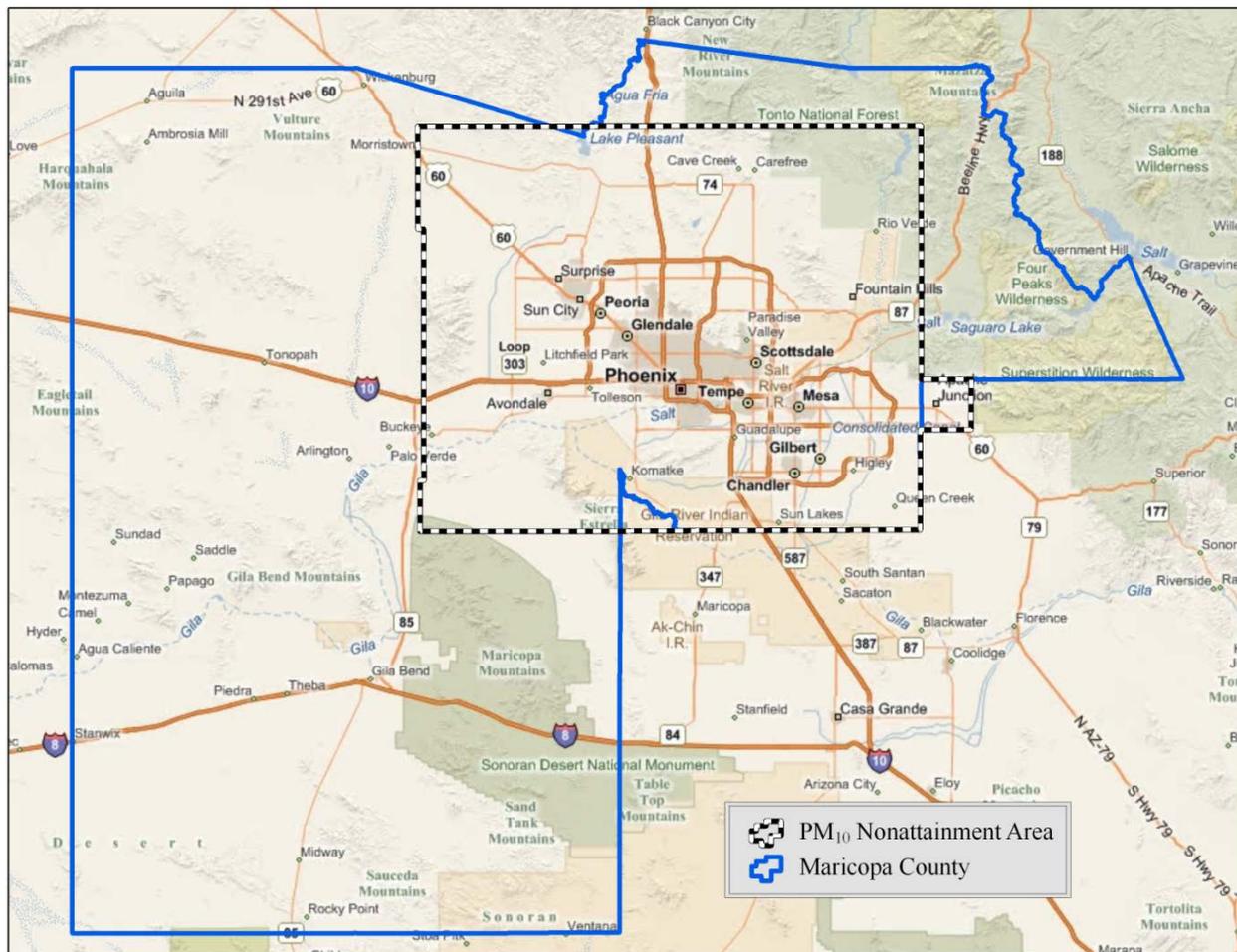
1.3 Temporal scope

Annual and typical daily emissions were estimated for the year 2017, for both Maricopa County and the Phoenix-region PM₁₀ nonattainment area (NAA).

1.4 Geographic scope

This inventory includes emission estimates for Maricopa County and for the Maricopa County PM₁₀ NAA. Maricopa County encompasses approximately 9,223 square miles of land area, while the Maricopa County PM₁₀ NAA is approximately 2,880 square miles or approximately 31 percent of the Maricopa County land area. A map of Maricopa County and the PM₁₀ NAA is provided in Figure 1.4–1.

Figure 1.4–1. Map of Maricopa County and the PM₁₀ nonattainment area.



1.5 Overview of local demographic and land use data

Many of the emissions estimates generated in this report were calculated using demographic and land use data provided by the Maricopa Association of Governments (MAG). These data were used to apportion and/or scale Maricopa County emissions estimates to the NAA and vice versa. (For example, county-level emissions from residential natural gas usage in Maricopa County were apportioned to the NAA using the ratio of total

population in each area). Detailed explanations of how emission estimates were apportioned or scaled are presented in each of the following chapters, along with the data sources used.

1.5.1 Demographic profile

The demographic data provided by MAG included population, employment data, and single family/multi-family splits for calendar year 2017, for both Maricopa County and the PM₁₀ NAA. Table 1.5–1 provides an overview of the demographic data used in this report. As noted throughout the text, these data are frequently used to derive estimates of activity or emissions within the PM₁₀ NAA from county-level calculations. It is important to note, however, that the NAA includes a portion of Pinal County, AZ (Apache Junction) as shown in Figure 1.4–1. Thus in some cases (e.g., those source categories calculated based on total population), the multiplier used to derive NAA estimates from County-level values may be greater than 1, and thus the resulting NAA emission totals are larger than the County-level estimates from which they are derived.

Table 1.5–1. Demographic profile of Maricopa County and the PM₁₀ NAA.

Demographic variable	Maricopa County	PM ₁₀ Nonattainment Area
1. Population:		
Resident population	4,307,033	4,309,507
Non-resident population	375,210	380,544
Total population:	4,682,243	4,690,051
2. Employment:		
–Retail employment *	493,145	493,247
–Office employment *	625,002	621,216
–Public employment *	128,630	129,815
–Other employment *	231,722	229,871
All commercial/institutional employment:	1,478,499	1,474,149
Industrial employment	274,824	274,456
Construction	21,250	20,465
Work at home	125,288	125,180
Non site-based	125,989	125,574
Total employment:	2,025,850	2,019,824
3. Household split:		
Single-family	80%	80%
Multi-family	20%	20%
Total households:	100%	100%

* These four categories comprise the “commercial/institutional” employment sector.

1.5.2 Land use data

The land use data used in this report have been developed by the MAG, which provided 2017 land use data. Table 1.5–2 presents a listing of the land use categories used, and the acreages of each land use type within Maricopa County and the PM₁₀ NAA.

Table 1.5–2. Land use categories used to apportion emissions for Maricopa County and the PM₁₀ NAA.

Land use category	Acreage within Maricopa County	Acreage within PM ₁₀ Nonattainment area
General/active open space/golf course (e.g., parks)	223,776	212,763
Passive/restricted open space, washes	3,471,524	437,582
Lakes	12,286	7,029
Agriculture	262,814	108,099
Vacant (e.g., developable land)	1,163,556	391,312

1.6 Emissions overview by source category

1.6.1 Point sources

The point source category includes those stationary sources that emit a significant amount of pollution into the air such as power plants, industrial processes, and large manufacturing facilities. The Maricopa County Air Quality Department (MCAQD) utilizes the US EPA’s Annual Emissions Reporting Requirements (AERR) rule to define which stationary sources are listed as point sources. A detailed definition of a point source can be found in Section 2.1 of Chapter 2. Table 1.6–1 summarizes annual and typical daily emissions from point sources, emission reduction credits (ERCs), and potential ERCs in Maricopa County. A detailed breakdown of emissions calculations for all point sources is contained in Chapter 2.

Table 1.6–1. Annual and typical daily emissions from point source facilities, emission reduction credits (ERCs), and potential ERCs in Maricopa County and the PM₁₀ NAA.

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Facility totals	753.7	459.2	2,622.5	118.6	288.2	4,410	2,595	14,636	799	1,584
ERCs	4.8	0.0	14.1	0.2	0.0	26	0	77	1	0
Potential ERCs	—	—	46.0	—	—	—	—	252	—	—
Total point sources:	758.5	459.2	2,682.7	118.7	288.2	4,436	2,595	14,965	800	1,584

1.6.2 Nonpoint (area) sources

Nonpoint sources are facilities or activities whose individual emissions do not qualify them as point sources. Nonpoint sources represent numerous facilities or activities that individually release small amounts of a given pollutant, but collectively this can become a significant amount. Emissions from stationary sources that were not identified as point sources in this report have been included in the nonpoint source inventory. Examples of nonpoint source categories include residential wood burning, commercial cooking, and wildfires.

Tables 1.6–2 and 1.6–3 summarize annual and typical daily emissions of the chief nonpoint source categories, for Maricopa County and the PM₁₀ NAA, respectively. A detailed breakdown of emissions calculations for each nonpoint source category is contained in Chapter 3.

Table 1.6–2. Annual and typical daily emissions from nonpoint(area) sources in Maricopa County.

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Fuel combustion	1,463.1	1,445.2	4,885.0	391.9	261.8	18,957	18,726	35,055	2,687	2,684
Industrial proc.	8,176.7	2,041.8	83.1	23.8	2,444.1	46,278	11,994	514	157	15,650
Misc. nonpoint	22,818.0	3,869.6	166.0	33.5	15,213	151,221	27,426	1,930	451	83,459
Waste treatment	110.9	83.1	39.2	75.7	12.0	728	563	246	387	66
Total nonpoint sources:	32,568.3	7,439.8	5,173.3	525.0	17,930.5	217,183	58,709	37,744	3,683	101,859

Table 1.6–3. Annual and typical daily emissions from nonpoint sources in the PM₁₀ NAA.

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Fuel combustion	1,463.4	1,445.5	4,876.8	391.4	261.9	18,964	18,734	34,998	2,684	2,685
Industrial proc.	7,870.6	1,991.9	65.7	13.0	2,437.7	44,517	11,706	418	98	15,612
Misc. nonpoint	9,365.3	1,731.6	61.1	5.1	9,910.4	60,677	11,239	415	38	54,309
Waste treatment	58.9	41.0	29.3	80.9	12.0	358	260	173	445	66
Total nonpoint sources:	18,758.1	5,210.0	5,032.8	490.5	12,621.9	124,517	41,938	36,004	3,264	72,671

1.6.3 Nonroad mobile sources

Nonroad mobile sources include off-highway vehicles and engines that move or are moved within a 12-month period. Tables 1.6–4 and 1.6–5 summarize annual and typical day emissions from nonroad mobile sources for Maricopa County, and the PM₁₀ NAA, respectively. A detailed breakdown of emissions calculations for each source category is contained in Chapter 4. GSE and APU refers to airport ground support equipment and auxiliary power units respectively.

Table 1.6–4. Annual and typical daily emissions from nonroad mobile sources in Maricopa County.

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Agricultural equip.	23.5	22.8	279.7	0.4	0.4	150	145	1,781	3	2
Airport GSE/APU	16.6	16.2	230.5	18.8	N/A	91	89	1,263	103	N/A
Commercial equip.	79.1	75.3	866.0	1.7	2.1	507	482	5,548	11	13
Constr. & mining	879.3	849.2	10,109	15.2	15.4	5,628	5,435	64,696	98	99
Industrial equip.	46.6	45.5	917.9	1.9	1.4	288	281	5,601	12	8
Lawn & garden	182.1	168.0	520.9	2.1	2.9	1,259	1,161	3,641	15	21
Pleasure craft	2.9	2.7	66.9	0.1	0.1	39	36	897	1	2
Railway maint.	0.7	0.7	5.9	0.0	0.0	5	5	41	0	0
Recreational equip.	14.8	13.6	46.5	0.2	0.3	126	116	395	2	3
Aircraft	262.2	251.9	2,962.0	322.3	N/A	1,512	1,455	16,869	1,834	N/A
Locomotives	36.0	34.9	1,427.0	202.8	1.4	197	191	7,819	1,111	8
Total nonroad sources:	1,543.8	1,480.8	17,432.0	565.5	24.0	9,802	9,396	108,551	3,190	156

Table 1.6–5. Annual and typical daily emissions from nonroad mobile sources in the PM₁₀ NAA.

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Agricultural equip.	9.7	9.4	115.0	0.2	0.2	62	60	733	1	1
Airport GSE/APU	16.1	15.7	221.7	18.2	N/A	88	86	1,215	100	N/A
Commercial equip.	79.0	75.2	864.8	1.7	2.1	506	481	5,541	11	13
Constr. & mining	846.8	817.8	9,735	14.7	14.9	5,420	5,234	62,306	94	95
Industrial equip.	46.6	45.5	916.6	1.9	1.4	287	281	5,593	12	8
Lawn & garden	182.8	168.6	522.8	2.1	2.9	1,263	1,164	3,652	15	21
Pleasure craft	1.7	1.5	38.3	0.0	0.1	22	21	513	1	1
Railway maint.	0.4	0.4	3.7	0.0	0.0	3	3	26	0	0
Recreational equip.	4.1	3.7	27.1	0.1	0.2	34	32	231	1	2
Aircraft	254.7	244.9	2,912	313.0	N/A	1,471	1,417	16,595	1,783	N/A
Locomotives	23.2	22.5	924.8	129.2	0.9	127	123	5,067	708	5
Total nonroad sources:	1,465.1	1,405.2	16,281.8	481.1	22.7	9,283	8,902	101,472	2,726	146

1.6.4 Onroad mobile sources

Emissions from onroad mobile sources were calculated for Maricopa County and the PM₁₀ NAA. A detailed breakout of emissions calculations for each nonpoint source category is contained in Chapter 5.

Tables 1.6–6 and 1.6–7 summarize annual and typical daily emissions from onroad mobile sources in Maricopa County and the PM₁₀ NAA, respectively.

Table 1.6–6. Annual and typical daily emissions from onroad mobile sources in Maricopa County.

Emission category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Exhaust, tire wear, and brake wear	2,356.0	834.7	27,415.2	148.3	981.9	12,918	4,573	150,249	813	5,383
Paved road fugitive dust	6,863.4	1,680.9				37,608	9,211			
Unpaved road/alley fugitive dust	8,764.2	864.9				48,023	4,739			
Totals:	17,984.0	3,380.5	27,415.2	148.3	981.9	98,549	18,523	150,249	813	5,383

Table 1.6–7. Annual and typical daily emissions from onroad mobile sources in the PM₁₀ NAA.

Emission category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Exhaust, tire wear, and brake wear	2,270.5	776.1	24,308.6	144.2	951.3	12,441	4,255	133,225	789	5,210
Paved road fugitive dust	6,562.0	1,622.0				35,956	8,888			
Unpaved road/alley fugitive dust	8,438.6	842.0				46,239	4,614			
Totals:	17,271.0	3,240.1	24,308.6	144.2	951.3	94,636	17,757	133,225	789	5,210

1.6.5 Biogenic sources

The biogenic source category includes emissions from all vegetation (e.g., crops, indigenous vegetation, landscaping, etc.) in Maricopa County and the PM₁₀ NAA. Emissions were estimated using the Model of

Emissions of Gases and Aerosols from Nature (MEGAN). MEGAN is a state-of-the-art biogenic emissions model developed by the National Center for Atmospheric Research (NCAR). Some corrections and improvements were made in the latest version, MEGAN2.1 which was the version used to compute biogenic emissions in Maricopa County and the PM₁₀ NAA. Annual and typical daily NO_x emissions from biogenic sources are shown in Table 1.6–8 for Maricopa County and the PM₁₀ NAA.

Table 1.6–8. Annual and typical daily emissions from biogenic sources in Maricopa County and the PM₁₀ NAA.

Geographic area	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Maricopa County			822.4					4,486		
PM ₁₀ NAA			285.0					1,555		

1.7 Summary of all source categories

Tables 1.7–8 and 1.7–9 provide summary totals of annual and season-day emissions from all emission sources in Maricopa County and the PM₁₀ NAA, respectively.

Table 1.7–8. Annual and typical daily emissions from all sources in Maricopa County (including emission reduction credits).

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Point	758.5	459.2	2,682.7	118.7	288.2	4,436	2,595	14,965	800	1,584
Nonpoint (area)	32,568.3	7,439.8	5,173	525.0	17,930.5	217,183	58,709	37,744	3,683	101,859
Nonroad mobile	1,543.8	1,480.8	17,431.5	565.5	24.0	9,802	9,396	108,551	3,190	156
Onroad mobile	17,984.0	3,380.5	27,415.2	148.3	981.9	98,549	18,523	150,249	813	5,383
Biogenic			822.4					4,486		
Total, all source categories:	52,854.6	12,760.3	53,524.8	1,357.6	19,224.6	329,970	89,223	315,996	8,486	108,981

Table 1.7–9. Annual and typical daily emissions from all sources in the PM₁₀ NAA (including emission reduction credits).

Source category	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Point	758.5	459.2	2,682.7	118.7	288.2	4,436	2,595	14,965	800	1,584
Nonpoint (area)	18,758.1	5,210.0	5,032.8	490.5	12,621.9	124,517	41,938	36,004	3,264	72,671
Nonroad mobile	1,465.1	1,405.2	16,281.5	481.1	22.7	9,283	8,902	101,472	2,726	146
Onroad mobile	17,271.1	3,240.1	24,308.6	144.2	951.3	94,636	17,757	133,225	789	5,210
Biogenic			285.0					1,555		
Total, all source categories:	38,252.8	10,314.6	48,590.6	1,234.6	13,884.1	232,872	71,192	287,222	7,579	79,611

1.8 Agencies responsible for the emissions inventory

MCAQD has primary responsibility for preparing and submitting the 2017 PEI for particulate matter pollutants for Maricopa County. Point, area, and some nonroad mobile source emission estimates were prepared by MCAQD. MAG prepared the emission estimates for onroad mobile, biogenic, and the majority of nonroad mobile sources. Table 1.8–1 lists those responsible for inventory preparation and quality assurance/quality control activities, which are described in the respective chapters.

Table 1.8–1. Chapter authors and quality assurance/quality control (QA/QC) contacts.

Chapter	Author(s)	QA/QC contact person(s)
2. Point sources	Hanna Valenzuela, MCAQD 602-506-6790	Eric Raisanen, and Joshua Uebelherr, MCAQD 602-506-6790 Matt Poppen, MAG 602-254-6300
3. Nonpoint (area) sources	Eric Raisanen, and Joshua Uebelherr, MCAQD 602-506-6790	Hanna Valenzuela, MCAQD 602-506-6790 Matt Poppen, MAG 602-254-6300
4. Nonroad mobile sources	Taejoo Shin, MAG 602-254-6300	Matt Poppen, MAG 602-254-6300
5. Onroad mobile sources	Taejoo Shin, MAG 602-254-6300	Matt Poppen, MAG 602-254-6300
6. Biogenic sources	Taejoo Shin, MAG 602-254-6300	Matt Poppen, MAG 602-254-6300

Point Sources

2.1 Introduction and scope

This inventory of particulate matter pollutants (PM₁₀, PM_{2.5}, NO_x, SO_x and NH_x) is one of two 2017 emissions inventory reports being prepared to meet US EPA reporting requirements. This inventory has been developed concurrently with a similar inventory for ozone precursors (VOC, NO_x, and CO) as part of Maricopa County's requirements under the respective State Implementation Plans (SIPs).

In addition to preparing a periodic emissions inventory for the PM₁₀ NAA as a commitment under the current state SIP, the federal Air Emission Reporting Requirements (AERR; US EPA, 2015) rule requires that state and local agencies prepare emissions estimates on a county basis and submit data electronically to the US EPA for inclusion in the National Emissions Inventory (NEI) for calendar year 2017.

2.2 Identifying point sources

In order to provide consistency among various inventories, it was decided to standardize the definition of a “point source” by adopting the designation of point sources as outlined in the *Federal Register* notice for the original AERR:

We are basing the requirement for point source format reporting on whether the source is major under 40 CFR part 70 for the pollutants for which reporting is required, i.e., CO, VOC, NO_x, SO₂, PM_{2.5}, PM₁₀, lead and NH₃ but without regard to emissions of HAPs... [T]his approach will result in a more stable universe of reporting point sources, which in turn will facilitate elimination of overlaps and gaps in estimating point source emissions, as compared to nonpoint source emissions. Under this requirement, states will know well in advance of the start of the inventory year which sources will need to be reported. (US EPA, 2008)

This chapter contains several tables that provide information on emissions from large stationary point sources. Table 2.2–1 provides an alphabetical listing of all point sources and their location. Table 2.4–1 shows the annual and daily emissions of PM₁₀, PM_{2.5}, NO_x, SO_x, and NH_x for those point sources that reported emissions of one or more of these pollutants in 2017. Table 2.5–1 lists emission reduction credits for the area, while Table 2.7–1 summarizes point source emission totals for both Maricopa County and the PM₁₀ NAA. Note that the totals shown in tables may not equal the sum of individual values due to independent rounding.

The MCAQD identified point sources within the county through its electronic permit system database, EMS, and the 2017 annual emissions reports submitted to the department. A total of 22 stationary sources were identified as point sources using the definition described in Section 2.1 above. While the Arizona Department of Environmental Quality (ADEQ) retains permitting authority for a limited number of industrial source categories in Maricopa County, no ADEQ-permitted facilities are considered point sources, and are addressed instead as nonpoint sources.

Table 2.2–1 contains an alphabetical listing of all point sources, including a unique business identification number, North American Industry Classification System (NAICS) code, business name, and physical address.

Table 2.2–1. Name and location of all point sources in Maricopa County.

ID #	NAICS	Business name	Address	City	ZIP
3313	221112	APS West Phoenix Power Plant	4606 W Hadley St	Phoenix	85043
43063	221112	Arlington Valley LLC	39027 W Elliot Rd	Arlington	85322
1218	562212	Butterfield Station Facility	40404 S 99th Ave	Mobile	85239
127771	331111	CMC Steel Fabricators Inc.	11444 E Germann Rd	Mesa	85212
44439	221112	Gila River Power Station	1250 E Watermelon	Gila Bend	85337
4173	562212	Glendale Mun Sanitary Landfill	11480 W Glendale Av	Glendale	85301
355	336412	Honeywell International Inc.	111 S 34th St	Phoenix	85034
3966	334413	Intel Corp. – Ocotillo Campus	4500 S Dobson Rd	Chandler	85248
3300	92811	Luke AFB – 56th Fighter Wing	14002 W Marauder St	Glendale	85309
44186	221112	Mesquite Generating Station	37625 W Elliot Rd	Arlington	85322
43530	221112	New Harquahala Generating Co.	2530 N 491st Ave	Tonopah	85354
20706	32614	New Wincup Holdings Inc.	7980 W Buckeye Rd	Phoenix	85043
1879	562212	Northwest Regional Landfill	19401 W Deer Valley	Surprise	85387
1331	337122	Oak Canyon Manufacturing Inc.	3021 N 29th Dr.	Phoenix	85017
52382	221112	Ocotillo Power Plant	1500 E University Dr.	Tempe	85281
42956	221112	Redhawk Generating Facility	11600 S 363rd Ave	Arlington	85322
303	332431	Rexam Beverage Can Company	211 N 51st Ave	Phoenix	85043
3315	221112	Santan Generating Station	1005 S Val Vista Rd	Gilbert	85296
4175	424710	SFPP LP Phoenix Terminal	49 N 53rd Ave	Phoenix	85043
3316	221112	SRP Agua Fria Generating Station	7302 W Northern Av	Glendale	85303
3317	221112	SRP Kyrene Generating Station	7005 S Kyrene Rd	Tempe	85283
1210	337122	Trendwood Inc.	2402 S 15th Ave	Phoenix	85007

Note: All facilities listed above are also located within the PM₁₀ NAA.

2.3 Procedures for estimating emissions from point sources

Annual and season-day emission estimates were calculated from annual source emissions reports, MCAQD investigation reports, permit files and logs, or telephone contacts with sources. For most of the sources, material balance methods were used for determining emissions. Emissions were estimated using the emission factors from source tests, the EPA’s Compilation of Emission Factors (AP–42), engineering calculations, or manufacturers’ specifications.

MCAQD distributes annual emissions survey forms to most facilities for which MCAQD has issued an operating permit, including all Title V and synthetic minor facilities. All facilities are required to report detailed information on stacks, control devices, operating schedules, and process-level information concerning their annual activities. Detailed instructions accompany the emissions reporting forms and include examples and explanations on how to complete the annual emissions reporting forms that facilities must submit to MCAQD. (See Appendix A for a copy of the instructions accompanying the annual emissions inventory forms.)

After a facility has submitted an annual emissions report to MCAQD, emissions inventory staff check all reports for missing and questionable data and check the accuracy and reasonableness of all emissions calculations with AP–42, the Factor Information and REtrieval (*webFIRE*) software, and other EPA documentation. Control efficiencies are determined by source tests when available, or by AP–42 factors, engineering calculations, or manufacturers’ specifications. MCAQD has conducted annual emissions surveys for permitted facilities since 1988, and the department's database system, EMS, contains numerous automated quality assurance/quality control checks for data input and processing.

2.3.1 Application of rule effectiveness

Rule effectiveness (“RE”) reflects the actual ability of a regulatory program to achieve the emission reductions required by regulation. The concept of applying rule effectiveness in a SIP emissions inventory has evolved from the observation that regulatory programs may be less than 100 percent effective for some source categories. Rule effectiveness is applied to those sources affected by a regulation and for which emissions are determined by means of emission factors and control efficiency estimates.

MCAQD has estimated rule effectiveness for a variety of emissions sources and source categories. For processes that claimed emissions reductions through the use of a control device, rule effectiveness was quantified separately for Title V and non-Title V sources. Overall RE values of 94.29% (for Title V processes) and 91.37% (for non-Title V processes) were calculated and applied to 2017 process-level emissions information where applicable. Appendix B provides further details on the methods and data used in computing these rule effectiveness rates.

2.4 Detailed overview of point source emissions

Table 2.4–1 and 2.4–2 provides a summary of annual and season-day emissions respectively from all 20 facilities that have been categorized as point particulate matter emission sources (all of which are located within the PM₁₀ NAA). Sources for which rule effectiveness was applied are noted. Emissions values of “0.0” and “0” for annual and season-day emissions denote quantities below the level of significance (0.05 tons/yr and 0.5 lbs/day, respectively).

Table 2.4–1. Annual emissions from point sources by facility.

ID #	Business name		Annual emissions (tons/yr)				
			PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
3313	APS West Phoenix Power Plant	*	52.0	48.6	857.7	7.1	42.6
43063	Arlington Valley LLC	*	22.5	17.3	55.7	4.5	8.9
1218	Butterfield Station Facility	*	47.6	10.5	18.1	1.8	—
127771	CMC Steel Fabricators Inc.	*	26.1	18.6	48.0	35.0	—
44439	Gila River Power Station	*	56.4	52.6	117.8	7.9	47.5
4173	Glendale Mun. Sanitary Landfill	*	32.6	5.5	9.2	0.1	—
355	Honeywell International Inc.		1.4	1.4	25.8	5.4	—
3966	Intel Corp. – Ocotillo Campus		32.9	21.0	56.7	4.4	7.1
3300	Luke AFB – 56th Fighter Wing		0.5	0.5	6.7	0.2	—
44186	Mesquite Power Operations LLC		54.6	48.0	156.7	10.9	71.1
43530	New Harquahala Gen Co.		31.6	31.5	41.9	4.0	58.9
20706	New Wincup Holdings Inc.		0.2	0.2	4.6	0.1	—
1879	Northwest Regional Landfill	*	174.6	32.1	20.1	2.9	—
1331	Oak Canyon Manufacturing Inc.		0.0	0.0	—	—	—
52382	Ocotillo Power Plant		20.8	16.8	226.1	0.9	—
42956	Redhawk Generating Facility		87.3	49.9	178.1	10.0	29.1
303	Rexam Beverage Can Co.	*	0.4	0.4	4.8	—	—
3315	Santan Generating Station		61.6	60.6	274.2	8.7	15.5
4175	SFPP LP Phoenix Terminal	*	0.9	0.7	5.6	0.2	—
3316	SRP Agua Fria Generating Stn.		25.6	19.0	472.5	12.4	—
3317	SRP Kyrene Generating Station		24.2	24.0	42.3	2.3	7.5
1210	Trendwood Inc.		0.0	0.0	—	—	—
Totals:			753.7	459.2	2,622.5	118.6	288.2

* = Facility for which rule effectiveness has been applied to one or more reported processes.

Table 2.4–2. Daily emissions from point sources by facility.

ID #	Business name		Daily emissions (lbs/day)				
			PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
3313	APS West Phoenix Power Plant	*	286	267	4,712	39	234
43063	Arlington Valley LLC	*	124	96	317	27	49
1218	Butterfield Station Facility	*	300	64	113	11	—
127771	CMC Steel Fabricators Inc.	*	194	138	452	336	—
44439	Gila River Power Station	*	310	289	651	44	261
4173	Glendale Mun. Sanitary Landfill	*	208	34	51	0	—
355	Honeywell International Inc.		8	8	144	30	—
3966	Intel Corp. – Ocotillo Campus		181	115	312	24	39
3300	Luke AFB – 56th Fighter Wing		3	3	44	1	—
44186	Mesquite Power Operations LLC		300	264	861	60	391
43530	New Harquahala Gen Co.		173	173	230	22	323
20706	New Wincup Holdings Inc.		1	1	25	0	—
1879	Northwest Regional Landfill	*	1,109	199	110	16	—
1331	Oak Canyon Manufacturing Inc.		0	0	—	—	—
52382	Ocotillo Power Plant		114	92	1,242	5	—
42956	Redhawk Generating Facility		480	274	979	55	160
303	Rexam Beverage Can Co.	*	2	2	26	0	—
3315	Santan Generating Station		339	333	1,506	48	85
4175	SFPP LP Phoenix Terminal	*	6	4	31	1	—
3316	SRP Agua Fria Generating Stn.		141	104	2,596	68	—
3317	SRP Kyrene Generating Station		133	132	233	12	41
1210	Trendwood Inc.		0	0	—	—	—
Totals:			4,410	2,595	14,636	799	1,584

* = Facility for which rule effectiveness has been applied to one or more reported processes.

2.5 Emission Reduction Credits

A major source or major modification planned in a NAA must obtain emissions reduction as a condition for approval. These reductions, generally obtained from existing sources located in the vicinity of a proposed source, must offset the increased emissions from the new source or modification. The obvious purpose of acquiring offsetting emission decreases is to allow an area to move towards attainment of the national ambient air quality standards while still allowing some industrial growth.

In order for these emission reductions to be available in the future for offsetting, they must: (1) be explicitly included and quantified as growth in projection-year inventories required in rate of progress plans or attainment demonstrations that were based on 1990 actual inventories, and (2) meet the requirements outlined in MCAQD Rule 240 (renamed “Federal Major New Source Review [NSR]” in early 2016). Table 2.5–1 provides a list of emission reduction credits for PM₁₀, NO_x, and SO_x.

Table 2.5–1. Available certified ERCs in the Arizona Emissions Bank.

Facility name	Reduction Date	Emission reduction credits (tons/yr)		
		PM ₁₀	NO _x	SO _x
Freescale Semiconductor, Inc.	3/1/2004	1.8	6.8	0.16
Intel Corporation	3/4/2005	—	7.0	—
Madison 51, LLC	10/8/2012	1.8	—	—
Penn Racquet Sports Inc.	3/6/2009	1.19	0.34	—
Totals:		4.79	14.14	0.16

A number of facilities have been identified as potential sources of ERCs for NO_x in addition to those listed in Table 2.5–1. The companies listed in Table 2.5–2 are provided here in order to maintain the availability of these emissions in this periodic inventory in the event that sufficient documentation can be secured to confirm the emissions reductions.

Table 2.5–2. Potential sources of ERCs for NO_x.

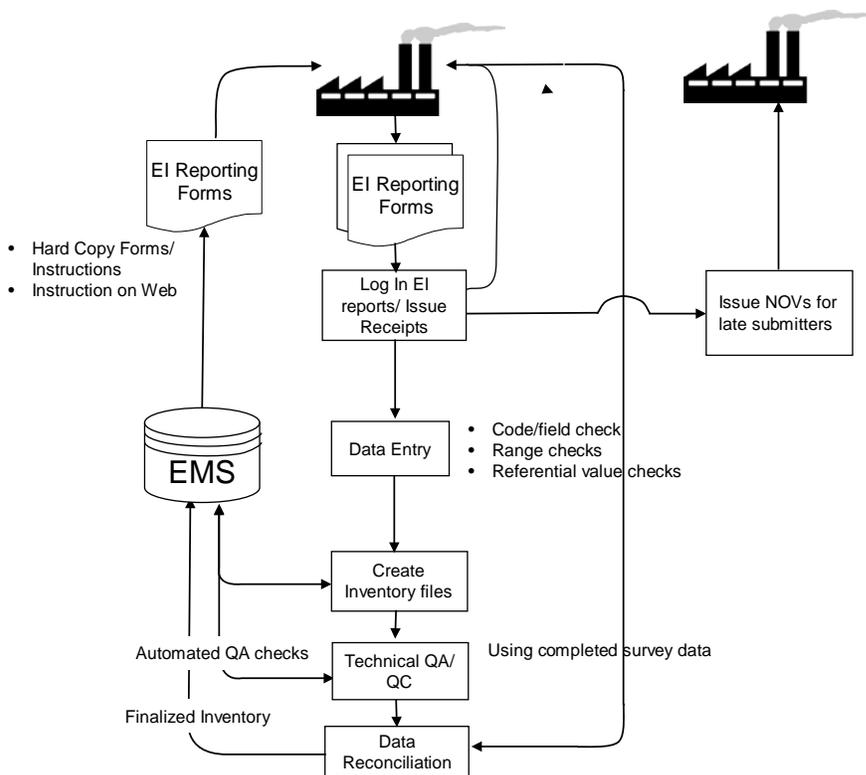
Permit no.	Facility name	City, ZIP	Potential NO _x ERCs (tons/yr)
090003	Phoenix San-Man Inc.	Buckeye, 85326	9.9
010143	Gro-Well Brands Inc.	Phoenix, 85009	8.3
970349	Cemex – Central Ave. Plant	Phoenix, 85041	7.5
990571	Southwest Airlines	Phoenix, 85034	6.0
070022	Costco	Phoenix, 85017	6.0
990378	Opt Co	Phoenix, 85120	5.2
090298	Phoenix Brick Yard	Phoenix, 85007	3.1
Totals:			46.0

2.6 Quality assurance/quality control procedures

2.6.1 Emission survey preparation and data collection

The MCAQD's Emissions Inventory (EI) Unit annually collects point source criteria pollutant emission data from sources in the county. MCAQD annually reviews EPA guidance, documents from the Emissions Inventory Improvement Program (EIIP), and other source materials to ensure that the most current emission factors and emission calculation methods are used for each year's survey. Each January, the EI Unit prepares a pre-populated hard copy of the preceding year's submissions and mails reporting forms to permitted sources, along with detailed instructions for completing the forms. (A copy of these instructions is included as Appendix A). The EI Unit asks sources to verify and update the data. The EI Unit also holds numerous workshops each spring to assist businesses in completing EI forms. The general data flow for data collection and inventory preparation is shown in Figure 2.6–1.

Figure 2.6–1. Data flow for annual point source emissions inventory reporting.



2.6.2 Submission processing

Submitted EI reports are logged in as they are received, and receipts are issued for any emissions fee paid. The data are input “as received” into the department's database. During data entry, a variety of automated quality control (QC) checks are performed, including:

- pull-down menus to minimize data entry errors (e.g., city, pollutant, emission factor unit, etc.)
- mandatory data field requirement checks (e.g., a warning screen appears if a user tries to save an emission record with a missing emission factor)
- range checks (e.g., were valid Source Classification Codes (SCC), Tier, Standard Industrial Classification (SIC), and NAICS codes entered?)
- referential value checks (e.g., emission factor units, annual throughput units) automatic formatting of date, time, telephone number fields, etc.

Automated quality assurance (QA) checks on the report that has been entered include the following:

- comparing reported emission factors to SCC reference lists,
- comparing reported emission factors to material name reference list,
- checking the report for completeness of required data, and
- checking the report for calculation errors. This includes annual throughput, emission factors, unit conversion factors (e.g., therms to MMCF), capture efficiency, primary/secondary control device efficiency, and any offsite recycling credits claimed.

When data entry is complete, an electronic version of the original data is preserved separately to document changes made during the technical review and QA/QC process. When errors are flagged, the businesses are contacted and correct information is obtained and input to EMS. Outstanding reporting issues are documented. Confidential business information is identified by a checkbox on the form, and these data elements are flagged during data entry and are not transmitted to the EPA.

To prepare the inventory for submittal to the National Emissions Inventory (NEI), the EI Unit has developed a series of MS-Access queries to extract data from EMS and to append or convert codes, units of measure, etc., in order to create staging tables that adhere to the EPA’s Consolidated Emissions Reporting Schema. These tables are then converted to XML files using EPA’s Bridge conversion tool for submittal to the EPA’s Emissions Inventory System (EIS).

2.6.3 Analysis of annual point source emissions data for this inventory

Air quality planning staff checked inventory accuracy and reasonableness and assured that all point sources had been identified and that the methodology applied to calculate emissions was appropriate and that the calculations were correct. Other reasonableness checks were conducted by recalculating emissions using methods other than those used to make the initial emissions calculations and then comparing results. Quality assurance checks were conducted by checking all emissions reports submitted to MCAQD for the year 2017 for missing and questionable data and by checking the accuracy and reasonableness of all emissions calculations made for such reports. Notes concerning follow-up calls and corrections to calculations were documented on each 2017 annual emissions report.

2.7 Summary of all point source emissions

Table 2.7–1 below summarizes annual and daily emissions from all point sources, including the existing and potential emission reduction credits listed above in Tables 2.5–1 and 2.5–2 respectively, for both Maricopa County and the PM₁₀ NAA.

Table 2.7–1. Annual and typical daily point source emissions (including all emission reduction credits).

Geographic area	Annual emissions (tons/yr)					Daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Maricopa County	758.5	459.2	2,682.7	118.7	288.2	4,436	2,595	14,965	800	1,584
PM ₁₀ NAA	758.5	459.2	2,682.7	118.7	288.2	4,436	2,595	14,965	800	1,584

2.8 References

US EPA, 2008. Air Emissions Reporting Requirements. 73 Fed. Reg. 76539 (Dec. 17, 2008).

<https://federalregister.gov/a/E8-29737>

US EPA, 2015. Revisions to the Air Emissions Reporting Requirements: Revisions to Lead (Pb) Reporting Threshold and Clarifications to Technical Reporting Details. 80 Fed. Reg. 8787 (Feb. 19, 2015).

<https://federalregister.gov/a/2015-03470>

Nonpoint Sources

3.1 Introduction and scope

This chapter considers all stationary sources which are too small or too numerous to be treated as point sources. A variety of US EPA guidance materials were evaluated to identify nonpoint source categories meriting inclusion in this inventory, including the 2017 National Emissions Inventory (NEI) website (US EPA, 2018); documentation of the development of the previous NEI in 2014 (US EPA, 2016); and the document “Introduction to Nonpoint source Inventory Development” (US EPA, 2001a). In addition, permit and emissions data in the MCAQD’s EMS database were analyzed to identify critical point and nonpoint source categories. Some source categories were deemed “insignificant” because there are no large production facilities and/or very few small sources, and thus emissions from these categories were not quantified. Annual emissions for Maricopa County, as well as the PM₁₀ NAA are presented in Tables 3.5–1 and 3.5–2.

3.2 Emission Calculation Methodology

The specific emissions estimation methods that MCAQD used to estimate the annual and daily nonpoint emission inventory for Maricopa County are summarized in Table 3.2-1. The methodologies associated with these calculation methods are described in the following sub-sections.

Table 3.2–1. Calculation method for all nonpoint (area)sources.

Source category	Annual method	Season-day method
<i>Fuel combustion:</i>		
Industrial distillate oil: boilers	2017 EPA NEMO	Operating Schedule
Industrial distillate oil: engines	2017 EPA NEMO	Operating Schedule
Industrial natural gas	2017 EPA NEMO	Operating Schedule
Industrial LPG	2017 EPA NEMO	Operating Schedule
Comm./inst. distillate oil: boilers	2017 EPA NEMO	Operating Schedule
Comm./inst. distillate oil: engines	2017 EPA NEMO	Operating Schedule
Comm./inst. natural gas	2017 EPA NEMO	Operating Schedule
Residential distillate oil	2017 EPA NEMO	Heating Degree Days
Residential LPG	2014 Emissions Extrapolation	Heating Degree Days
Residential natural gas	2017 EPA NEMO	Heating Degree Days
Residential wood combustion	2017 EPA NEMO	Heating Degree Days

Table 3.2–1. Calculation method for all nonpoint (area) sources (continued).

Source category	Annual method	Season-day method
<i>Industrial processes:</i>		
Commercial cooking	2017 EPA NEMO	Uniform Usage 2014 Emissions Extrapolation
Electrical equipment manufacturing	2014 Emissions Extrapolation	Extrapolation
Industrial processes, NEC	Annual Emission Reports	Annual Emission Reports
Secondary metal production	Annual Emission Reports	Annual Emission Reports
Chemical manufacturing	Scaling Up	Scaling Up
Fabricated metal product manufacturing	Scaling Up	Scaling Up
Rubber/plastic product manufacturing	Scaling Up	Scaling Up
Ammonia cold storage	Scaling Up	Uniform Usage
Grain handling/processing	Scaling Up	Scaling Up
Industrial paved/unpaved road travel	Annual Emission Reports	Annual Emission Reports
Mining/quarrying	Annual Emission Reports	Annual Emission Reports
Wood product manufacturing	Scaling Up	Scaling Up
Nonmetallic mineral products	Annual Emission Reports	Annual Emission Reports
Commercial construction	Dust Control Permits	Uniform Usage
Residential construction	Dust Control Permits	Uniform Usage
Road construction	Dust Control Permits	Uniform Usage
Construction, other	Dust Control Permits	Uniform Usage
<i>Misc. nonpoint sources:</i>		
Backyard barbeques	EPA Tool	Uniform Usage
Aircraft engine testing	Annual Emission Reports	Annual Emission Reports
Crematories, human	Annual Emission Reports	Annual Emission Reports
Crematories, animal	Annual Emission Reports	Annual Emission Reports
Structure fires	Fire Database	Uniform Usage
Vehicle fires	Fire Database	Uniform Usage
Prescribed fires	Prescribed Fires	Prescribed Fires
Accidental releases	Self-Reported	Self-Reported
Wildfires	Wildfires	Wildfires
Leaf blower fugitive dust	Leaf Blower Fugitive Dust	Uniform Usage
Offroad recreational vehicle fugitive dust	Offroad Recreational Fug. Dust	Uniform Usage
Humans	Per-Capita	Uniform Usage
Fertilizer application	2017 EPA NEMO	Uniform Usage
Livestock	2017 EPA NEMO	Uniform Usage
Composting	2017 EPA NEMO	Uniform Usage
Tilling	Agriculture	Operating Schedule
Harvesting	Agriculture	Operating Schedule
Travel on unpaved agricultural roads	Scaling Up	Operating Schedule
Travel on unpaved parking lots	Unpaved Parking Lots	Uniform Usage
Windblown dust	Windblown Dust	Uniform Usage
Cotton ginning	Annual Emission Reports	Annual Emission Reports

Table 3.2–1. Calculation method for all nonpoint (area) sources (continued).

Source category	Annual method	Season-day method
<i>Waste disposal:</i>		
Publicly owned treatment works	Per-Capita	Uniform Usage
Landfills	Annual Emission Reports	Annual Emission Reports
Other waste	Annual Emission Reports	Annual Emission Reports
Open burning	Burn Permits	Burn Permits

3.2.1 2017 EPA NEMO

Annual emissions for these source categories were derived using county-specific data with the 2017 EPA Nonpoint Emissions Methodologies and Operator Instructions (NEMO), which are the methodologies used by US EPA for the 2017 National Emissions Inventory (NEI).

3.2.2 Operating Schedule

In order to calculate the daily emissions, it is assumed the activity occurs a certain number of days per week and is relatively uniform throughout the year. Thus, the annual emissions were divided by the days per week it operated multiplied by 52 weeks per year. The exception is agricultural tilling and harvesting which had a specific number of operating weeks per crop type throughout the year used to calculate emissions.

3.2.3 Heating Degree Days

PM₁₀ daily emissions were calculated by dividing annual emissions by the number of heating degree days (NOAA, 2018), which is the number of degrees per day that the daily average temperature is below 65 °F.

3.2.4 Uniform Usage

For certain categories it is assumed to occur uniformly throughout the year. Therefore, average daily emissions were developed by dividing the annual emissions by 365 days. Uniform daily usage for ammonia cold storage is calculated by equally distributing the annual usage equally over 312 days assuming activity occurring 6 days per week multiplied by 52 weeks per year.

3.2.5 2014 Emissions Extrapolation

For electrical equipment manufacturing, the data from the 2014 PM₁₀ periodic emissions inventory (MCAQD, 2017) were extrapolated to 2017 based on the ratio of industrial employment levels for those two years. Residential LPG fuel use was extrapolated from the 2014 PM₁₀ periodic emissions inventory (MCAQD, 2017) to 2017 based on the ratio of Maricopa County population for those two years.

3.2.6 Annual Emission Reports

Annual and season-day emissions from facilities were derived by using annual emissions reports from permitted sources. For these categories it was assumed that there were no significant unpermitted sources within Maricopa County. When all facilities in a given source category are considered to only be located within the PM₁₀ NAA, total emission values for the county and the NAA are equal.

3.2.7 Scaling Up

Emissions were calculated by the “scaling up” method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources and county-level employment data from the US Census Bureau (2018) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category. The most recent data from the US Census Bureau’s County Business Patterns for 2017 employment were used. Where employment estimates were provided as a range of values, the midpoint was used. Some facilities in this category have been categorized as point sources, and thus their emissions are accounted for in Chapter 2. To avoid double-counting, reported total employment at individual point sources are subtracted from estimated County employment levels.

3.2.8 Dust Control Permits

Dust from construction was calculated using Maricopa County’s air quality permits database to identify all dust control permits issued during 2017. A total of 3,691 permits were issued, comprising a total of 31,264 acres. All construction emission factors used were developed by the Western Regional Air Partnership (WRAP, 2006), except the road construction emission factor from Clark County (Clark County, 2001). The following construction durations were assumed: 6 months for residential single-family, 12 months for residential multi-family, 11 months for commercial, 12 months for road construction, 1 month for trenching and demolition, 8 months for site prep/land development activities, and 12 months for temporary storage yards. A 90% watering control efficiency was applied to the uncontrolled emissions calculation. A 2017 rule effectiveness study by Maricopa County estimated a 90.94% compliance rate with Maricopa County Rule 310 on dust control at construction sites. Thus, an overall control effectiveness of 81.4% ($= 90\% \times 90.94\%$) was applied for all Maricopa County construction activity. $PM_{2.5}$ emissions were estimated to comprise 10% of PM_{10} emissions (WRAP, 2006). Dust control permit site location data were used to determine construction activity that occurred in the Maricopa County PM_{10} NAA. In addition, the Pinal County Air Quality Department (PCAQD) provided construction emission estimates for the Pinal County portion of the PM_{10} NAA. The PCAQD estimates incorporated the same assumptions concerning relevant input variables such as the average duration of construction activity, emission factors and control efficiency. PCAQD assumed a 90.4% rule effectiveness.

3.2.9 Fire Database

2017 structure and vehicle fire data were from the Arizona Department of Forestry and Fire Management (ADFFM pers. commun.: B. Kimball, October 19, 2018). The ADFFM coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire departments. The NFIRS is a national reporting system used by fire departments to report fires and other incidents to which they respond and to maintain records of these incidents in a uniform manner. Twenty-one of forty fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2017. This included 2,027 reported structure fires. Because the ADFFM data only included data reported by twenty-one out of forty fire departments in Maricopa County, the number of structure fires reported were scaled up to the entire inventory area based on population. The most recent estimates for Maricopa County city populations were used to scale up the number of structure and vehicle fires from the AZ Office of Economic Opportunity (AOEO; Arizona Office of Economic Opportunity, 2018). Estimates of material burned in a structure fire were determined by multiplying the number of structure fires by a fuel loading factor of 1.15 tons of material per fire to yield tons material burned per year, which factors in the estimated percentage of structural loss and content loss (US

EPA, 2001). Annual emissions from vehicle fires were calculated by first multiplying the number of vehicle fires by a fuel loading factor of 0.25 tons per vehicle fire to estimate the annual amount of material burned in vehicle fires (US EPA, 2000).

3.2.10 Prescribed fires

Emissions from prescribed fires were estimated using data obtained from the ADEQ (2018), which reported that a total of two prescribed fires occurred in Maricopa County during 2017 (M. Pace, pers. commun., Oct. 16, 2018), neither which were within the PM₁₀ NAA. Because both 2017 prescribed fires were piled fuels, material burned was derived by multiplying the number of acres burned by tons of piles per acre for each fire. Table 3.2–2 shows the data provided by the ADEQ, the amount of material burned for each fire, and whether the fire occurred within the NAA.

Table 3.2–2. Prescribed fires in Maricopa County during 2017.

Date	Burn ID	Tons/acre	Acres burned	Material burned (tons)	Within PM ₁₀ NAA?
03/07/2017	PHD205P	5	50	250	N
03/09/2017	TNF0301P	1	2	2	N
Totals:			52	252	

To estimate emissions, emission factors for “piled fuels” from the Western Regional Air Partnership’s (WRAP) 2002 Fire Emissions Inventory (WGA/WRAP, 2005) were used. Annual emissions from prescribed fires in Maricopa County were derived by multiplying material burned by the emission factor then dividing by 2,000 lbs/ton. Daily emissions were calculated by dividing the total emissions by the two burn days.

3.2.11 Self-Reported

As part of its air quality permit compliance program, MCAQD keeps an “upset log” for each calendar year that records excess emissions and accidental releases at permitted facilities. Annual emissions inventory reports also provide for recording of accidental releases. Data from these two sources were reviewed to estimate emissions from all accidental releases in 2017.

3.2.12 Wildfires

Data on the incidence of wildfires in Maricopa County were obtained from the ADFFM (pers. commun.: B. Kimball, October 19, 2018) and data reported in the Geospatial Multi-Agency Coordination Group (GeoMAC) GIS Wildland Fire Support database (USGS, 2018). The ADFFM provides for the prevention and suppression of wildfires on state trust land and private lands located outside of incorporated communities; the wildfire data provided by ADFFM includes wildfires reported by local fire departments. The ADFFM and GeoMAC datasets were crosschecked and there was no overlap in the fires contained in these two databases, which respectively reported 828 and 7 fires, covering 1,110 and 7,358 respective acres for Maricopa County.

Estimates of the material burned were derived by multiplying the acres burned for each category by an assigned fuel loading factor. Since there was insufficient information concerning the land use or vegetation types for each reported fire, a fuel loading factor of 4.5 tons/acre (reflecting e.g., “agriculture” or “sagebrush” categories), was used as a conservative estimate.

Latitude and longitude data were used to determine the number of acres burned inside of the NAA. Table 3.2–3 shows the number of wildfires and acreage burned for the Maricopa County PM₁₀ NAA, as well as the estimated total material burned.

Table 3.2–3. Wildfire incidence, acreage burned, and material burned in 2017.

Geographic area	No. of fires	Acreage burned	Fuel loading factor (tons/acre)	Material burned (tons/yr)
Maricopa County	835	8,468	4.5	38,107
PM ₁₀ NAA	725	1,082	4.5	4,868

Annual emissions from wildfires for each geographic area were calculated by multiplying the material burned for each area by the emission factors obtained from the Western Regional Air Partnership's (WRAP) 2002 Fire Emissions Inventory (WGA/WRAP, 2005). Typical daily emissions were estimated by multiplying the total material burned during the year by the emission factor. This result was divided by the number of separate days on which wildfire activity was reported for Maricopa County and the PM₁₀ NAA – 283 and 275 days respectively.

3.2.13 Leaf Blower Fugitive Dust

Leaf blower annual emissions are calculated based on the EPA MOVES 2014b model nonroad model output data files. It is assumed that 60% of leaf blowers are electric based on a California Air Resources Board (CARB) report in order to upscale the number of gas-powered leaf blowers from MOVES 2014b to the total population of leaf blowers that generate PM₁₀ emissions.

3.2.14 Offroad Recreation Fugitive Dust

Fugitive dust emissions from offroad recreational vehicles are generated when the vehicles travel on unpaved surfaces. For the 2017 periodic inventory, these emissions were estimated by MAG using mileage and activity data for offroad recreational vehicles in Maricopa County from the MOVES2014b model. This includes fugitive dust and exhaust (tailpipe) emissions from offroad recreational vehicles. It was assumed that 75 percent of the annual travel by offroad recreational vehicles occurs on unpaved surfaces inside Maricopa County, with the remaining 25 percent occurring on paved surfaces within Maricopa County and paved and unpaved surfaces outside of Maricopa County. The product of the mileage, number of vehicles, and 75 percent produces the annual vehicle miles of travel (VMT) on unpaved surfaces. The VMTs above were multiplied by emission factors for unpaved industrial roads from AP-42 (EPA, 2006), assuming a silt content of 11.9 percent, an average vehicle weight of one-half of a ton, and accounting for days of the year in 2017 with precipitation of at least 0.01 inches (26 days). The emissions for the PM₁₀ NAA were derived by using MAG 2017 land use data to obtain the acreage of vacant and passive open space in the PM₁₀ NAA and Maricopa County. Passive open space includes open desert, mountains, and washes.

3.2.15 Per-Capita

The change from the 2012 to 2017 US population proportion was used to extrapolate the 2012 Publicly Owned Treatment Works (POTW) annual flow rate to 2017 values. Then the proportion of Maricopa County population to US population in 2017 was used to apportion the amount of POTW flow rate to Maricopa County. The flow rate was then used to calculate emissions based on an emissions factor.

3.2.16 Agriculture

Agricultural PM₁₀ and PM_{2.5} tilling emissions were calculated from an equation developed by the EPA (2017). The crop tilling emissions are based on multiplying the total number of acres times the total number of tillage passes per acre for that crop, times the tillage emissions factor (*EF*, lbs/acre-passes). The number of crop acres were obtained through linear extrapolation of crop acres from 2007 & 2012 USDA Census of Agriculture to the year 2017. However, potato acres were extrapolated to 2017 based on the number of acres in the 2008 and 2011 MCAQD PM₁₀ Periodic Emissions Inventories (MCAQD, 2011 & 2014). The number of tillage passes by crop type were derived from the URS Corporation (URS) & Eastern Research Group's (ERG) *Agricultural Best Management Practices Technical Support Document* (June 8, 2001), Appendix C-1: Tillage p. C-1-3 & C-1-4.

PM₁₀ emissions from crop harvest were estimated by multiplying crop-specific emissions factors (CARB, 2017) by the number of harvest acres for each species. The Crop harvest acres were obtained through linear extrapolation of the values from the 2007 and 2012 USDA National Agricultural Statistics Service to 2017. Upland and Pima cotton acres for 2007 were estimated using a proportion based on the total acres of all cotton in 2007 and 2012, and the relative percentage of Upland and Pima cotton in 2012. Potato acres for 2017 were extrapolated based on the number of acres reported in the 2008 and 2011 MCAQD PM₁₀ Periodic Emissions Inventories (MCAQD, 2011 & 2014). Annual PM_{2.5} emissions from agricultural harvesting inside and outside of Area A were calculated based on PM₁₀ emissions using the following equation: $PM_{2.5} = (PM_{10}/0.4543) * 0.0681$ (CARB, 2017).

The same compliance factor approach was used for both tilling and harvest. URS and ERG (2001) quantified two Best Management Practices (BMPs) for tillage: 1) combining tractor operations, 2) reduced harvest activity, and 3) use of multi-year crops. URS and ERG (2001) developed minimum, maximum and midpoint control efficiencies by multiplying control efficiencies and relevancy factors by a compliance factor. An assumption is made here that the mid-point control efficiencies for BMPs apply to Maricopa County. A compliance factor of 55.2% was assumed based on agricultural operations rule effectiveness for agricultural operations from the 2008 Maricopa County Periodic PM₁₀ Emissions Inventory Appendix A (MCAQD, 2011).

For both tilling and harvest, total uncontrolled emissions from areas outside of Area A were derived by multiplying the total county uncontrolled emissions by the percentage of agricultural acreage outside of Area A relative to the total acreage of the county (100% - 64.1%). Area A means the area delineated according to A.R.S. § 49-541(1). The controlled emissions from agricultural operating within Area A were estimated by multiplying the BMP mid-point control efficiencies by the total uncontrolled emissions, which were then multiplied by the percentage of agricultural acreage of Area A relative to the total acreage of the county of 64.1% (M. Poppen, MAG, pers. commun., Oct. 3, 2018). Total tillage and harvest controlled and uncontrolled emissions were summed to estimate total annual PM₁₀ emissions from agricultural tilling in Maricopa County. Annual tillage and harvest emissions from agricultural harvesting in the PM₁₀ NAA were calculated in the same manner as the annual PM₁₀ emissions from the Maricopa County portion of Area A. This was achieved by multiplying the total county PM₁₀ emissions by the percentage of agricultural acreage inside the PM₁₀ NAA relative to the total acreage of the county of 41.1%.

3.2.17 Unpaved Parking Lots

Fugitive dust emissions from vehicles traveling on unpaved parking lots were developed by MAG based on land area devoted to unpaved parking lots, vehicle activity on unpaved parking lots, and emission rates from AP-42 (EPA, 2006). The vehicle miles traveled on unpaved parking lots in the PM₁₀ NAA were derived using assumptions from the Phase I windblown dust modeling for the Western Regional Air Partnership (ENVIRON, 2004). This study estimated that eight percent of the vacant land in core urban areas is disturbed and thirty percent of the land under development is disturbed.

For the 2017 periodic emissions inventory, the core urban area is defined as the carbon monoxide maintenance area. A geographic information system (GIS) was applied to 2017 MAG land use data to estimate that there are 159,846 acres of vacant land in the core urbanized area and 11,667 acres of land under residential and non-residential development in the PM₁₀ NAA. Multiplying the vacant disturbed percentages by these land areas produces 12,788 acres of vacant disturbed land in the urbanized core, and 3,500 acres of vacant disturbed land under development in the PM₁₀ NAA. Summing the vacant disturbed acres in the urbanized core and areas under development produces a total of 16,288 acres of vacant disturbed land in the PM₁₀ NAA.

In estimating fugitive dust emissions from unpaved parking lots, the MAG Serious Area PM₁₀ Plan assumed that 24 percent of the disturbed vacant non-agricultural land is devoted to unpaved parking areas (MAG, 2000). Applying this percentage to the acres of vacant disturbed land results in 3,909 acres of unpaved parking lots in the PM₁₀ NAA. The MAG Serious Area PM₁₀ Plan also assumed that the average size of an unpaved parking lot is 625 square meters (i.e., 0.154 acres), an average of ten vehicles travel on each lot per day, and each vehicle travels an average distance of 0.031 miles on a lot. The emission factors for unpaved parking lots were derived from the AP-42 equation for unpaved industrial roads (EPA, 2006); assuming a silt content of 11.9 percent, an average vehicle weight of 2.75 tons in the PM₁₀ NAA (derived from 2017 vehicle registration data), and accounting for days of the year in 2017 with precipitation of at least 0.01 inches (26 days). The resultant AP-42 emission factors are 1.3296 pounds per mile for PM₁₀ and 0.1330 pounds per mile for PM_{2.5}. These AP-42 emission factors were applied to the unpaved parking lot VMT of 7,818.

The final step in estimating Maricopa County emissions requires removing the Pinal County portion of the PM₁₀ NAA. The unpaved parking lot emissions in the Pinal County portion of the PM₁₀ NAA are assumed to be proportional to the acres of vacant land. These were derived using GIS and 2017 MAG land use data. Adding the emissions inside and outside the PM₁₀ NAA and subtracting the Pinal County portion produces total Maricopa County emissions attributable to vehicles traveling on unpaved parking lots

3.2.18 Windblown Dust

Estimates of PM₁₀ and PM_{2.5} emissions from windblown dust are developed using the supply-limited windblown dust emission scheme described in detail in Appendix 4 of the 2008 PM₁₀ Periodic Emissions Inventories for the Maricopa County, Arizona, Nonattainment Area (MCAQD, 2011). Updates to the methodology developed for the 2008 inventory include the use of 2017 land use data, 2017 rule effectiveness rates, 2017 meteorological data, and 2017 PM₁₀ concentration data.

The land use categories that are capable of producing windblown dust in Maricopa County and the PM₁₀ NAA were defined in the 2011 PM₁₀ Periodic Emissions Inventories for the Maricopa County, Arizona,

Nonattainment Area (MCAQD, 2014). Figure 3.2–1 displays the location of these land use categories and Table 3.2–4 contains the amount of acreage in each land use category capable of producing windblown dust within Maricopa County and the PM₁₀ NAA.

Figure 3.2–1. Location of land use categories within Maricopa County and the PM₁₀ nonattainment area capable of producing windblown dust.

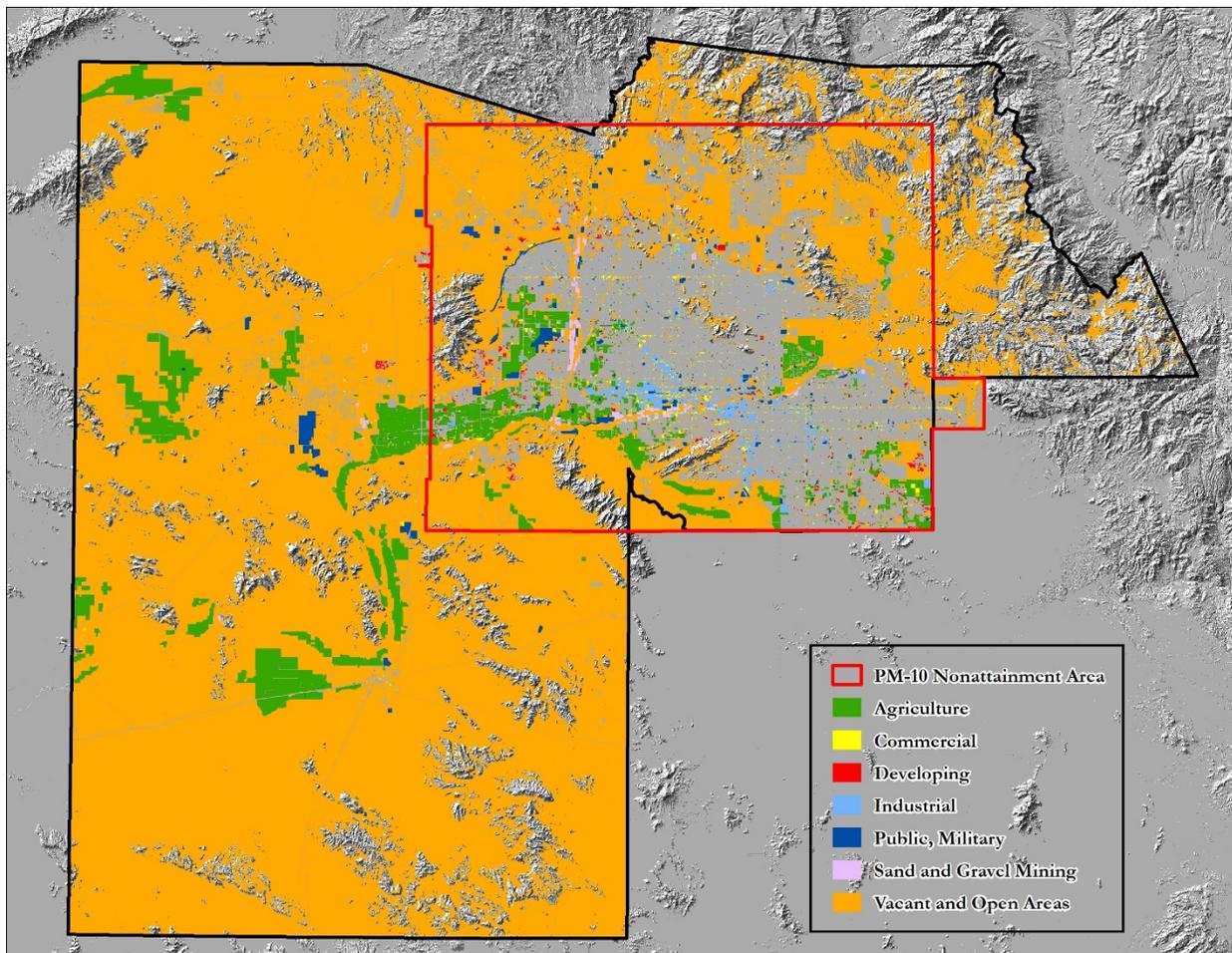


Table 3.2–4. Maricopa County and PM₁₀ nonattainment area acreage totals within each land use category capable of producing windblown dust.

Land use category	Maricopa County acreage	PM ₁₀ Nonattainment area acreage
Agriculture	261,588	106,883
Commercial	18,331	17,778
Developing	12,303	11,020
Industrial	33,410	33,317
Public/Military	37,762	26,897
Sand & Gravel/Mining	11,599	10,113
Vacant and Open Areas	3,882,415	806,548

Based upon a matched-pairs comparison of wind speed and PM₁₀ concentration data, a five-minute average wind speed of 12 mph has been established as the threshold when windblown dust emissions are created from both the stable and disturbed portions of each land use category. Vertical flux PM₁₀ emission factors

for the stable and disturbed portions of each land use category have been developed for five-minute average wind speed bins. The vertical flux emission factors are primarily based upon wind tunnel testing performed in southern Arizona with additional input from, and consideration of, wind tunnel tests in the areas around Barstow, California and Las Vegas, Nevada.

The amount of stable and disturbed land in each land use category is determined through the use of rule effectiveness (RE) rates (e.g., a RE rate of 90% would assume 90% of the land is stabilized and 10% is disturbed). Annual 2017 RE rates are used for all land use categories when available. As RE rates for agricultural land have not been updated, the rates developed for the MAG 2012 Five Percent Plan (MAG, 2012) are assumed to represent 2017 conditions on agricultural land. Table 3.2–5 contains the PM₁₀ vertical flux emission factors for the stable and disturbed portions of each land use category, by wind speed bin.

Table 3.2–5. Vertical flux PM₁₀ emission factors for the stable and disturbed portions of each land use category, by wind speed bin.

Land use category	Percent of total land use category	PM ₁₀ emission factor (tons/acre-5-minute) by wind speed bin (mph)				
		12-15	15-20	20-25	25-30	30-35
Active Agriculture (crop activity present)	NA	NA – Calculated under different methodology				
Inactive Agriculture – Stable	85%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Inactive Agriculture – Disturbed	15%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Commercial – Stable	99%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Commercial – Disturbed	1%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Developing – Stable	93%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Developing – Disturbed	7%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Industrial – Stable	99%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Industrial – Disturbed	1%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Public/Military – Stable	99%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Public/Military – Disturbed	1%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Sand & Gravel/Mining – Stable	86%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Sand & Gravel/Mining – Disturbed	14%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³
Vacant and Open Areas – Stable	99%	1.10×10 ⁻⁵	2.93×10 ⁻⁵	7.68×10 ⁻⁵	1.64×10 ⁻⁴	3.10×10 ⁻⁴
Vacant and Open Areas – Disturbed	1%	5.44×10 ⁻⁵	1.69×10 ⁻⁴	5.14×10 ⁻⁴	1.24×10 ⁻³	2.57×10 ⁻³

Annual 2017 wind speed data from 36 meteorological stations are used to produce wind speed counts for grouping into five-minute average wind speed bins. Where necessary, wind speeds are adjusted to account for differences in heights between anemometers, grown to replace missing values, and interpolated to produce five-minute averages. Table 3.2–6 lists the resulting counts of five-minute average wind speeds for all meteorological stations in 2017.

Table 3.2–6. Annual 2017 counts of hourly average wind speeds and actual/interpolated five-minute average wind speeds, by meteorological station and wind speed bin.

Meteorological Station	Count of hourly average wind speeds >12 mph	Count of hourly average wind speeds >15 mph	Count of hourly average wind speeds >18 mph	Count of five-minute average wind speeds by wind speed bin*				
				12-15 mph	15-20 mph	20-25 mph	25-30 mph	30-35 mph
ADEQ Super Site	9	1	0	455	113	2	2	0
AZMET Aguila	551	200	74	5,574	2,945	454	68	18
AZMET Buckeye	327	114	32	3,461	1,723	259	29	7
AZMET Desert Ridge	151	35	10	1,799	602	80	8	2
AZMET Harquahala	376	165	62	3,924	2,450	375	60	15
AZMET Maricopa	401	147	56	4,160	2,194	334	52	13
AZMET Mesa	57	12	2	908	270	27	2	0
AZMET Paloma	389	165	62	4,047	2,450	375	71	18
AZMET Phoenix Encanto	68	9	2	1,012	227	21	4	1
AZMET Phoenix Greenway	57	7	2	908	199	16	4	1
AZMET Queen Creek	239	84	26	2,629	1,296	191	31	8
MCAQD Blue Point	120	33	8	1,759	640	78	6	0
MCAQD Buckeye	142	34	12	1,716	629	108	7	0
MCAQD Cave Creek	113	31	5	1,541	582	61	8	2
MCAQD Central Phoenix	57	7	2	1,460	315	33	1	1
MCAQD Deer Valley	180	59	21	1,817	831	176	15	3
MCAQD Diablo	33	10	0	493	165	9	0	2
MCAQD Durango Complex	53	9	1	837	192	17	3	0
MCAQD Dysart	108	28	5	1,372	460	55	9	2
MCAQD Falcon Field	147	29	7	2,332	698	106	10	5
MCAQD Fountain Hills	31	2	0	624	119	6	1	0
MCAQD Glendale	171	42	7	2,197	738	71	3	0
MCAQD Higley	98	22	3	1,298	451	52	1	0
MCAQD Mesa	43	5	2	744	182	16	1	0
MCAQD North Phoenix	9	3	0	245	73	5	1	0
MCAQD Pinnacle Peak	156	24	0	2,091	473	11	0	0
MCAQD South Phoenix	15	3	2	254	86	9	1	0
MCAQD South Scottsdale	37	4	0	893	216	18	3	0
MCAQD Tempe	1	0	0	53	5	0	0	0
MCAQD Thirty-Third	12	4	2	144	80	17	2	0
MCAQD West 43 rd Avenue	164	36	11	2,120	682	90	12	5
MCAQD West Chandler	69	17	0	969	390	21	5	0
MCAQD West Phoenix	52	11	1	801	192	15	1	0
MCAQD Zuni Hills	411	133	26	3,730	1,876	255	33	1
PCAQCD Apache Junction	186	47	7	2,093	665	88	4	0
PCAQCD Hidden Valley	449	153	104	4,673	2,354	380	49	0

*Grey shaded cells denote interpolated values.

GIS is used to assign the five-minute average wind speed counts in Table 3.2–6 to individual parcels within the land use categories listed in Table 3.2–7. Pre-standardized emissions¹ are then calculated for those windblown dust-producing parcels using the emission factors in Table 3.2–5, with the exception of parcels in the active agricultural land use category (i.e., fields growing crops, neither fallow or abandoned). Windblown

¹ Pre-standardized emissions are windblown dust emissions that have not been adjusted to scale with observed ratios of PM₁₀ monitoring concentrations under high wind conditions. See Appendix 4 of the 2008 PM₁₀ Periodic Emissions Inventory (MCAQD, 2011) for an expanded explanation of pre-standardized emissions.

dust from active agricultural lands are calculated using a U.S. Department of Agriculture (USDA) soil erodibility formula (in US EPA, 1974). Annual 2017 harvested acres by crop type (cf. Section 3.2.16) serve as a surrogate for determining the amount of acres in the active agricultural land use category within Maricopa County. The USDA formula is applied to the acreage in each crop type to generate annual 2017 windblown dust emissions. A control factor is applied to the USDA-generated emissions to account for the benefits of Arizona’s Agricultural Best Management Practices (AgBMP) program.

To account for the dust-mitigating effects of precipitation, pre-standardized emissions have been reduced by 7.12% (26 days of precipitation in 2017 in Maricopa County). Annual 2017 pre-standardized PM₁₀ windblown dust emissions from all applicable land use categories are listed in Table 3.2–7 for Maricopa County and the PM₁₀ NAA.

Table 3.2–7. Pre-standardized PM₁₀ emissions from windblown dust in Maricopa County and the PM₁₀ nonattainment area in 2017.

Land use category	Annual PM ₁₀ emissions (tons/yr)	
	Maricopa County	PM ₁₀ Nonattainment area
Active Agriculture	2,837.59	1,167.10
Inactive Agriculture	5,597.71	908.51
Commercial	187.99	161.44
Developing	851.57	731.70
Industrial	246.64	238.70
Public/Military	792.35	381.02
Sand & Gravel/Mining	1,085.99	812.04
Vacant and Open Areas	478,236.05	41,113.59
Totals:	489,835.88	45,514.11

Pre-standardized windblown dust emission estimates are the product of maximum windblown dust emission rates. These pre-standardized emissions are based upon wind tunnel-produced vertical flux emission factors that do not incorporate many of the supply limitations to windblown dust production that exist in Maricopa County; and thus over-estimate windblown dust emissions. Correction for this bias in the pre-standardized emissions is accomplished through a sensitivity analysis that utilizes the percentage of 2017 monitored PM₁₀ concentrations under high wind conditions to scale pre-standardized emissions. Table 3.2–8 shows the percentages of 2017 PM₁₀ concentrations associated with five-minute average wind speeds greater than or equal to 12 mph at the 15 monitors in Maricopa County that simultaneously record five-minute average wind speed and PM₁₀ concentration.

Table 3.2–8. Percentages of 2017 PM₁₀ concentrations associated with five-minute average wind speeds greater than or equal to 12 mph at 15 Maricopa County monitors.

Monitoring station	Sum of 5-min PM ₁₀ concentrations when 5-min winds ≥ 12mph (µg/m ³)	Sum of all 5-min PM ₁₀ concentrations (µg/m ³)	Percent PM ₁₀ concentrations associated with 5-min winds ≥ 12 mph
Buckeye	290,390	4,991,301	5.82%
Central Phoenix	151,006	3,795,086	3.98%
Durango Complex	125,684	5,504,041	2.28%
Dysart	136,134	2,872,328	4.74%
Glendale	120,876	2,643,068	4.57%
Higley	225,114	3,413,823	6.59%
Mesa	94,479	2,871,158	3.29%
North Phoenix	34,861	2,592,738	1.34%
South Phoenix	87,128	4,116,911	2.12%
South Scottsdale	127,869	3,080,880	4.15%
Tempe	9,971	2,875,172	0.35%
West 43 rd Avenue	367,939	5,967,354	6.17%
West Chandler	203,434	3,605,841	5.64%
West Phoenix	80,784	3,774,509	2.14%
Zuni Hills	283,385	3,033,008	9.34%
All 15 Monitors:	2,339,054	55,137,218	4.24%

Table 3.2–8 shows that as a weighted average of the monitoring stations, about 4% of PM₁₀ concentrations are associated with five-minute average wind speeds greater than or equal to 12 mph. As such, pre-standardized emission estimates are scaled to represent 4% of the total annual 2017 emissions inventory for PM₁₀ for Maricopa County and the NAA. Annual 2017 PM₁₀ emissions from sources other than windblown dust total 50,740.41 tons for Maricopa County and 36,722.74 tons for the PM₁₀ NAA. After applying this scaling technique, PM₁₀ emissions from windblown dust for Maricopa County and the NAA are standardized to 2,114.18 and 1,530.11 tons, respectively.²

Standardized estimates of annual and daily PM₁₀ and PM_{2.5} emissions from windblown dust for Maricopa County and the PM₁₀ NAA are shown in Tables 3.2–9 and 3.2–10. Daily emissions are obtained by dividing annual emissions by 365, the number of days in calendar year 2017. As per WRAP guidance, PM_{2.5} emissions are assumed to be 15% of PM₁₀ emissions (WGA, 2006).

² (50,740.41 tons ÷ (1 – 4%)) – 50,740.41 = 2,114.18 tons; (36,722.74 ÷ (1 – 4%)) – 36,722.74 = 1,530.11 tons.

Table 3.2–9. Standardized, 2017 annual and daily PM₁₀ and PM_{2.5} emissions from windblown dust in Maricopa County, by land use category.

Land use category	Annual emissions (tons/yr)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Active Agriculture	41.43	6.21	227.0	34.1
Inactive Agriculture	36.71	5.51	201.1	30.2
Commercial	5.46	0.82	29.9	4.5
Developing	24.76	3.71	135.7	20.3
Industrial	8.04	1.21	44.0	6.6
Public/Military	13.35	2.00	73.2	11.0
Sand & Gravel/Mining	27.66	4.15	151.6	22.7
Vacant and Open Areas	1,956.78	293.52	10,722.1	1,608.3
Totals:	2,114.18	317.13	11,584.6	1,737.7

Table 3.2–10. Standardized, 2017 annual and daily PM₁₀ and PM_{2.5} emissions from windblown dust in the PM₁₀ nonattainment area, by land use category.

Land use category	Annual emissions (tons/yr)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Active Agriculture	39.24	5.89	215.0	32.2
Inactive Agriculture	30.54	4.58	167.4	25.1
Commercial	5.43	0.81	29.7	4.5
Developing	24.60	3.69	134.8	20.2
Industrial	8.02	1.20	44.0	6.6
Public/Military	12.81	1.92	70.2	10.5
Sand & Gravel/Mining	27.30	4.09	149.6	22.4
Vacant and Open Areas	1,382.18	207.33	7,573.6	1,136.0
Totals:	1,530.11	229.52	8,384.2	1,257.6

3.2.19 Burn Permits

Emissions from controlled open burning are regulated by Maricopa County Rule 314 (Open Outdoor Fires and Indoor Fireplaces at Commercial and Institutional Establishments), which requires a burn permit for open burning in Maricopa County. Burn permits are issued primarily for purposes of agricultural ditch bank and fencerow burning, tumbleweed burning, land clearance, and firefighting training. MCAQD's burn permit database was used to identify all burn permits issued in 2017. A total of 25 open burn permits were issued during the year. The quantity and reported activity for the open burn permits are shown in Table 3.2–11.

Table 3.2–11. Maricopa County burn permit activity in 2017.

Permit subtype	Permits issued	Total reported activity	Activity unit of measure
Ditch bank & fence row	16	107,450	Linear feet
Land clearance	1	90.9	Acres
Air Curtain	1	79.96	Tons of Material Burned
Tumbleweeds	1	0.1	Piles
Firefighting instruction	6	65	Structures

The above activity data (excluding firefighting instruction) were converted to tons material burned using fuel loading factors from AP-42, Table 2.5-5 (US EPA, 1992) and assumptions made based on previous Maricopa County emission inventories (MCAQD, 2008). The emission and loading factors used are shown in Table 3.2-12.

Table 3.2-12. Emission and fuel loading factors for open burning.

Category	Emission factors (lbs/ton burned)				Fuel loading factor (tons/acre)
	PM ₁₀	PM _{2.5}	NO _x	SO _x	
Weeds, unspecified	15	15	4	N/A	3.2
Russian Thistle (tumbleweeds)	22	22	4	N/A	0.1
Orchard crops: Citrus	6	6	4	N/A	1.0

MCAQD’s records of citizen complaints received during 2017 regarding suspected open or illegal outside burning were reviewed to assess the potential extent of unpermitted open burning activity. Emissions estimates from permitted burn activity were multiplied by a factor of 34.11 to account for unpermitted outdoor burning.

To estimate typical daily emissions, it was assumed that activity in all categories listed above normally occurs, on average, 5 days per week. Thus, typical daily emissions were calculated by dividing total annual emissions by 260 (5 days/week × 52 weeks/year).

Annual and daily emissions for the PM₁₀ NAA were calculated by applying ratios of various land use types located in the NAA to County-level emissions estimates. See Section 1.5.2 for a discussion of the land use data used.

3.3 Emission Allocation Methodology

County level annual emissions for each of the calculation methods are allocated to the PM₁₀ NAA using the methodology presented in this section. In instances where all of a given source category are considered to be located within the PM₁₀ NAA, total emission values for the county and the NAA are considered equal and are listed as “Assumed same” in Table 3.3-1.

Table 3.3-1. Allocation method for all nonpoint (area)sources.

Source category	Allocation method
<i>Fuel combustion:</i>	
Industrial distillate oil: boilers	Employment
Industrial distillate oil: engines	Employment
Industrial natural gas	Employment
Industrial LPG	Employment
Comm./inst. distillate oil: boilers	Employment
Comm./inst. distillate oil: engines	Employment
Comm./inst. natural gas	Employment
Residential distillate oil	Population
Residential LPG	Population

Table 3.3–1. Allocation method for all nonpoint (area) sources (continued).

Source category	Allocation method
<i>Fuel combustion (continued):</i>	
Residential natural gas	Population
Residential wood combustion	Population
<i>Industrial processes:</i>	
Commercial cooking	Population
Electrical equipment manufacturing	Assumed Same
Industrial processes, NEC	Assumed Same
Secondary metal production	Assumed Same
Chemical manufacturing	Employment
Fabricated metal product manufacturing	Employment
Rubber/plastic product manufacturing	Employment
Ammonia cold storage	Employment
Grain handling/processing	Employment
<i>Industrial processes:</i>	
Industrial paved/unpaved road travel	Location Data
Mining/ quarrying	Location Data
Wood product manufacturing	Employment
Nonmetallic mineral products	Location Data
Commercial construction	Location Data
Residential construction	Location Data
Road construction	Location Data
Construction, other	Location Data
<i>Misc. area sources:</i>	
Backyard barbeques	Population
Aircraft engine testing	Assumed Same
Crematories, human	Assumed Same
Crematories, animal	Assumed Same
Structure fires	Population
Vehicle fires	Population
Prescribed fires	Location Data
Accidental releases	Location Data
Wildfires	Location Data
Leaf blower fugitive dust	Population
Offroad recreational vehicle fugitive dust	Land Use
Humans	Population
Fertilizer application	Population
Livestock	Land Use
Composting	Population

Table 3.3–1. Allocation method for all nonpoint (area)sources (continued).

Source category	Allocation method
<i>Misc. area sources (continued):</i>	
Tilling	Land Use
Harvesting	Land Use
Travel on unpaved agricultural roads	Land Use
Travel on unpaved parking lots	Land Use
Travel on unpaved parking lots	Land Use
Windblown dust	Land Use
Cotton ginning	Location Data
<i>Waste disposal:</i>	
Publicly owned treatment works	Population
Landfills	Location Data
Other waste	Assumed Same
Open burning	Land Use

3.3.1 Employment

Annual emissions for the PM₁₀ NAA were estimated by apportioning Maricopa County’s emissions to the NAA, using the ratio of employment, based on the source category. See Section 1.5.1 of this report for a discussion of the employment data used.

3.3.2 Population

Annual emissions for the PM₁₀ NAA were estimated by apportioning Maricopa County’s emissions to the NAA, using the ratio of total resident population in the NAA to that of Maricopa County. See Section 1.5.1 of this report for a discussion of the population data used.

3.3.3 Land use

The annual emissions for the PM₁₀ NAA emissions were calculated by multiplying county emission totals by the ratio of a specific land use acreage in the NAA to the land use acreage in Maricopa County. See Section 1.5.2 for a discussion of the land use data used to allocate emissions to the PM₁₀ NAA.

3.3.4 Location Data

Geographic data on the location of each permitted source or incident was used to identify whether they were located inside or outside of the PM₁₀ NAA.

3.4 Quality assurance/quality control procedures

Quality assurance and quality control (QA/QC) activities for the nonpoint source emissions inventory were designed to create a comprehensive, accurate, representative, and comparable inventory of nonpoint source emissions for Maricopa County and the NAA. During each step of creating, building, and reviewing the nonpoint source emissions inventory, quality checks and assurances were performed to establish confidence in the inventory structure and data.

Nonpoint source categories were identified for inclusion in the inventory based on the latest EIIP guidance available. In addition, recent EPA activities to develop county-level emissions estimates for newly created source categories (such as portable fuel containers) or refined source classification codes were also reviewed and incorporated where relevant. Prior-year inventories for the region were also examined to identify possible additional categories for inclusion in the present inventory. The list of nonpoint source categories developed based on these guidance documents was modified to fit the characteristics of Maricopa County, with some nonpoint source categories determined to be insignificant (e.g., emissions from industrial coal combustion, oil and natural gas production, and snowmobile use).

Data for nonpoint source emission calculations were gathered from a wide universe of resources. Whenever applicable, local surveyed data (such as annual emissions reports) were used as these data best reflect activity in the county and the NAA. When local data were not available, state data from state agencies (e.g., Arizona Department of Transportation [ADOT]) and regional bodies (such as WRAP) were used. National-level data (such as those from the US Census Bureau) were used when no local, state or regional data were available. In addition, the most recent EIIP guidance for nonpoint sources was consulted for direction in determining the most relevant data source for use in emissions calculations.

Emissions calculations for nonpoint sources were performed by three air quality planners and one unit manager. All nonpoint source emission estimates were calculated in spreadsheets to ensure the calculations could be verified and reproduced. Whenever possible or available, the “preferred method” described in the most recent EIIP guidance documents for nonpoint sources was used to calculate emissions. Emissions were estimated using emission factors from EIIP guidance, AP-42, and local source testing. Local seasonal and activity data were used when available, with EPA and EIIP guidance used when no local seasonal or activity data existed. All calculations were evaluated to ensure that emissions from point sources were not being double-counted and to determine if rule effectiveness applied.

Once nonpoint source emission estimates had been produced, several quality control checks were performed to substantiate the calculations. Most nonpoint source calculations were peer-reviewed by two other planners, with all nonpoint sources being reviewed by at least one other planner. Peer review ensured that all emission calculations were reasonable and could be reproduced. Sensitivity analyses and computational method checks were performed on nonpoint sources when emissions seemed to be outside the expected ranges. When errors were found, the appropriate changes were made by the author of the calculations to ensure consistency of the emissions calculations. The peer-reviewed emissions estimates were combined into a draft nonpoint source chapter. This draft chapter was read through in its entirety by the unit manager and the two air quality planners for final review, with any identified errors corrected by the author of the section.

The draft version of the nonpoint source chapter was sent to the ADEQ, the ADOT, and the MAG for a quality assurance review. These agencies provided comments which were addressed and incorporated into the final nonpoint source chapter. The quality assurance and quality control activities described here have produced high levels of confidence in the nonpoint source emissions estimates detailed in this chapter and represent the best efforts of the inventory preparers.

3.5 Summary of all nonpoint source emissions

Tables 3.5–1 and 3.5–2 summarize the total annual and average season-day emissions from all nonpoint sources addressed in this chapter, for both Maricopa County and the PM₁₀ NAA, respectively.

Table 3.5–1. Annual and typical daily emissions from all nonpoint sources in Maricopa County.

Source category	Annual emissions (tons/yr)					Season-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
<i>Fuel combustion:</i>										
Industrial distillate oil: boilers	16.7	12.9	101.1	215.3	4.0	107	58	648	1,380	26
Industrial distillate oil: engines	289.8	280.7	2,035.1	134.1	2.7	1,857	1,741	13,045	860	17
Industrial natural gas	4.9	4.1	656.7	3.9	21.0	31	23	4,210	25	135
Industrial LPG	0.2	0.2	41.1	0.2	0.9	1	1	263	1	6
Comm./inst. distillate oil: boilers	0.6	0.6	3.5	7.5	0.1	4	3	23	48	1
Comm./inst. distillate oil: engines	0.8	0.8	5.6	0.4	0.0	5	5	36	2	0
Comm./inst. natural gas	7.6	6.7	1,060	6.4	5.2	49	37	6,795	41	33
Residential distillate oil	0	0	0.2	0	0	0	0	2	0	0
Residential LPG	0.2	0.1	44.5	0.2	0.2	2	1	420	2	1
Residential natural gas	4.4	3.6	793.8	5.1	168.9	41	34	7,489	48	1,593
Residential wood combustion	1,138.0	1,135.5	143.4	18.9	58.8	16,859	16,823	2,125.1	280.4	871.4
Total fuel combustion:	1,463.1	1,445.2	4,885.0	391.9	261.8	18,957	18,726	35,055	2,687	2,684
<i>Industrial processes:</i>										
Commercial cooking	1,008.6	937.6	0	0	0	5,527	5,138	0	0	0
Electrical equip. manufacturing	21.4	15.2	20.0	0.5	11.8	118	84	111	3	65
Industrial processes, NEC	78.2	37.3	34.4	10.8	7.1	449	215	197	59	39
Secondary metal production	20.5	17.2	28.7	12.5	0.0	147	124	206	95	0
Chemical manufacturing	73.8	54.5				579	427			
Fabricated metal product manufact.	88.8	73.8				641	532			
Rubber/ plastic product manufact.	9.9	7.0				71	50			
Ammonia cold storage					2,425.2					15,546
Grain handling/ processing	45.3	1.6				346	12			
Industrial paved/unpaved road travel	221.2	34.5				1,583	247			
Mining/ quarrying	53.3	11.4				362	77			
Wood product manufacturing	284.5	207.7				2,041	1,520			
Nonmetallic mineral products	35.6	20.4				246	143			
Commercial construction	2,698.2	269.8				14,785	1,483			
Residential construction	1,273.4	127.3				6,978	700			
Road construction	2,023.9	202.4				11,090	1,112			
Construction, other	240.1	24.0				1,315	132			
Total industrial processes:	8,176.7	2,041.8	83.1	23.8	2,444.1	46,278	11,994	514	157	15,650

Table 3.5-1. Annual and typical daily emissions from all nonpoint sources in Maricopa County (continued).

Source category	Annual emissions (tons/yr)					Season-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Misc. nonpoint sources:										
Backyard barbeques	191.8	153.5	20.9	0	0	1,051	841	115	0	0
Aircraft engine testing	0.0	0.0	1.0	0.1	0	0	0	7	1	0
Crematories, human	8.2	5.0	15.7	0.0	0.0	63	38	120	0	0
Crematories, animal	3.5	2.2	6.6	0.8	0.0	29	18	54	7	0
Structure fires	14.6	14.6	1.9	0	0	80	80	10	0	0
Vehicle fires	22.3	22.3	0.9	0	0	109	109	4	0	0
Prescribed fires	1.0	1.0	0.8	0.2	0.1	1,008	1,008	781	214	63
Accidental releases	0	0	0.1	0	0	0	0	0	0	0
Wildfires	535.4	459.2	118.1	32.4	24.8	3,797	3,257	838	230	176
Leaf blower fugitive dust	995.9	374.2				5,457	2,050			
Offroad rec. vehicle fugitive dust	7,741.9	773.8				42,421	4,240			
Humans					1,184.4					6,490
Fertilizer applications					4,925.3					26,988
Livestock	2,092.8	419.8			8,976.5	11,467	2,300			49,186
Composting					101.5					556
Tilling	3,617.5	764.3				35,663	7,506			
Harvesting	267.2	40.1				7,679	1,151			
Travel on unpaved agricultural roads	2,414.3	241.4				15,476	1,548			
Travel on unpaved parking lots	2,772.6	277.3				15,192	1,520			
Windblown dust	2,114.2	317.1				11,585	1,738			
Cotton ginning	24.4	3.7				142	21			
Total misc. nonpoint sources:	22,817.6	3,869.6	166.0	33.5	15,2132.6	151,221	27,426	1,930	451	83,459
Waste disposal:										
Publicly owned treatment works					12.0					66
Landfills	64.0	38.6	6.8	6.4	0	383	231	38	6	0
Other waste	7.6	5.2	18.7	69.3	0	42	29	102	381	0
Open burning	39.3	39.3	13.8	0	0	302	302	106	0	0
Total waste disposal:	110.9	83.1	39.2	75.7	12.0	728	563	246	387	66
Total, all nonpoint sources:	32,568.3	7,439.8	5,173.3	525.0	17,930.5	217,183	58,709	37,744	3,683	101,859

Table 3.5–2. Annual and typical daily emissions from all nonpoint sources in the PM₁₀ nonattainment area.

Source category	Annual emissions (tons/yr)					Season-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
<i>Fuel combustion:</i>										
Industrial distillate oil: boilers	16.7	12.9	100.9	215.0	4.0	107	58	647	1,378	26
Industrial distillate oil: engines	289.4	280.3	2,032.4	133.9	2.7	1,855	1,739	13,028	858	17
Industrial natural gas	4.9	4.1	655.9	3.9	21.0	31	23	4,204	25	135
Industrial LPG	0.2	0.2	41.0	0.2	0.9	1	1	263	1	6
Comm./inst. distillate oil: boilers	0.6	0.6	3.5	7.5	0.1	4	3	22	48	1
Comm./inst. distillate oil: engines	0.8	0.8	5.6	0.4	0.0	5	5	36	2	0
Comm./inst. natural gas	7.6	6.7	1,056.9	6.3	5.2	49	37	6,775	41	33
Residential distillate oil	0.0	0.0	0.2	0.0	0.0	0	0	2	0	0
Residential LPG	0.2	0.1	42.6	0.2	0.1	1	1	402	2	1
Residential natural gas	4.4	3.6	794.3	5.1	169.0	41	34	7,493	48	1,594
Residential wood combustion	1,138.7	1,136.2	143.5	18.9	58.9	16,869	16,833	2,126	281	872
Total fuel combustion:	1,463.4	1,445.5	4,876.8	391.4	261.9	18,964	18,734	34,998	2,684	2,685
<i>Industrial processes:</i>										
Commercial cooking	1,009.2	938.2	0	0	0	5,530	5,141	0	0	0
Electrical equip. manufact.	21.3	15.2	19.9	0.5	11.8	118	84	111	3	65
Industrial processes, NEC	49.3	20.1	17.0	0.0	3.9	290	120	101	0	21
Secondary metal production	20.5	17.2	28.7	12.5	0.0	147	123	205	95	0
Chemical manufact.	73.7	54.4				578	426			
Fabricated metal product manufact.	88.8	73.8				641	532			
Rubber/ plastic product manufact.	9.9	7.0				71	50			
Ammonia cold storage					2,422.0					15,526
Grain handling/ processing	45.2	1.6				346	12			
Industrial paved/ unpaved road travel	156.1	24.3				1,166	181			
Mining/ quarrying	41.5	9.1				277	60			
Wood product manufact.	284.1	207.4				2,039	1,518			
Nonmetallic mineral products	35.2	20.3				243	142			
Commercial construction	2,677.0	267.7				14,669	1,471			
Residential construction	1,127.7	112.8				6,179	620			
Road construction	1,993.0	199.3				10,920	1,095			
Construction, other	238.1	23.8				1,305	131			
Total industrial processes:	7,870.6	1,991.9	65.7	13.0	2,437.7	44,517	11,706	418	98	15,612

Table 3.5–2. Annual and typical daily emissions from all nonpoint sources in the PM10 nonattainment area (continued.)

Source category	Annual emissions (tons/yr)					Season-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Misc. nonpoint sources:										
Backyard barbeques	183.4	146.8	20.0	0	0	1,005	804	110	0	0
Aircraft engine testing	0	0	1.0	0.1	0	0	0	7	1	0
Crematories, human	8.1	4.9	15.5	0	0	62	38	119	0	0
Crematories, animal	3.5	2.2	6.6	0.8	0	29	18	54	7	0
Structure fires	14.6	14.6	1.9	0	0	80	80	10	0	0
Vehicle fires	22.4	22.4	0.9	0	0	110	110	4	0	0
Prescribed fires										
Accidental releases	0	0	0.1	0	0	0	0	1	0	0
Wildfires	68.4	58.7	15.1	4.1	3.2	497	427	110	30	23
Leaf blower fugitive dust	984.8	370.0				5,396	2,028			
Offroad rec. vehicle fugitive dust	1,384.3	138.4				7,585	758			
Humans					1,185.1					6,494
Fertilizer applications					4,928.2					27,004
Livestock	860.8	172.7			3,692.1	4,717	946			20,231
Composting					101.7					557
Tilling	1,357.8	271.6				13,481	2,696			
Harvesting	98.7	14.8				2,842	426			
Travel on unpaved agricultural roads	946.6	94.7				6,068	607			
Travel on unpaved parking lots	1,897.1	189.8				10,395	1,040			
Windblown dust	1,530.1	229.5				8,384	1,258			
Cotton ginning	4.8	0.7				26	4			
Total misc. nonpoint sources:	9,365.3	1,731.6	61.1	5.1	9,910.4	60,677	11,239	415	38	54,309
Waste disposal:										
Publicly owned treatment works					12.0					66
Landfills	35.9	20.3	5.4	11.7		197	112	30	64	
Other waste	7.6	5.2	18.7	69.3		42	29	102	381	
Open burning	15.5	15.5	5.3	0	0	119	119	41	0	0
Total waste disposal:	58.9	41.0	29.3	80.9	12.0	358	260	173	445	66
Total, all nonpoint sources:	18,758.1	5,210.0	5,032.8	490.5	12,621.9	124,517	41,938	36,004	3,264	72,671

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Nonroad Mobile Sources

4.1 Introduction

Nonroad mobile sources are vehicles or equipment that move (or are moved) within the 12-month period and are not licensed or certified as highway vehicles. Nonroad vehicles and equipment fall into the following categories:

- Agricultural equipment, such as tractors, combines, and balers;
- Airport ground support equipment (GSE), such as baggage tugs and terminal tractors, and auxiliary power units (APU);
- Commercial equipment, such as generators, and pumps;
- Construction equipment, such as graders, back hoes, and trenchers;
- Industrial equipment, such as forklifts, and sweepers;
- Lawn and garden equipment, such as leaf blowers, and lawn mowers;
- Logging equipment (not present in Maricopa County);
- Oil field equipment (not present in Maricopa County);
- Pleasure craft, such as power boats, and personal watercraft;
- Railway maintenance equipment, such as rail straighteners;
- Recreational equipment, such as all-terrain vehicles, and off-road motorcycles;
- Underground mining equipment (not present in Maricopa County);
- Aircraft, such as jet- and piston-engine planes
- Locomotives, such as switching, and line-haul trains.

For most nonroad mobile source categories (except airport GSE, APUs, aircraft, and locomotives), the EPA MOVES2014b model was used to produce emission estimates. EPA released MOVES2014b in August 2018. It updates the growth estimates for equipment populations, which results in changes to equipment population estimates for all years. It also updates emissions estimates for nonroad equipment meeting Tier 4 standards and corrects errors in characteristics of nonroad diesel fuel.

For aircraft, APUs, and airport GSE categories, the Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT) Version 2d computed emissions related to aircraft operation. As of May 2015, AEDT replaced the Emissions and Dispersion Modeling System (EDMS) as the required model for aviation sources. In addition, a local survey of the three railroad companies having operations within the county (Burlington Northern Santa Fe, Union Pacific and Amtrak) provided locomotive emissions estimates.

The PM₁₀ NAA contains portions of Maricopa and Pinal counties. Spatial surrogates based on land use and demographics allocated the Maricopa County annual and annual-day emissions to the NAA. The sections below describe the different approaches used for each category.

4.2 Emission Calculation Methodology

Table 4.2-1 summarizes the specific emissions estimation methods used to generate the annual and annual-day nonroad mobile sources emission inventory. The following subsections describe the methodologies associated with these calculation methods.

Table 4.2-1. Calculation method for all nonroad mobile sources.

Category	Annual method	Annual-day method
Agricultural	MOVES2014b	MOVES2014b
Airport GSE+APUs	AEDT 2d	AEDT 2d
Commercial	MOVES2014b	MOVES2014b
Construction	MOVES2014b	MOVES2014b
Industrial	MOVES2014b	MOVES2014b
Lawn & garden	MOVES2014b	MOVES2014b
Pleasure craft	MOVES2014b	MOVES2014b
Railway maintenance	MOVES2014b	MOVES2014b
Recreational	MOVES2014b	MOVES2014b
Aircraft	AEDT 2d	AEDT 2d
Locomotives	Survey Data	Survey Data

4.2.1 MOVES2014b

The MOVES2014b model calculated emissions for nonroad sources in Maricopa County using local inputs as described below.

The National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Environmental Information (NCEI) Local Climatological Data website (NCEI, 2018) provided hourly profiles of monthly average temperature observations at Phoenix Sky Harbor Airport for 2017. The Arizona Department of Agriculture (AZDA) Weights & Measures Services Division provided fuel specifications for 2017, identical to the fuel data used in modeling onroad mobile emissions.

EPA recommends adjusting default model input files (such as equipment population and activity levels) where local data are available, to replace the default values derived from national averages. A local survey performed by ENVIRON as part of an inventory developed to study the impact of visibility-impairing pollutants (ENVIRON et al., 2003) was used to replace the default population and activity levels for commercial lawn and garden equipment. Survey results showed that for most categories of commercial lawn and garden equipment, populations in Maricopa County are significantly lower than EPA default values, while the average annual hours of operation for most equipment types are slightly higher than EPA’s values. Using this local data results in a considerable decrease in emissions from commercial lawn and garden equipment, compared with earlier results using EPA default inputs. Default equipment populations for oil field equipment based on employment were set to zero, as there is no oil and gas production in either Maricopa County or Pinal County (AZOGCC, 2018).

The MOVES2014b nonroad model output consists of typical weekday and weekend emissions for each month of the year. The typical weekday emission factor multiplied by the number of weekdays in each month added to the typical weekend emission factor multiplied by the number of weekend days in the month represents the total emissions for the month. The sum of the monthly emissions over the year represents the total annual emissions.

Annual-day emissions are a 12-month average of the typical weekday, or typical weekend, emissions over the year. To be conservative, the typical day type with the highest emissions (weekday or weekend) represents annual-day emissions for each nonroad emissions category. For example, typical daily emissions from agricultural equipment are higher on weekdays than on weekends. As such, weekday emissions are representative of annual-day emissions for agricultural equipment. Other categories, such as recreational equipment, have higher emissions on weekends rather than weekdays.

Spatial surrogates based on land use and demographics proportionally allocate the annual and annual-day emissions for Maricopa County to the PM₁₀ NAA, as described in Section 4.3.

4.2.2 Airport ground support equipment

The AEDT model produced emission estimates for GSE and APUs at airports. Section 4.2.3 below describes the modeling input data used. GSE and APU emissions for Luke Air Force Base (AFB) and aircraft emissions for Luke AFB are a single grouped emissions estimate.

4.2.3 Aircraft

The AEDT model produced emission estimates for aircraft at 14 airports in Maricopa County. The AEDT model is a software system that models aircraft performance in space and time to estimate noise, fuel consumption, emissions, and air quality consequences. AEDT leverages GIS and relational database technology to support individual studies ranging in scope from a single flight at an airport to scenarios at the regional, national, and global levels. AEDT is actively used by the U.S. government for regulatory studies, research, domestic aviation system planning and aviation environmental policy analysis.

The AEDT model calculates aircraft, GSE, and APU emissions of PM₁₀, PM_{2.5}, SO_x, and NO_x using airport operational data for 2017 as discussed below. The model computes emissions individually for each combination of aircraft and engine type, and reports aggregated emissions for four main aircraft categories:

- Air carriers (AC): Larger commercial aircraft with at least 60 seats or 18,000 pounds of payload capacity, used for scheduled service to transport passengers and/or freight;
- Air taxis (AT): Smaller commercial turbine- or piston-powered aircraft with less than 60 seats or 18,000 pounds of payload capacity;
- General aviation (GA): Aircraft used on an unscheduled basis for recreational flying, personal transportation, and other activities, including business travel; and
- Military (ML): Aircraft used to support military operations.

The AEDT model utilizes three main input databases to estimate annual or seasonal emission inventories at each airport:

- Airport database: Relevant airport information, such as latitude, longitude, runway, taxi-in and taxi-out time, country, and weather data;
- Fleet database: Aircraft/engine models and flight tracking profiles for arrival, departure, and touch-and-go (T&G) operations; and
- Local activity database: Number of aircraft operations for landing/takeoffs (LTO), and fleet mix at each airport.

Local aircraft activity data (number of LTOs or T&G operations) is a critical input to the AEDT model. The FAA Operations Network (OPSNET) database (FAA, 2018a) provided daily activity data on 2017 aircraft operations for the eight larger commercial and general aviation airports in the Maricopa County (Chandler Municipal, Falcon Field, Glendale Municipal, Phoenix Deer Valley, Phoenix Goodyear, Phoenix-Mesa Gateway, Phoenix Sky Harbor, and Scottsdale airports). Additionally, AirNav (airnav.com) provided operations data for the six smaller general aviation airports included in the inventory (Buckeye Municipal, Gila Bend Municipal, Pleasant Valley, Sky Ranch at Carefree, Stellar Airpark, and Wickenburg Municipal airports). Base personnel provided the number of F-16s and F-35s military aircraft based at Luke AFB in 2017. The FAA Traffic Flow Management System Counts (TFMSC) database provided aircraft fleet mix for 11 of the 14 commercial and general aviation airports, and the FAA 5010 Airport Master Records database provided verification of the AirNav operations data.

To supplement the FAA data, MAG conducted a survey of the general aviation airports in the area to obtain the number of LTOs for 2017 (including any T&G operations) along with fleet mix where available. Table 4.2.3-1 summarizes the activity level for each aircraft category at each airport included in the inventory and indicates the data sources for activity and fleet mix.

Table 4.2.3–1. Annual airport operations (by aircraft category) and related data sources.

Airport name	2017 Operations			Air carrier (AC)	Air taxi (AT)	General aviation (GA)	Military (ML)
	FAA LID	Operations data source ¹	Fleet mix data source ²				
Buckeye Municipal	BXK	AirNav	County-wide profile	0	100	52,800	100
Chandler Municipal	CHD	OPSNET	TFMSC	17	3,215	190,644	348
Falcon Field	FFZ	OPSNET	TFMSC	9	65,668	221,706	4,074
Gila Bend Municipal	E63	AirNav	County-wide profile	0	540	35,700	50
Glendale Municipal	GEU	OPSNET	TFMSC	1	394	74,478	132
Luke Air Force Base	LUF	[Emissions for 2017 were estimated by scaling based on numbers of F-16 and F-35 fighter jets, see text for details]					
Phoenix Deer Valley	DVT	OPSNET, Survey	TFMSC	12	4,670	373,961*	134
Phoenix Goodyear	GYR	OPSNET, Survey	TFMSC	199	5,208	102,359*	3,397
Phoenix-Mesa Gateway	IWA	OPSNET	TFMSC	11,503	38,202	233,248	7,503
Phoenix Sky Harbor	PHX	OPSNET	TFMSC	378,911	28,747	21,014	2,296
Pleasant Valley	P48	Survey	Survey	0	0	20,000*	0
Scottsdale	SDL	OPSNET	TFMSC	10	14,990	152,492	639
Sky Ranch at Carefree	18AZ	Survey	TFMSC	0	0	4,291	0
Stellar Airpark	P19	AirNav	TFMSC	0	0	40,000	0
Wickenburg Municipal	E25	AirNav	TFMSC	0	400	35,700	50

1. **AirNav:** online database of FAA Form 5010 information (<http://airnav.com>)

OPSNET: Operational Network (FAA, 2018a)

Survey: MAG Airport Survey (2017 operations and fleet mix, conducted via email and phone call, 2018)

2. **TFMSC:** Traffic Management System Counts (FAA, 2018b)

County-wide profile: representative fleet derived from reported data for 11 airports in Maricopa County

* The number of operations includes T&G operations reported by airport.

Note that T&G operations for fixed wing aircraft consist of an approach, brief ground roll (landing), an immediate takeoff, and a climb-out—all of which occur without exiting the runway. Specifically, a T&G operation counts as two operations in FAA procedures, because both a landing and a takeoff occur.

The following section describes the derivation of activity and emission estimates for general aviation activity at a representative airport: Chandler Municipal (CHD). The OPSNET database reported 190,644 general aviation operations at this airport in 2017, as listed in Table 4.2.3–1. The TFMSC database of general aviation activity and fleet mix at Chandler Municipal airport in 2017 comprised 97 different aircraft types recognized by AEDT, with a combined 2,133 operations. The smaller numbers reported in TFMSC are a representative sample of the total general aviation operations. The number of operations for each type in the sample divided by the combined number of operations in the sample gives a relative frequency distribution of aircraft types at this airport. This frequency distribution, multiplied by the total number of operations reported by OPSNET, provides the number of operations allocated to each aircraft type for input to the AEDT model. Table 4.2.3-2 demonstrates this calculation for the general aviation activity at Chandler Municipal Airport. When applied to each aircraft category at each airport, this procedure typically resulted in 10 to 100 aircraft types representing 98.8 to 100% of all reported activity.

Table 4.2.3–2. Aircraft type activity distribution at Chandler Municipal airport.

Rank	Aircraft type	TFMSC reported operations	Relative frequency	Cumulative frequency	Total operations for AEDT*
1	BE20 - Beech 200 Super King	184	8.626%	8.626%	16,450
2	C172 - Cessna Skyhawk 172/Cutlass	151	7.079%	15.706%	13,496
3	C25C - Cessna Citation CJ4	148	6.939%	22.644%	13,228
4	P46T - Piper Malibu Meridian	133	6.235%	28.880%	11,888
5	AC90 - Gulfstream Commander	112	5.251%	34.130%	10,010
6	C525 - Cessna CitationJet/CJ1	108	5.063%	39.194%	9,652
7	LJ45 - Bombardier Learjet 45	92	4.313%	43.507%	8,222
8	R22 - Robinson R-22 Mariner	70	3.282%	46.789%	6,256
9	BE36 - Beech Bonanza 36	68	3.188%	49.977%	6,078
10	BE9L - Beech King Air 90	63	2.954%	52.930%	5,630
11	C182 - Cessna Skylane 182	61	2.860%	55.790%	5,452
12	C56X - Cessna Excel/XLS	60	2.813%	58.603%	5,362
13	P28A - Piper Cherokee	57	2.672%	61.275%	5,094
14	C560 - Cessna Citation V/Ultra/Encore	51	2.391%	63.666%	4,558
15	BE58 - Beech 58	45	2.110%	65.776%	4,022
16	SR22 - Cirrus SR 22	42	1.969%	67.745%	3,754
17	M20T - Turbo Mooney M20K	39	1.828%	69.573%	3,486
18	PC12 - Pilatus PC-12	34	1.594%	71.167%	3,038
19	C425 - Cessna 425 Corsair	32	1.500%	72.668%	2,860
20	C421 - Cessna Golden Eagle 421	28	1.313%	73.980%	2,502
21	M20P - Mooney M-20C Ranger	25	1.172%	75.152%	2,234
22	HDJT - HONDA HA-420 HondaJet	24	1.125%	76.278%	2,146
:	:	:	:	:	:
91	BT36 – Beech Bonanza A36TC/B36TC	1	0.047%	99.719%	90
92	C177 - Cessna 177 Cardinal	1	0.047%	99.766%	90
93	C25M - Cessna Citation M2	1	0.047%	99.812%	90
94	CL35 - Bombardier Challenger 300	1	0.047%	99.859%	90
95	LR25 - Bombardier Learjet 25	1	0.047%	99.906%	90
96	RV10 - Experimental	1	0.047%	99.953%	90
97	RV6 - AIEP Air Beetle	1	0.047%	100.000%	90
Total:		2,133			190,644

* Computations rounded to produce even multiples of LTO, with adjustments to account for accumulated rounding error added to the dominant aircraft type.

There are three types of aircraft with emissions at Luke AFB: F-16 fighter jets, F-35 fighter jets and transient aircraft. There are also emissions from associated GSE. The ratio of 0.52 between the number of F-16s based at Luke AFB in 2017 and the number of F-16s based there in 2008 (Weston, 2010) provides an estimate of aircraft and associated GSE emissions. Emissions from F-35 aircraft and their associated GSE were scaled using a ratio of 0.42 between the number of F-35 aircraft based at Luke AFB in 2017 and the future total number of F-35 aircraft in the L6 scenario emissions as obtained from the base’s 2012 environmental impact statement report (USAF, 2012). Transient aircraft emissions for 2017 are similar to those for 2008, based on discussions with Luke AFB personnel.

The AEDT model contains a database of PM₁₀ and PM_{2.5} emission factors for various aircraft, but this database is not complete. For all aircraft, generic emission factors developed for the 2014 National Emissions Inventory (ERG, 2016) are applied. Table 4.2.3–3 lists the EPA’s generic PM₁₀ and PM_{2.5} emission factors for each aircraft category and engine type. The FAA’s fleet mix data (FAA, 2018b) for the eleven airports in Maricopa County showed that turbine powered aircraft constituted 100% of air taxi (AT) operations and 79.63% of general aviation (GA) operations in 2017.

Table 4.2.3–3. EPA’s generic PM₁₀ and PM_{2.5} emission factors for aircraft.

SCC	Aircraft category / engine	Emission factor (pounds/LTO)	
		PM ₁₀	PM _{2.5}
2275060011	Air Taxi /Piston	0.6040	0.4160
2275060012	Air Taxi /Turbine	0.6040	0.5880
2275020000	Commercial	1.0780	1.0520
2275050011	General Aviation /Piston	0.2360	0.1634
2275050012	General Aviation /Turbine	0.2360	0.2320
2275001000	Military	1.3940	1.3600

Assuming that all activity occurs evenly throughout the year, the annual emissions divided by the number of days per year (365) represents the annual-day emissions, with the exception of Luke AFB, which has only 260 working days per year.

4.2.4 Locomotives

There are three railway companies operating within the PM₁₀ NAA. Burlington Northern/Santa Fe Railway (BNSF), Union Pacific Railway (UP), and Amtrak each provided diesel fuel usage for the computation of annual emissions from locomotives. Railway operations from these companies fall into three categories: Class I haul lines, passenger trains, and yard/switching operations. Diesel fuel usage multiplied by emission factors published by EPA (US EPA, 2009) produced the annual emission totals. Assuming that locomotive activity is uniform throughout the year, the annual totals divided by 365 days per year represent the annual-day emissions.

4.3 Emission Allocation Methodology

Spatial surrogates were allocated at the county level annual and annual-day emissions for each of the categories to the PM₁₀ NAA using the methodology presented in this section. Table 4.3-1 summarizes the specific allocation methods used. The following sub-sections describe the methodologies.

Table 4.3–1. Calculation and allocation method for nonroad mobile sources.

Category	Allocation
Agricultural	Land Use (Agricultural)
Airport GSE/APUs	Location Data
Commercial	Employment (Industrial)
Construction	Employment (Construction)
Industrial	Employment (Industrial)
Lawn & garden	Employment (Landscaping) and Housing
Pleasure craft	Land Use (Lakes)
Railway maintenance	Railroad Track Miles
Recreational	Land Use (Passive Open + Vacant, Golf Courses)
Aircraft	Location Data
Locomotives	Location Data

4.3.1 Land use

The acreages of specific land use categories are the spatial surrogates for the allocation of Maricopa County emissions to the PM₁₀ NAA for the agriculture, pleasure craft and recreational sectors. Maricopa County annual and annual-day emissions, multiplied by the ratio of the category acreage in the NAA to the category acreage in Maricopa County, represent the annual and annual-day emissions for the NAA.

4.3.2 Location data

The geographic location of each source identifies whether it is located inside or outside of the PM₁₀ NAA. Annual and annual-day emissions for each source located inside the NAA are included in NAA totals.

4.3.3 Employment

The number of employees in specific employment sectors are spatial surrogates for the allocation of Maricopa County emissions to the PM₁₀ NAA for the commercial, construction and industrial sectors, as well as the commercial portion of the lawn and garden sector. Maricopa County annual and annual-day emissions, multiplied by the ratio of employees in the NAA to the number of employees in Maricopa County, represent the annual and annual-day emissions for the NAA.

4.3.4 Housing

The number of residential houses (single family and duplex) is the spatial surrogate for the allocation of Maricopa County emissions to the PM₁₀ NAA for the residential portion of the lawn and garden sector. Maricopa County annual and annual-day emissions, multiplied by the ratio of the number of houses in the NAA to the number of houses in Maricopa County, represent the annual and annual-day emissions for the NAA.

4.3.5 Railroad Track Miles

The number of miles of active railroad track is the spatial surrogate for the allocation of Maricopa County emissions to the PM₁₀ NAA for the railway maintenance sector. Maricopa County annual and annual-day emissions, multiplied by the ration of the number of track miles in the NAA to the number of track miles in Maricopa County, represents the annual and annual-day emissions for the NAA.

4.4 Quality assurance procedures

A comparison of the 2017 nonroad mobile sources emission estimates to previous emissions inventories (2014 and 2011) provided a quality check of the results. Any unexpected changes (large increases or decreases in source emissions) triggered investigations to identify the reasons for the changes. Inspection of annual emissions totals computed individually for each source served as additional validation. Personnel who were not involved in the development of the results reviewed the input/output files and calculations for accuracy. In addition, external agency staff reviewed the emissions estimates.

4.5 Summary of nonroad mobile source emissions

Table 4.5–1 summarizes annual and annual-day emissions of PM₁₀, PM_{2.5}, NO_x, SO_x, and NH₃ from nonroad mobile sources in Maricopa County. Table 4.5–2 shows annual and annual-day emissions for these pollutants for the PM₁₀ NAA.

Table 4.5-1. Annual and annual-day emissions from nonroad mobile sources in Maricopa County.

Category	Annual emissions (tons/yr)					Annual-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Agricultural	23.5	22.8	279.7	0.4	0.4	150	145	1,781	3	2
Airport GSE+APUs	16.6	16.2	230.5	18.8	N/A	91	89	1,263	103	N/A
Commercial	79.1	75.3	866.0	1.7	2.1	507	482	5,548	11	13
Construction	879.3	849.2	10,108.5	15.2	15.4	5,628	5,435	64,696	98	99
Industrial	46.6	45.5	917.9	1.9	1.4	288	281	5,601	12	8
Lawn & garden	182.1	168.0	520.9	2.1	2.9	1,259	1,161	3,641	15	21
Pleasure craft	2.9	2.7	66.9	0.1	0.1	39	36	897	1	2
Railway maintenance	0.7	0.7	5.9	0.0	0.0	5	5	41	0	0
Recreational	14.8	13.6	46.5	0.2	0.3	126	116	395	2	3
Aircraft	262.2	251.9	2,961.7	322.3	N/A	1,512	1,455	16,869	1,834	N/A
Locomotives	36.0	34.9	1,427.0	202.8	1.4	197	191	7,819	1,111	8
Total:	1,543.8	1,480.8	17,431.5	565.5	24.0	9,802	9,396	108,551	3,190	156

Table 4.5-2. Annual and annual-day emissions from nonroad mobile sources in the PM₁₀ NAA.

Category	Annual emissions (tons/yr)					Annual-day emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Agricultural	9.7	9.4	115.0	0.2	0.2	62	60	733	1	1
Airport GSE+APUs	16.1	15.7	221.7	18.2	N/A	88	86	1,215	100	N/A
Commercial	79.0	75.2	864.8	1.7	2.1	506	481	5,541	11	13
Construction	846.8	817.8	9,735.1	14.7	14.9	5,420	5,234	62,306	94	95
Industrial	46.6	45.5	916.6	1.9	1.4	287	281	5,593	12	8
Lawn & garden	182.8	168.6	522.8	2.1	2.9	1,263	1,164	3,652	15	21
Pleasure craft	1.7	1.5	38.3	0.0	0.1	22	21	513	1	1
Railway maintenance	0.4	0.4	3.7	0.0	0.0	3	3	26	0	0
Recreational	4.1	3.7	27.1	0.1	0.2	34	32	231	1	2
Aircraft	254.7	244.9	2,911.6	313.0	N/A	1,471	1,417	16,595	1,783	N/A
Locomotives	23.2	22.5	924.8	129.2	0.9	127	123	5,067	708	5
Total:	1,465.1	1,405.2	16,281.5	481.1	22.7	9,283	8,902	101,472	2,726	146

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Onroad Mobile Sources

5.1 Introduction

Onroad mobile source emissions have been calculated for particulate matter for the 2017 PEI for the PM₁₀ NAA and the Maricopa County area. For the purposes of this particulate matter inventory, the following pollutants were included: PM₁₀, PM_{2.5}, NO_x, SO_x, and 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.

Emission factors were calculated using MOVES2014b, which is the latest model developed by the EPA for the purpose of estimating motor vehicle emission factors, and AP-42, which is the EPA Compilation of Air Pollutant Emission Factors.

Onroad exhaust, tire wear, and brake wear emissions were estimated by MOVES2014b. The MOVES2014b inputs were developed using local data from multiple sources such as the ADOT, AZDA, the MAG Transportation Division, and the NCEI.

Paved road fugitive dust emission estimates were derived from the AP-42 equation published by EPA in January 2011. The 2017 VMTs for freeways, high traffic arterials, and low traffic arterials were derived from the 2017 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 multiplied by the appropriate particulate emission factors derived from the AP-42 equation for paved roads.

Public unpaved road VMTs were derived from the MAG 2009 Unpaved Road Inventory (MAG, 2010). VMTs for private unpaved roads and alleys were derived from a study conducted by MAG in August-September 2011 (MAG, 2011). The public and private unpaved road and alley VMTs were multiplied by the appropriate particulate emission factors derived from the AP-42 equation for unpaved roads.

The main references for preparing the onroad mobile source portion of the 2017 emissions inventory were:

- Compilation of Air Pollutant Emissions Factors, AP-42 (US EPA, 2006);
- Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes (US EPA, 2014);
- MOVES2014a User Guide (US EPA, 2015a);
- MOVES2014a Software Design Reference Manual (US EPA, 2015b);
- MOVES2014a User Interface Reference Manual (US EPA, 2016);
- Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standard (NAAQS) and Regional Haze Regulations (US EPA, 2017);
- MOVES2014 User Interface Reference Manual Appendix: MOVES2014b (US EPA, 2018a); and
- MOVES2014, MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity (US EPA, 2018b).

5.2 Exhaust, tire wear, and brake wear emissions calculation

Vehicle exhaust emission factors for PM₁₀, PM_{2.5}, NO_x, SO_x, and NH₃, as well as tire wear and brake wear emission factors for PM₁₀ and PM_{2.5}, were calculated using MOVES2014b. The exhaust PM₁₀ and PM_{2.5} estimates include the components of sulfate and carbon (organic and elemental).

5.2.1 MOVES2014b model

The emissions were calculated using the EPA state-of-the-art emissions modeling tool, MOVES2014b. MOVES2014b is intended for official use to estimate national, state, and county level inventories of criteria air pollutants from highway vehicles. The user of MOVES2014b is allowed to specify vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types for a particular scenario to be modeled by creating a Run Specification (RunSpec).

In order to calculate vehicle emissions for the calendar year 2017, MOVES2014b was executed using local input data for each geographical area (Maricopa County and the PM₁₀ NAA). Each scenario was created using the county scale setting and the inventory calculation type. The specific MOVES2014b model RunSpec and RunSpec summaries are described in Appendix C.

5.2.2 Local input data used with the MOVES2014b model

MOVES2014b requires local data such as inspection and maintenance (I/M) programs, meteorological data, vehicle populations, source type age distribution, annual VMT, monthly/daily/hourly fractions, road type distribution, average speed distribution, ramp fraction, fuel data, and alternative vehicle and fuel technologies (AVFT).

5.2.2.1 Fuel data

Regarding the fuel local input data, MOVES2014b provides three MOVES tables, which are [fuelsupply], [fuelformulation], and [fuelusagefraction]. The fuel data for each month were derived from the 2017 fuel inspection results in Maricopa County provided by AZDA. The fuel data for Maricopa County were applied to the PM₁₀ NAA. The specific MOVES tables for fuel data are presented in Appendix C.

5.2.2.2 I/M programs

MOVES2014b has an [IMCoverage] table for I/M programs, which 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 Area A, with the exception of certain model years and vehicle classes. However, it is assumed that 91.6 percent of the vehicles operating within Area A participate in the I/M programs, while the remaining 8.4 percent of the vehicles come from outside of the areas where vehicles are not subject to the programs. 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 specific MOVES table for I/M programs is presented in Appendix C.

5.2.2.3 Meteorological data

MOVES2014b requires hourly temperature and relative humidity data by specific month of the year. Meteorological data for the Phoenix Sky Harbor International Airport in 2017 were obtained from the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/IPS/lcd/lcd.html>). 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 C.

5.2.2.4 Vehicle population

In MOVES2014b, off-network emissions including start and extended idle emissions are directly determined by population of vehicles in an area. The vehicle population in Maricopa County was obtained from the July 2017 vehicle registration data provided by ADOT. The vehicle population data were allocated to the 13 MOVES source types based on MOVES default vehicle population fractions for Maricopa County in 2017. 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 2017 was derived from the MAG socioeconomic data. The specific MOVES table [SourceTypeYear] for vehicle population is presented in Appendix C.

5.2.2.5 Source type age distribution

MOVES2014b categorizes vehicles according to vehicle classes and model years. The source type age distribution input table was prepared using EPA MOVES data converter and the July 2017 vehicle registration data from ADOT. The same source type age distribution was applied for Maricopa County and the PM₁₀ NAA. The specific MOVES table [SourceTypeAgeDistribution] for source type age distribution is presented in Appendix C.

5.2.2.6 Annual VMT

The 2017 annual VMTs were used to estimate onroad exhaust, tire wear, and brake wear emissions. The 2017 annual average daily VMTs for Maricopa County and the PM₁₀ NAA were derived from the 2017 traffic assignment data provided by the MAG Transportation Modeling Group. The annual average daily VMTs were multiplied by 365 days to obtain the annual VMTs. The specific MOVES table [HPMS³vTypeYear] for annual VMT is presented in Appendix C.

5.2.2.7 Road type distribution

MOVES2014b requires the distribution of VMTs by road type as a local input. The road type VMT distribution by HPMS vehicle type was derived with the 2017 traffic assignment data and the MOVES default VMT fractions for the HPMS vehicle types. The road type distribution assigned to the HPMS vehicle class was applied to all MOVES source types in the class. The specific MOVES table [RoadTypeDistribution] for road type distribution is presented in Appendix C.

5.2.2.8 VMT fraction

Since VMT varies by month, day of week, and hour, MOVES2014b requires month/day/hour VMT fractions as a local input in order to derive hourly VMT for each weekday/weekend and month from the

³ Highway Performance Monitoring System

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) in 2007. The specific MOVES tables [MonthVMTFraction], [DayVMTFraction], and [HourVMTFraction] for VMT fractions are presented in Appendix C.

5.2.2.9 Average speed distribution

In MOVES2014b, vehicle power, speed, and acceleration have a significant effect on vehicle emissions for all pollutants. MOVES2014b estimates those emission effects by assigning activity to operating mode distributions, which are determined by the distribution of vehicle hours traveled (VHT) in sixteen speed bins. Local average speeds were developed by post-processing the output from the 2017 traffic assignment data. 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 distribution for the PM₁₀ NAA. The specific MOVES table [AvgSpeedDistribution] for the average speed distribution is presented in Appendix C.

5.2.2.10 Ramp fraction

MOVES2014b requires the ramp fraction, which represents the percent of VHT on ramps, on both rural and urban restricted roads. 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 2017 traffic assignment. The specific MOVES table [RoadType] for ramp fractions is shown in Appendix C.

5.2.2.11 Alternative vehicle and fuel technologies (AVFT) strategy

MOVES2014b allows users to modify the fuel engine fraction using different fuels and technologies in each model year in order to reflect the local situation. The fleet information for transit buses was provided by Valley Metro and used to prepare the AVFT input. Since the fleet data are available only for specific model years, MOVES2014b default values were obtained from the [fuelEngFraction] table in the MOVES default database and used for the rest of the model years. The specific MOVES table [AVFT] for AVFT strategy is shown in Appendix C.

5.2.3 MOVES2014b outputs

MOVES2014b was executed with the RunSpec files described in Appendix C to obtain exhaust, tire wear, and brake wear emissions for PM₁₀, PM_{2.5}, NO_x, SO_x, and NH₃. These values were obtained for the following categories:

- Source types: motorcycle, passenger car, passenger truck, light commercial truck, intercity bus, transit bus, school bus, refuse truck, single unit short-haul truck, single unit long-haul truck, motor home, combination short-haul truck, and combination long-haul truck.
- Road types: off-network, rural restricted access, rural unrestricted access, urban restricted access, and urban unrestricted access

5.2.4 MOVES2014b emission estimates

MOVES2014b was used to generate onroad emissions by source type, road type, weekday/weekend day, and month. By specifying the output time aggregate level as month, MOVES2014b produces monthly emissions including weekday and weekend emissions for a given month. The annual emissions were calculated by aggregating monthly onroad emissions derived by MOVES2014b. The average daily emissions were calculated by dividing the annual emissions by 365 days.

Tables 5.2–1 and 5.2–2 show the calculated annual and average daily PM₁₀, PM_{2.5}, NO_x, SO_x, and NH₃ emissions by road type and source type in Maricopa County and the PM₁₀ NAA, respectively. Emission estimates for PM₁₀ and PM_{2.5} in these tables represent exhaust, tire wear, and brake wear emissions.

Table 5.2–1. Annual and average daily onroad mobile source emissions in Maricopa County, by road and vehicle type.

Road type	Source type	Annual emissions (tons/yr)					Average daily emissions (lbs/day)				
		PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Off- Network	Motorcycle	0.1	0.1	3.4	0.0	0.0	0	0	19	0	0
	Passenger car	45.1	39.9	3,529.0	3.2	0.0	247	219	19,341	18	0
	Passenger truck	16.8	14.9	1,695.3	0.8	0.0	92	82	9,291	5	0
	Light commercial truck	4.5	4.0	465.8	0.2	0.0	25	22	2,553	1	0
	Intercity bus	0.0	0.0	0.1	0.0	0.0	0	0	0	0	0
	Transit bus	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0
	School bus	0.1	0.1	1.1	0.0	0.0	1	1	6	0	0
	Refuse truck	0.0	0.0	0.1	0.0	0.0	0	0	0	0	0
	Single unit short-haul truck	0.8	0.7	80.4	0.0	0.0	4	4	440	0	0
	Single unit long-haul truck	0.0	0.0	1.6	0.0	0.0	0	0	9	0	0
	Motor home	0.0	0.0	4.3	0.0	0.0	0	0	24	0	0
	Combo short-haul truck	0.1	0.1	0.0	0.0	0.0	0	0	0	0	0
	Combo long-haul truck	18.7	17.2	1,815.0	0.2	5.0	102	94	9,947	1	27
Rural Restricted Access	Motorcycle	0.1	0.1	3.0	0.0	0.2	1	0	17	0	1
	Passenger car	6.0	2.6	99.5	1.3	11.2	33	14	545	7	62
	Passenger truck	1.7	0.9	67.3	0.4	3.1	9	5	369	2	17
	Light commercial truck	0.5	0.3	17.6	0.1	0.8	3	2	97	1	4
	Intercity bus	0.4	0.4	11.3	0.0	0.0	2	2	62	0	0
	Transit bus	0.1	0.1	8.9	0.0	0.1	1	0	49	0	1
	School bus	1.4	1.1	28.6	0.0	0.2	8	6	157	0	1
	Refuse truck	0.4	0.3	8.8	0.0	0.1	2	1	48	0	0
	Single unit short-haul truck	5.1	3.2	85.1	0.2	1.2	28	18	466	1	7
	Single unit long-haul truck	0.3	0.2	5.0	0.0	0.1	2	1	28	0	0
	Motor home	0.2	0.1	3.7	0.0	0.0	1	1	20	0	0
	Combo short-haul truck	9.9	7.0	266.8	0.4	1.8	54	39	1,462	2	10
	Combo long-haul truck	30.8	23.0	792.5	1.0	4.3	169	126	4,343	6	24

Table 5.2-1. Annual and average daily onroad mobile source emissions in Maricopa County, by road and vehicle type (continued).

Road type	Source type	Annual emissions (tons/yr)					Average daily emissions (lbs/day)				
		PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Rural Unrestricted Access	Motorcycle	0.6	0.3	11.8	0.1	0.6	3	2	64	0	4
	Passenger car	63.2	13.6	323.6	5.2	37.7	347	74	1,774	28	207
	Passenger truck	15.8	4.1	208.3	1.5	10.2	87	22	1,141	8	56
	Light commercial truck	4.4	1.3	58.4	0.4	2.5	24	7	320	2	14
	Intercity bus	0.3	0.2	5.5	0.0	0.0	2	1	30	0	0
	Transit bus	0.2	0.0	3.8	0.0	0.0	1	0	21	0	0
	School bus	1.1	0.7	11.7	0.0	0.1	6	4	64	0	0
	Refuse truck	1.1	0.6	13.5	0.0	0.1	6	3	74	0	0
	Single unit short-haul truck	13.2	6.5	142.7	0.4	1.9	73	36	782	2	11
	Single unit long-haul truck	0.9	0.4	8.9	0.0	0.1	5	2	49	0	1
	Motor home	0.4	0.2	5.3	0.0	0.1	2	1	29	0	0
	Combo short-haul truck	5.3	2.8	73.9	0.1	0.5	29	15	405	1	3
	Combo long-haul truck	15.4	8.9	222.1	0.3	1.2	84	49	1,217	2	7
Urban Restricted Access	Motorcycle	3.2	2.4	57.7	0.3	3.5	17	13	316	1	19
	Passenger car	259.8	96.2	2,480.8	33.2	269.3	1,424	527	13,596	182	1,476
	Passenger truck	73.6	35.0	1,624.6	9.8	73.7	403	192	8,904	54	404
	Light commercial truck	19.8	9.6	424.0	2.4	17.9	108	53	2,324	13	98
	Intercity bus	2.1	1.6	40.2	0.0	0.1	12	9	220	0	1
	Transit bus	1.0	0.3	33.6	0.1	0.3	6	2	184	0	2
	School bus	6.9	4.8	108.8	0.1	0.6	38	26	596	1	3
	Refuse truck	7.7	4.8	126.9	0.2	0.7	42	26	695	1	4
	Single unit short-haul truck	102.5	60.2	1,433.8	3.9	17.8	562	330	7,858	21	97
	Single unit long-haul truck	6.8	3.8	88.5	0.1	0.9	37	21	485	1	5
	Motor home	3.6	2.3	58.2	0.2	0.7	20	12	319	1	4
	Combo short-haul truck	36.5	21.2	628.4	1.0	4.2	200	116	3,444	6	23
	Combo long-haul truck	108.7	68.7	1,864.4	2.4	9.9	596	377	10,218	13	54
Urban Unrestricted Access	Motorcycle	6.3	2.8	77.6	0.4	4.3	35	15	425	2	24
	Passenger car	875.5	166.3	3,125.4	54.2	358.5	4,798	912	17,129	297	1,965
	Passenger truck	217.4	48.6	1,959.3	15.5	93.4	1,192	266	10,738	85	512
	Light commercial truck	59.1	15.4	562.5	3.9	23.3	324	84	3,083	21	128
	Intercity bus	3.0	1.9	33.0	0.0	0.1	17	10	181	0	0
	Transit bus	1.8	0.3	17.4	0.0	0.2	10	2	96	0	1
	School bus	7.6	4.2	62.8	0.1	0.3	42	23	344	0	2
	Refuse truck	11.5	5.4	101.4	0.1	0.5	63	30	556	1	3
	Single unit short-haul truck	129.8	54.4	1,095.2	2.8	11.8	711	298	6,002	15	65
	Single unit long-haul truck	9.3	3.7	70.9	0.1	0.6	51	20	388	1	3
	Motor home	3.7	1.5	37.9	0.1	0.4	21	8	208	1	2
	Combo short-haul truck	34.8	15.1	307.9	0.5	1.7	191	83	1,688	3	9
	Combo long-haul truck	99.4	48.3	910.3	1.1	4.1	545	265	4,989	6	22

Table 5.2–2. Annual and average daily onroad mobile source emissions in the PM₁₀ attainment area, by road and source type.

Road type	Source type	Annual emissions (tons/yr)					Average daily emissions (lbs/day)				
		PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Off- Network	Motorcycle	0.1	0.1	3.4	0.0	0.0	0	0	19	0	0
	Passenger car	45.1	39.9	3,530.3	3.2	0.0	247	219	19,348	18	0
	Passenger truck	16.8	14.9	1,698.4	0.8	0.0	92	82	9,308	5	0
	Light commercial truck	4.5	4.0	466.6	0.2	0.0	25	22	2,557	1	0
	Intercity bus	0.0	0.0	0.1	0.0	0.0	0	0	0	0	0
	Transit bus	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0
	School bus	0.1	0.1	1.1	0.0	0.0	1	1	6	0	0
	Refuse truck	0.0	0.0	0.1	0.0	0.0	0	0	0	0	0
	Single unit short-haul truck	0.8	0.7	80.9	0.0	0.0	4	4	443	0	0
	Single unit long-haul truck	0.0	0.0	1.6	0.0	0.0	0	0	9	0	0
	Motor home	0.0	0.0	4.3	0.0	0.0	0	0	24	0	0
	Combo short-haul truck	0.1	0.1	0.0	0.0	0.0	0	0	0	0	0
	Combo long-haul truck	2.0	1.8	186.3	0.0	0.5	11	10	1,021	0	3
Rural Restricted Access	Motorcycle	0.0	0.0	0.9	0.0	0.1	0	0	5	0	0
	Passenger car	2.5	1.0	35.0	0.5	3.9	14	6	192	2	21
	Passenger truck	0.7	0.4	23.5	0.1	1.1	4	2	129	1	6
	Light commercial truck	0.2	0.1	6.1	0.0	0.3	1	1	34	0	1
	Intercity bus	0.0	0.0	1.1	0.0	0.0	0	0	6	0	0
	Transit bus	0.0	0.0	0.9	0.0	0.0	0	0	5	0	0
	School bus	0.2	0.1	2.9	0.0	0.0	1	1	16	0	0
	Refuse truck	0.1	0.1	2.4	0.0	0.0	1	0	13	0	0
	Single unit short-haul truck	1.5	1.0	24.9	0.1	0.3	8	5	137	0	2
	Single unit long-haul truck	0.1	0.1	1.5	0.0	0.0	1	0	8	0	0
	Motor home	0.1	0.0	1.1	0.0	0.0	0	0	6	0	0
	Combo short-haul truck	1.1	0.8	26.9	0.0	0.2	6	4	147	0	1
	Combo long-haul truck	3.5	2.5	79.8	0.1	0.4	19	14	437	1	2
Rural Unrestricted Access	Motorcycle	0.5	0.2	8.5	0.0	0.5	3	1	47	0	3
	Passenger car	50.4	10.6	245.2	4.0	28.5	276	58	1,344	22	156
	Passenger truck	12.6	3.2	157.4	1.2	7.7	69	17	863	6	42
	Light commercial truck	3.5	1.0	44.3	0.3	1.9	19	6	243	2	10
	Intercity bus	0.2	0.1	2.8	0.0	0.0	1	1	15	0	0
	Transit bus	0.1	0.0	1.8	0.0	0.0	1	0	10	0	0
	School bus	0.6	0.3	5.8	0.0	0.0	3	2	32	0	0
	Refuse truck	0.8	0.4	8.8	0.0	0.0	4	2	48	0	0
	Single unit short-haul truck	9.0	4.3	93.5	0.2	1.2	49	24	512	1	7
	Single unit long-haul truck	0.6	0.3	5.9	0.0	0.1	3	2	32	0	0
	Motor home	0.3	0.1	3.4	0.0	0.0	1	1	19	0	0
	Combo short-haul truck	3.0	1.5	38.1	0.1	0.3	16	8	209	0	1
	Combo long-haul truck	8.7	4.9	114.4	0.1	0.6	48	27	627	1	3

Table 5.2–2. Annual and average daily onroad mobile source emissions in the PM10 nonattainment area, by road and source type (continued).

Road type	Source type	Annual emissions (tons/yr)					Average daily emissions (lbs/day)				
		PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Urban Restricted Access	Motorcycle	3.2	2.4	58.0	0.3	3.5	17	13	318	1	19
	Passenger car	261.0	96.8	2,494.4	33.4	270.6	1,430	530	13,671	183	1,483
	Passenger truck	74.1	35.2	1,635.8	9.9	74.2	406	193	8,965	54	407
	Light commercial truck	19.9	9.7	426.8	2.4	18.0	109	53	2,339	13	99
	Intercity bus	2.1	1.6	40.2	0.0	0.1	12	9	220	0	1
	Transit bus	1.0	0.3	33.1	0.1	0.3	5	2	182	0	2
	School bus	7.0	4.8	108.9	0.1	0.6	38	26	597	1	3
	Refuse truck	7.8	4.9	127.8	0.2	0.7	43	27	700	1	4
	Single unit short-haul truck	102.8	60.5	1,439.5	3.9	17.8	563	331	7,889	21	98
	Single unit long-haul truck	6.8	3.8	88.8	0.1	0.9	37	21	487	1	5
	Motor home	3.6	2.3	58.3	0.2	0.7	20	12	320	1	4
	Combo short-haul truck	36.4	21.2	626.0	1.0	4.2	200	116	3,431	5	23
	Combo long-haul truck	108.5	68.6	1,858.2	2.4	9.9	595	376	10,184	13	54
Urban Unrestricted Access	Motorcycle	6.4	2.8	78.1	0.4	4.4	35	15	428	2	24
	Passenger car	880.1	167.2	3,143.7	54.5	360.6	4,823	917	17,229	299	1,976
	Passenger truck	218.9	49.0	1,973.8	15.7	94.1	1,200	268	10,817	86	515
	Light commercial truck	59.5	15.5	566.7	3.9	23.4	326	85	3,106	21	128
	Intercity bus	3.1	1.9	33.1	0.0	0.1	17	11	181	0	0
	Transit bus	1.8	0.3	17.2	0.0	0.2	10	2	94	0	1
	School bus	7.7	4.2	63.0	0.1	0.3	42	23	345	0	2
	Refuse truck	11.5	5.4	102.0	0.1	0.5	63	30	559	1	3
	Single unit short-haul truck	130.1	54.5	1,097.7	2.8	11.8	713	299	6,016	15	65
	Single unit long-haul truck	9.3	3.7	71.0	0.1	0.6	51	20	389	1	3
	Motor home	3.7	1.5	37.9	0.1	0.4	21	8	208	1	2
	Combo short-haul truck	34.8	15.1	307.9	0.5	1.7	191	83	1,688	3	9
	Combo long-haul truck	99.6	48.3	910.7	1.1	4.1	546	265	4,991	6	22

5.3 Fugitive dust emissions

While exhaust, tire wear, and brake wear emissions were calculated using the EPA MOVES2014b 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 AP-42 equation published by EPA in January 2011 was applied to estimate the PM₁₀ and PM_{2.5} emissions from paved roads.

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 freeways, 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 2017 vehicle registrations for Maricopa County provided by the ADOT. 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 (3.28 tons on freeways and 2.39 tons on arterials),

P = annual number of “wet” days with at least 0.254 mm (0.01 in) of precipitation (26 days⁴ in 2017), and

N = annual number of days (365 days in 2017).

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 2017 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 GIS to a 2017 traffic assignment output by the MAG travel demand model, TransCAD. The 2017 weekday traffic volumes output by TransCAD were normalized to 2017 VMTs for the PM₁₀ NAA and Maricopa County to produce the annual average daily VMTs by silt loading category shown in Table 5.3-2.

Table 5.3-1. 2017 fugitive dust emission factors for paved roads.

Silt loading category	Emission factors (g/mile)	
	PM ₁₀	PM _{2.5}
Freeways	0.09	0.02
High traffic arterials	0.20	0.05
Low traffic arterials	0.63	0.16

Table 5.3-2. 2017 VMT by silt loading category for paved roads.

Silt loading category	Daily VMT	
	Maricopa County	PM ₁₀ nonattainment area
Freeways	39,574,374	38,171,179
High traffic arterials	39,931,528	39,735,572
Low traffic arterials	15,755,060	14,828,602
Totals:	95,260,962	92,735,353

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 2017 uncontrolled particulate emissions from paved roads for the PM₁₀ NAA and Maricopa

⁴ Precipitation data for 2017 were obtained from National Oceanic and Atmospheric Administration (NOAA) in the form of local climatological data at Phoenix Sky Harbor Airport.

County, shown in Table 5.3-3. These uncontrolled emissions do not include the 2017 emission reductions attributed to PM₁₀ certified street sweepers in the MAG 2012 Five Percent Plan for PM₁₀ (MAG, 2012).

Table 5.3-3. 2017 uncontrolled fugitive dust emissions from paved roads.

Silt loading category	Maricopa County (lbs/day)		PM ₁₀ nonattainment area (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Freeways	7,852.1	1,744.9	7,573.7	1,683.0
High traffic arterials	17,606.6	4,401.7	17,520.2	4,380.1
Low traffic arterials	21,882.2	5,557.4	20,595.4	5,230.6
Totals:	47,340.9	11,704.0	45,689.3	11,293.7

The MAG 2012 Five Percent Plan includes emission reduction credit for 78 PM₁₀ certified street sweepers purchased by December 31, 2006 with MAG Congestion Mitigation and Air Quality Improvement (CMAQ) funds, that were still in service on December 31, 2009. Reductions for the sweepers purchased by December 31, 2006 were also applied to base case uncontrolled paved road emissions in the MAG 2012 Five Percent Plan. The PM₁₀ emission reduction benefit of these 78 sweepers is 5,097.2 pounds per day (lbs/day) in 2010. In 2017, this benefit is increased to 5,645.7 lbs/day, based on the 10.8 percent growth in arterial VMT in the PM₁₀ NAA between 2010 and 2017.

In addition, the MAG 2012 Five Percent Plan contains contingency measures implemented in 2007-2011 that reduce paved road emissions. These measures include ADOT contracted PM₁₀ certified street sweeping of freeways and frontage roads (2,401.8 lbs/day), projects completed by local governments in 2008-2011 that paved and stabilized unpaved shoulders (822.0 lbs/day), ADOT overlays of state highways with rubberized asphalt (14.3 lbs/day), and 22 additional PM₁₀ certified street sweepers purchased with CMAQ funds in 2007-2009. The benefit of the 22 PM₁₀ certified street sweepers is increased from 767.1 lbs/day to 849.6 lbs/day, using the 10.8 percent growth in arterial VMT in the PM₁₀ NAA between 2010 and 2017.

The total reduction of 9,733.4 pounds per day was subtracted from the uncontrolled PM₁₀ emissions shown in Table 5.3-3 for both Maricopa County and the PM₁₀ NAA. This emission reduction represents 21.3 percent of the uncontrolled PM₁₀ emissions of 45,689.3 pounds per day in the PM₁₀ NAA. This percent reduction was applied to the uncontrolled PM_{2.5} emissions in the PM₁₀ NAA and the absolute reduction in PM_{2.5} emissions was then applied to the uncontrolled PM_{2.5} emissions in Maricopa County.

The resultant controlled emissions in tons per year and pounds per day are shown in Table 5.3-4.

Table 5.3-4. 2017 controlled fugitive dust emissions from paved roads.

Area	Annual emissions (tons/yr)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Maricopa County	6,863.4	1,680.9	37,608	9,211
PM ₁₀ nonattainment area	6,562.0	1,622.0	35,956	8,888

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 public unpaved roads, 20 miles per hour on private unpaved roads and 10 miles per hour on unpaved alleys:

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

where: E = annual average particulate emission factor extrapolated for natural mitigation (lbs/mile),
k = particle size multiplier for particle size range (1.8 lbs/mile for PM₁₀ and 0.18 lbs/mile for PM_{2.5}),
s = surface material silt content (11.9%),
S = mean vehicle speed (25 mph for public unpaved roads, 20 mph for private 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 lbs/mile for PM₁₀ and 0.00036 lbs/mile for PM_{2.5}),
P = annual number of “wet” days with at least 0.254 mm (0.01 in) of precipitation (26 days in 2017),
and
N = annual number of days (365 days in 2017).

The public unpaved road emission factors resulting from the above equation are 1.5130 pounds per mile for PM₁₀ and 0.1510 pounds per mile for PM_{2.5}. The private unpaved road emission factors are 1.3532 pounds per mile for PM₁₀ and 0.1350 pounds per mile for PM_{2.5}. The unpaved alley emission factors are 0.9567 pounds per mile for PM₁₀ and 0.0954 pounds per mile for PM_{2.5}. These unpaved road and alley emission factors are consistent with the assumptions used in the MAG 2012 Five Percent Plan (MAG, 2012). These factors were applied to the annual average daily 2017 VMT estimates shown in Table 5.3-5.

The 2017 VMT for public unpaved roads in the PM₁₀ NAA was derived from the MAG 2009 Unpaved Road Inventory (MAG, 2010). The 2017 VMT for private unpaved roads in the PM₁₀ NAA was derived from a study of private unpaved roads and alleys conducted by MAG in August-September 2011 (MAG, 2011). The 2017 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 (AADT) estimate of 4 vehicles per day. The AADT for alleys was also derived from the 2011 MAG study referenced above.

The 2017 Maricopa County VMT on unpaved roads and alleys was obtained by applying a ratio of 1.02723459 to the PM₁₀ NAA VMT in Table 5.3-5. This ratio represents 2017 VMT on all roads in Maricopa County to 2017 VMT on all roads in the PM₁₀ NAA, as shown in Table 5.3-6.

Table 5.3-5. 2017 VMT on unpaved roads in Maricopa County and the PM₁₀ nonattainment area.

Area	2017 Annual average daily VMT		
	Unpaved public roads	Unpaved private roads	Unpaved alleys
Maricopa County	20,499	24,921	2,671
PM ₁₀ nonattainment area	19,956	24,260	2,600

Table 5.3-6. 2017 VMT on all roads in Maricopa County and the PM₁₀ nonattainment area.

Area	Ratio to 2017 annual average daily	
	2017 Annual average daily VMT	VMT in the PM ₁₀ nonattainment area
Maricopa County	95,260,962	1.02723459
PM ₁₀ nonattainment area	92,735,353	1.00000000

Multiplying the unpaved road emission factors by the VMTs in Table 5.3-5 results in the emissions shown in Table 5.3-7. These uncontrolled emissions do not include the emission reductions attributable to contingency measures in the MAG 2012 Five Percent Plan for PM₁₀ that were implemented by 2011. In addition, the uncontrolled emissions do not include credit for paving projects in the MAG Transportation Improvement Program (TIP) that were implemented in 2012, 2013, 2014, 2015, and 2016.

Table 5.3-7. Daily uncontrolled unpaved road and alley fugitive dust emissions.

Area	PM ₁₀ (lbs/day)		PM _{2.5} (lbs/day)	
	Unpaved roads	Unpaved alleys	Unpaved roads	Unpaved alleys
Maricopa County	64,739.1	2,555.2	6,459.8	254.8
PM ₁₀ nonattainment area	63,022.7	2,487.4	6,288.5	248.0

The MAG 2012 Five Percent Plan identifies a large number of projects that were implemented in 2008-2011 to pave and reduce speed limits on unpaved roads and alleys in the PM₁₀ NAA (MAG, 2012). In 2017, the total PM₁₀ emission reduction credit for these projects is 15,270.3 pounds per day. In addition to the benefits in the MAG 2012 Five Percent Plan, the total PM₁₀ emission reduction for unpaved roads needs to include credit for CMAQ-funded road and alley paving projects and other paving projects in the MAG FY11-22 TIP that were implemented by the end of 2016. This additional emission reduction for CMAQ and TIP paving projects is 4,000.9 pounds per day for 2017. The total unpaved road emission reduction of 19,271.1 pounds per day was subtracted from the total uncontrolled unpaved road and alley PM₁₀ emissions shown in Table 5.3-7 for both Maricopa County and the PM₁₀ NAA. This reduction represents 29.4 percent of the total uncontrolled unpaved road and alley emissions of 65,510.1 pounds per day in the PM₁₀ NAA. This 29.4 percent reduction was applied to the uncontrolled PM_{2.5} emissions in the PM₁₀ NAA and the absolute reduction in PM_{2.5} emissions was then applied to the uncontrolled PM_{2.5} emissions in Maricopa County.

The resultant controlled unpaved road and alley emissions in tons per year and pounds per day are shown in Table 5.3-8.

Table 5.3–8. Annual and average daily controlled fugitive dust emissions from unpaved roads and alleys.

Area	Annual emissions (tons/yr)		Average daily emissions (lbs/day)	
	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Maricopa County	8,764.2	864.9	48,023	4,739
PM ₁₀ nonattainment area	8,438.6	842.0	46,239	4,614

5.4 Quality assurance process

5.4.1 VMT estimates

Normal quality assurance procedures, including automated and manual consistency checks, were conducted by MAG in developing the 2017 TransCAD traffic assignment network used to generate the VMT data. The VMT estimates using the MAG travel demand model have been validated by the MAG transportation modeling group.

5.4.2 Emission estimates

The quality assurance process performed on the onroad mobile sources emission estimates included accuracy, completeness, and reasonableness checks. For reasonableness, the 2017 onroad mobile sources emission estimates were compared with previous emissions inventories. For accuracy and completeness, all input/output data and calculations were checked by an independent reviewer. Any errors found were corrected and the corrections were then rechecked by the reviewer.

5.5 Summary of all onroad mobile source emissions

Table 5.5–1 summarizes the annual emissions and the average daily emissions for PM₁₀, PM_{2.5}, NO_x, SO_x, and NH₃ from all onroad mobile sources in Maricopa County in 2017. Similar data for the PM₁₀ NAA are presented in Table 5.5–2.

Table 5.5–1. Annual and typical daily emissions from all onroad mobile sources in Maricopa County.

Emission category	Annual emissions (tons/yr)					Typical daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Exhaust, tire wear, and brake wear	2,356.4	834.7	27,415.2	148.3	981.9	12,918	4,573	150,249	813	5,383
Paved road fugitive dust	6,863.4	1,680.9				37,608	9,211			
Unpaved road and alley fugitive dust	8,764.2	864.9				48,023	4,739			
Totals:	17,984.0	3,380.5	27,415.2	148.3	981.9	98,549	18,523	150,249	813	5,383

Table 5.5–2. Annual and typical daily emissions from all onroad mobile sources in the PM₁₀ nonattainment area.

Emission category	Annual emissions (tons/yr)					Typical daily emissions (lbs/day)				
	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃	PM ₁₀	PM _{2.5}	NO _x	SO _x	NH ₃
Exhaust, tire wear, and brake wear	2,270.5	776.1	24,308.6	144.2	951.3	12,441	4,255	133,225	789	5,210
Paved road fugitive dust	6,562.0	1,622.0				35,956	8,888			
Unpaved road and alley fugitive dust	8,438.6	842.0				46,239	4,614			
Totals:	17,271.1	3,240.1	24,308.6	144.2	951.3	94,636	17,757	133,225	789	5,210

5.6 References

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Biogenic Sources

6.1 Introduction

Biogenic emissions have been estimated for the 2017 PEI for PM₁₀ precursors in Maricopa County and the PM₁₀ NAA using the MEGAN. MEGAN is a state-of-the-art biogenic emissions model developed initially at the NCAR and maintained at the University of California, Irvine. Some corrections and improvements were made in the latest version of MEGAN2.1 (Jiang et al., 2011; Guenther et al., 2012) compared to its previous versions (Guenther, 2006a, 2006b, and 2007; Guenther et al., 2006). NO_x emissions are reported as PM₁₀ precursor emissions.

In an effort to improve the meteorology field generated for MEGAN by the Weather Research and Forecasting Model (WRF), WRF Data Assimilation was implemented for the 2017 PEI using surface observational data and upper-air sounding data obtained from the National Centers for Environmental Prediction. The WRF Data Assimilation technique combines observations with WRF outputs (the first guess or background forecast) and their respective error statistics to provide an improved estimate (the analysis) of the atmospheric state. The application of the four-dimensional data assimilation (FDDA) option using surface observations further improved the WRF meteorological modeling performance as described in section 6.3 below.

Gridded biogenic emissions were calculated for each day in 2017 using day-specific hourly WRF meteorology data. The gridded daily emissions were aggregated to produce monthly and annual emission totals.

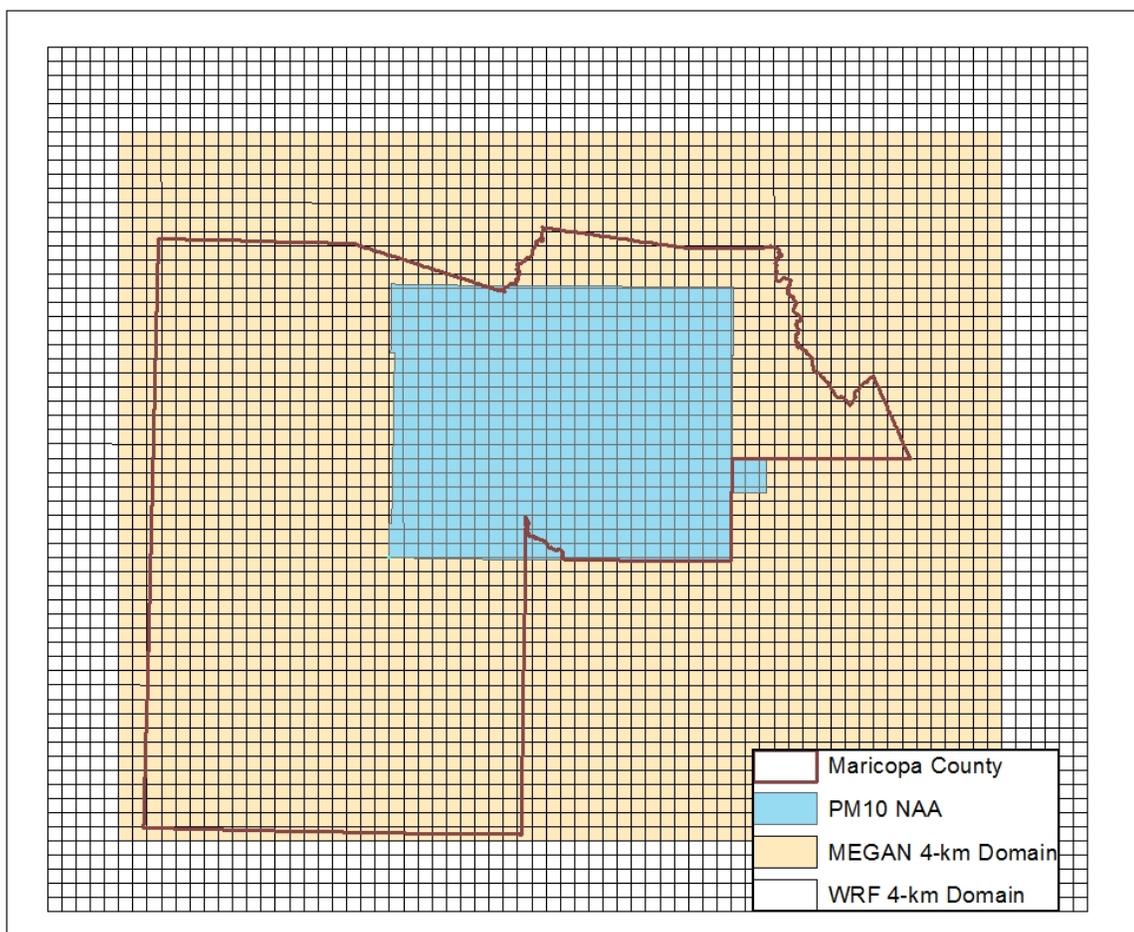
6.2 Modeling domain

MEGAN inputs and outputs for each grid cell are based on a user-defined two-dimensional gridded modeling domain. A 4-km × 4-km grid was defined to cover the entire area of Maricopa County and portions of neighboring counties. The target areas for the development of biogenic emissions are the PM₁₀ NAA and Maricopa County within the 4-km domain. The modeling domain is defined with a Lambert Conformal Conic Projection (LCC) coordinate system and the available domain parameters are presented in Table 6.2–1. Additional input files that mask areas covered by the PM₁₀ NAA and Maricopa County were developed using ArcGIS software in order to calculate emissions for the two target areas. The masking value is 1.0 for the grid cells fully covered by the target area, a fractional value for grid cells partially covered by the target area (e.g., boundaries of Maricopa County or the PM₁₀ NAAs), and 0.0 for grid cells outside the target area. As shown in Figure 6.2–1, biogenic emissions for the PM₁₀ NAA and Maricopa County were extracted from MEGAN simulations using the mask values from all of corresponding masked grid cells in the 4-km modeling domain as weights.

Table 6.2–1. The 4-km grid modeling domain defined in the LCC coordinate system.

Grid horizontal resolution	Grid size	Domain range (Decimal Degrees)	Target area
4 km × 4 km	62 × 50	(32.47, –113.41) to (34.30, –110.76)	PM ₁₀ nonattainment area and Maricopa County

Figure 6.2–1. The WRF 4-km × 4-km grid (white), MEGAN 4-km × 4-km grid (yellow), the PM10 nonattainment area (blue), and Maricopa County (grid cells within the brown boundary).



6.3 Input data

MEGAN requires both land cover and meteorological data as inputs for the calculation of biogenic emissions.

6.3.1 Land cover data

Land cover datasets released with MEGAN v2.1 include eight-day average leaf area index (LAI), percentages of 16 plant functional types (PFT), and emission factors (EF). The LAI data are based on 1-km NASA MODIS satellite observations; the PFT data are based on the National Land Cover Dataset with adjustments using additional datasets; and the EF data are based on a global map of species composition and species-specific emission factors or can be derived from PFT distributions and PFT-specific emission factors. For the 2017 PEI, PFT-dependent emission factors were used. This is consistent with the previous 2014 PEI. Within Maricopa County, PFT was adjusted based on the latest land use and land cover data from MAG. In the urban area, LAI and EF data were updated using LAI and EF files that were developed for the old MAG 4-km domain by ENVIRON (Mansell et al., 2006).

6.3.2 Meteorological data

Meteorological data were obtained from WRF version 3.9 model runs by post-processing the Meteorology-Chemistry Interface Processor (MCIP). The output of MCIP was then used as input to MET2MGN, a component program of MEGAN which prepares the meteorological data for input to MEGAN. The MET2MGN output includes photosynthetically active radiation (PAR) at the surface, air temperature at 2 meters above surface, air pressure, humidity, wind speed, top-layer soil moisture and temperature, and accumulated precipitation for each grid cell for each hour.

Biogenic emissions of NO_x from soils depend on soil temperature and soil moisture, which are determined by soil types and precipitation. Wind speed and humidity influence leaf temperature. Figure 6.3–1 shows daily mean and daily maximum air temperature, surface soil temperature, PAR, air pressure, wind speed, water vapor mixing ratio, surface soil moisture, and 24-hour accumulated precipitation in Maricopa County. The highest daily mean temperature and PAR were both recorded in June. The highest daily mean soil temperature and soil moisture both occurred in July. Therefore, the highest NO_x emissions from soil are expected to occur in July due to the higher soil temperature and moisture. The soil moisture is generally higher in July due to more rainfalls during the month. In particular, strong pulse NO_x emission responses to wet soils can occur in high temperature regions (Bertram et al. 2005; Oikawa, 2015).

In order to validate the WRF model output, the modeled temperature, water vapor mixing ratio, wind speed, and solar radiation were compared to hourly observations from fifteen National Weather Service stations (NWS; DS472.0) and twelve Arizona Meteorological Network (AZMET) stations located within the 4-km modeling domain. Figure 6.3-2 illustrates the locations of the monitoring stations in these two networks. The accuracy of the modeled temperature, water vapor mixing ratio, wind speed, and solar radiation was evaluated by performing a linear regression on the sets of paired modeled and observed hourly meteorological parameters, with a sample size of 7974. For each parameter the coefficient of determination (R^2) was computed, which represents the amount of variability in the observations that is explained by the model. Possible values of R^2 range from 0.0 to 1.0. The R^2 value of 1.0 means that the model explains 100% of the variability in the observations (model predictions perfectly fit observations) while a value of 0.0 means that the model explains none of the variability (model predictions are not correlated to observations at all). Thus, higher values of R^2 represent improvements in model accuracy. As shown in Figure 6.3-3, the R^2 values for temperature, water vapor mixing ratio, wind speed, and solar radiation using WRF FDDA are 0.98, 0.89, 0.63, and 0.92, respectively. This indicates that WRF with FDDA generates a more realistic set of meteorological inputs for use in the estimation of biogenic emissions.

Figure 6.3–1. WRF modeled daily average and daily maximum values of temperature at 2 meters above surface, soil temperature, PAR, air pressure, wind speed at 10 meters above the ground, water vapor mixing ratio at 2 meters above the ground, soil moisture, and 24-hour accumulated precipitation.

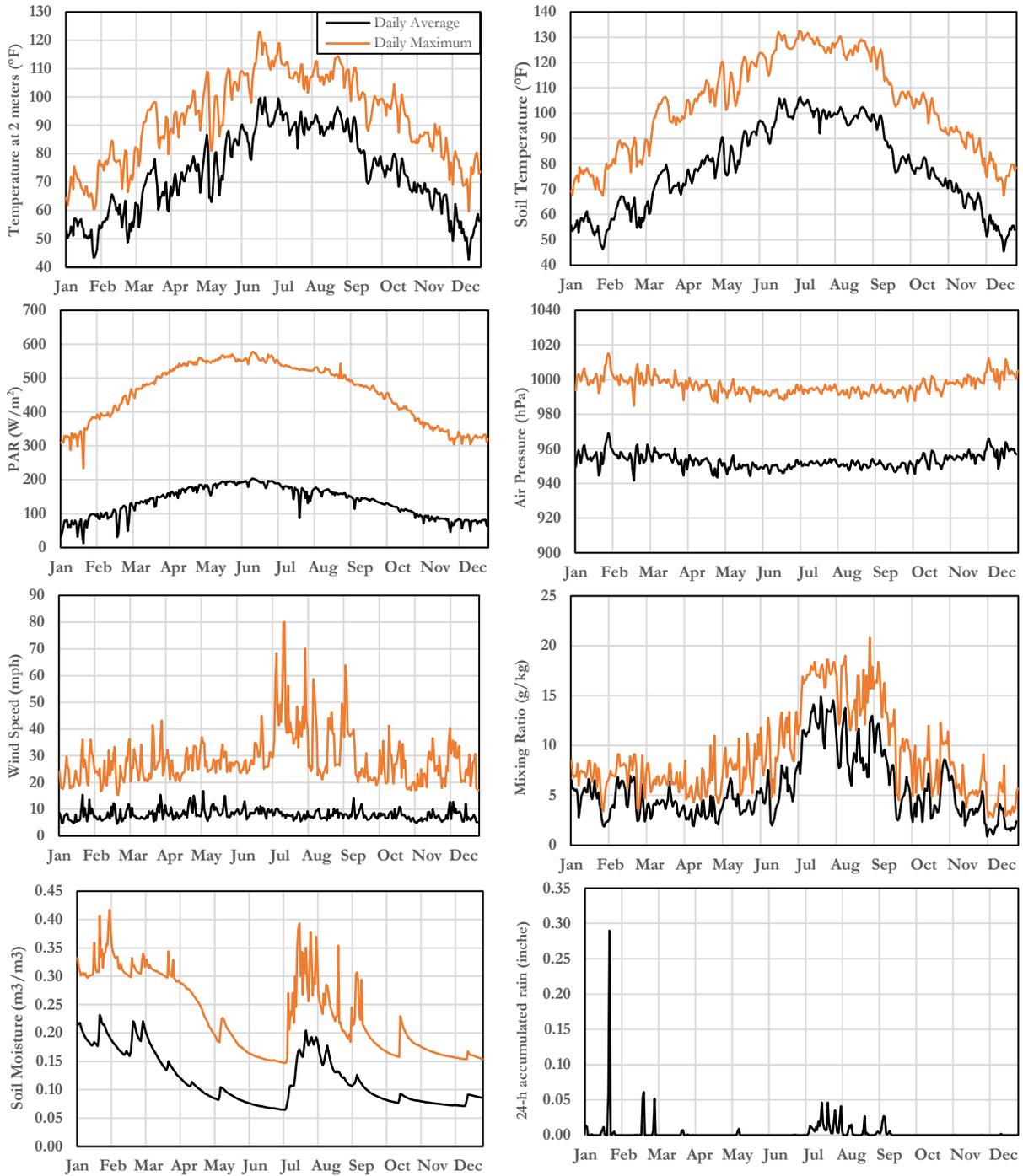


Figure 6.3.-2 Locations of DS472 and AZMET meteorological stations.

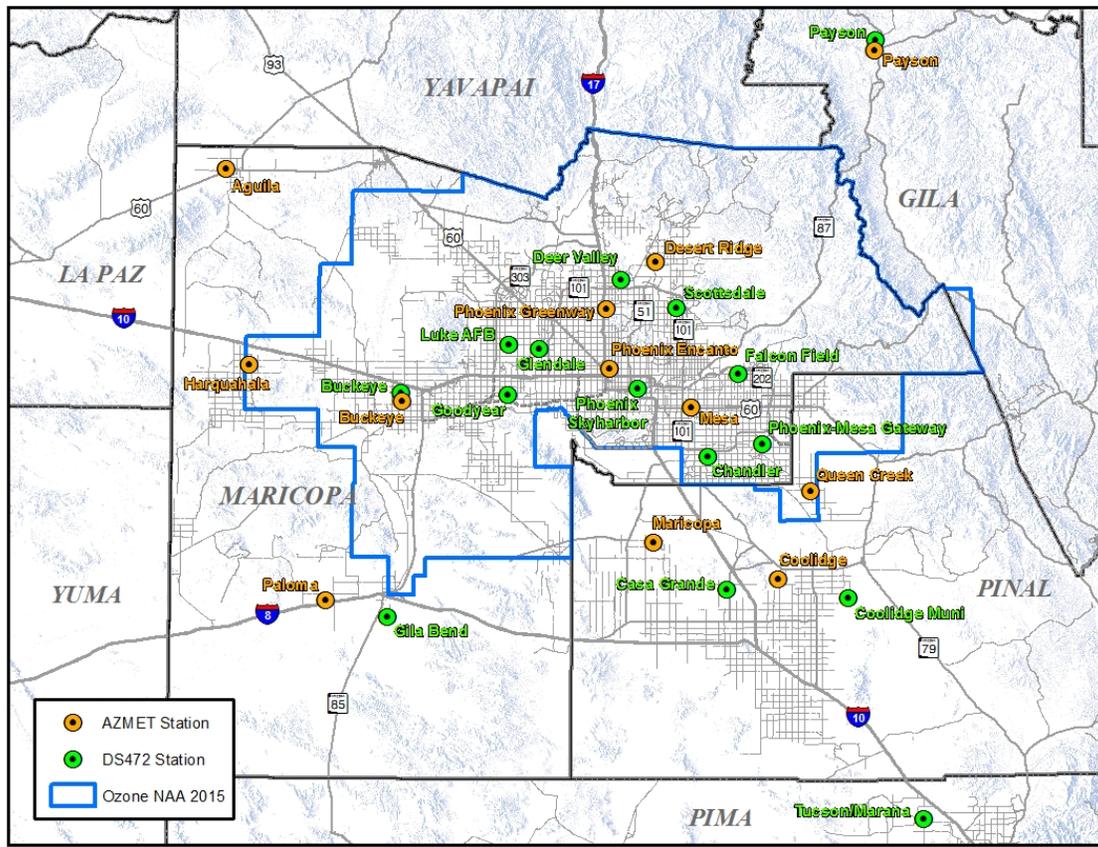
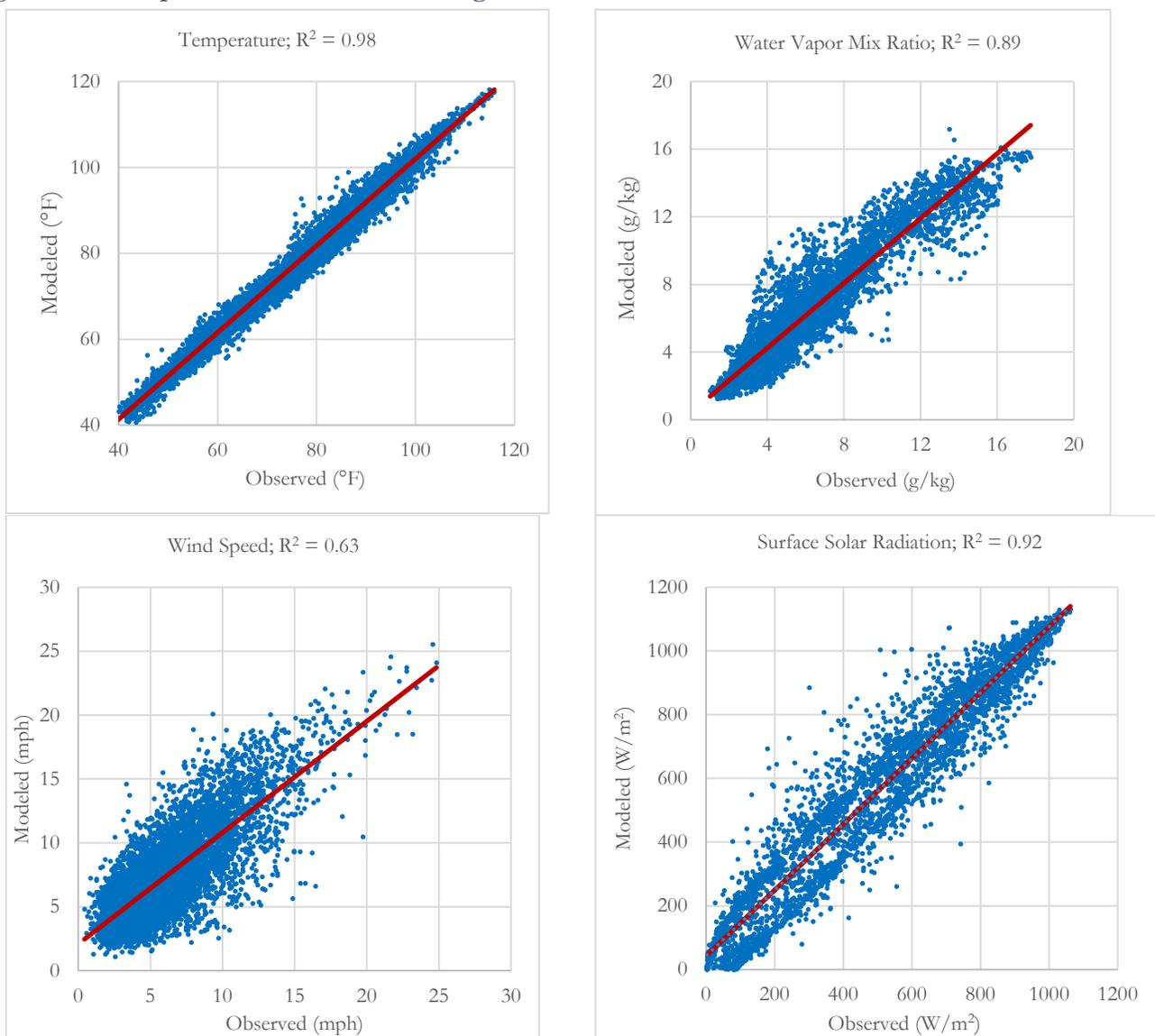


Figure 6.3–3. Paired hourly modeled and observed data in 2017 from NWS and AZMET stations for temperature at 2 meters above the surface, water vapor mixing ratio at 2 meters above the ground, wind speed at 10 meters above the ground, and surface solar radiation.



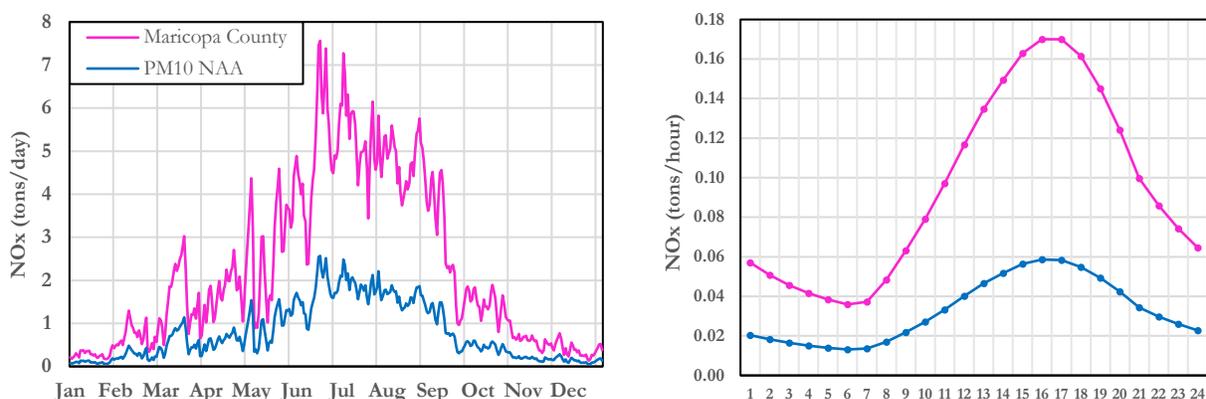
6.4 Emission estimation

Monthly and average daily emissions for each month in 2017 are provided in Table 6.4–1 for Maricopa County and the PM₁₀ NAA, respectively. Average daily biogenic NO_x emissions in 2017 and annual mean diurnal cycles of NO_x emissions for Maricopa County and the PM₁₀ NAA are illustrated in Figure 6.4–1.

Table 6.4–1. Average monthly (tons/month) and daily biogenic emissions (lbs/day) by month in 2017 for Maricopa County and the PM₁₀ nonattainment area.

Month	Maricopa County		PM ₁₀ nonattainment area	
	Monthly (tons/month)	Daily average (lbs/day)	Monthly (tons/month)	Daily average (lbs/day)
January	8.7	562	3.1	202
February	19.8	1,412	7.4	527
March	48.2	3,113	18.3	1,180
April	50.4	3,357	17.5	1,164
May	82.6	5,330	29.3	1,888
June	143.9	9,593	50.2	3,345
July	165.8	10,698	58.8	3,796
August	148.6	9,586	50.3	3,248
September	83.6	5,573	27.2	1,814
October	42.5	2,740	13.4	867
November	16.9	1,130	5.4	363
December	11.4	735	4.1	267

Figure 6.4–1. Daily biogenic NO_x emissions in 2017 and annual mean diurnal cycles of NO_x emissions for Maricopa County and the PM₁₀ nonattainment area.



6.5 Summary of all biogenic source emissions

Annual and average daily NO_x emissions from biogenic sources for Maricopa County and the PM₁₀ NAA are provided in Table 6.5–1.

Table 6.5–1. Annual and typical daily biogenic NO_x emissions in 2017 for Maricopa County and the PM₁₀ nonattainment area.

Geographic area	Annual emissions (tons/yr)	Typical daily emissions (lbs/day)
Maricopa County	822.4	4,486
PM ₁₀ nonattainment area	285.0	1,555

6.6 References

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[www.acom.ucar.edu/webt/MEGAN/MEGAN2.1 User Guide 05-07-2012.pdf](http://www.acom.ucar.edu/webt/MEGAN/MEGAN2.1%20User%20Guide%2005-07-2012.pdf)

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List of Appendices

Appendix A	Instructions for Reporting 2017 Annual Air Pollution Emissions.....	A-1
Appendix B	Rule Effectiveness (RE) Studies	
	B.1 Introduction	B-1
	B.2 Calculating Rule Effectiveness Rates for Title V and Non-Title V Facilities.....	B-2
	B.3 Calculating Rule Effectiveness Rates for Rules 310, 310.01, and 316	B-3
	B.3.1 Calculating Rule Effectiveness for Sources Subject to Rule 310.....	B-4
	B.3.2 Calculating Rule Effectiveness for Sources Subject to Rule 310.01	B-5
	B.3.3 Calculating Rule Effectiveness for Sources Subject to Rule 316.....	B-5
	B.4 References.....	B-5
Appendix C	MOVES2014b Local Input Data and RunSpecs	
	MOVES2014b RunSpec Summary (Maricopa County, Sept 11 2018)	C-2
	MOVES2014b RunSpec (Maricopa County, Sept 11 2018).....	C-4
	MOVES2014b Local Input Data (Maricopa County, Sept 11 2018).....	C-7
Appendix D	Emissions from Facilities treated as Area Sources in the 2017 Periodic Emissions Inventory.....	D-1
Appendix E	Responsiveness Summary	E-1

Appendix A. Instructions for Reporting 2017 Annual Air Pollution Emissions



INSTRUCTIONS

FOR REPORTING 2017

ANNUAL AIR POLLUTION EMISSIONS

January 2018

**Emissions Inventory Unit
1001 North Central Avenue, Suite 125
Phoenix, Arizona 85004**

Phone: (602) 506-6790

Fax: (602) 506-6179

Email: *EmissionsInventory@mail.maricopa.gov*

**Copies of this document, related forms,
and other reference materials are available online at our web site:
<https://www.maricopa.gov/2648/Emissions-Inventory-Instructions-Help-Sh>**

TABLE OF CONTENTS

WHAT'S NEW FOR 2017?	1
I. INTRODUCTION	2
Steps to Complete Your 2017 Maricopa County Emissions Inventory	
II. REPORTING REQUIREMENTS	3
– Pollutants to be Reported	
– Emission Calculation Method Hierarchy	
– Reporting Forms	
– Non-Operational Facilities	
III. CONFIDENTIALITY OF DATA SUBMITTED	5
– Arizona Revised Statute and Maricopa County Rule	
IV. HELPFUL HINTS AND INFORMATION	6
– What is a Process?	
– Processes and Materials That Do Not Have to be Reported	
– Grouping Materials and/or Equipment Under One Process ID	
– Assigning Identification Numbers (IDs)	
– Industry-Specific Instructions	
– Commonly Used Conversion Factors	
– Additional Resources and Assistance	
V. INSTRUCTIONS AND EXAMPLES FOR EMISSIONS REPORTING FORMS	
Business Form	8
Stack Form	9
Control Device Form	10
General Process Form.....	11
Evaporative Process Form.....	15
Off-Site Recycling/Disposal Form.....	19
Documentation of Emission Factor Calculations	20
Data Certification Form (for NON -Title V sources)	21
How to Calculate an Emission Fee (for Title V sources ONLY)	22
Data Certification/Fee Calculation Form (for Title V sources ONLY)	23

WHAT'S NEW FOR 2017?

Miscellaneous:

- **Emissions fees for Title V facilities:** In accordance with Maricopa County Air Pollution Control Rule 280 (Fees), the 2017 annual emission fee for Title V sources is \$43.60/ton. **NOTE:** Only emissions from Title V sources (those whose air quality permit numbers have a “V” prefix) are subject to this annual emissions fee.

I. INTRODUCTION

An annual emissions inventory is a document submitted by a business that: (1) lists all processes emitting reportable air pollutants and (2) provides details about each of those processes. Submitting the emissions inventory report is **required** as a condition of your Maricopa County Air Quality Permit. A separate emissions report is required for each business location with its own air quality permit.

Follow these steps to complete your 2017 Maricopa County emissions inventory:

STEP 1: Determine which forms are needed for your business. There are eight different forms available, but not all are required for every type of business. For most permitted sources, the packet you received from us contains the necessary preprinted forms based on your site's most recent emissions inventory.

1. **Business Form:** Contains general contact information about the permitted site. This form is required for all businesses.
2. **Stack Form:** Only required if your business location annually emits over 10 tons of a single pollutant (CO, VOC, NO_x, PM₁₀, or SO_x). A "stack" is defined as a stack, pipe, vent or opening through which a significant percentage of emissions (from one or more processes) are released into the atmosphere. See the "Stack Form Instructions" on page 9 for specific requirements.
3. **Control Device Form:** Required only if there is one or more emission control devices used at the business location.
4. **General Process Form** and
5. **Evaporative Process Form:** } Either or both will be required for all businesses.
6. **Off-Site Recycling/Disposal Form:** Required if you want to claim off-site recycling or disposal.
7. **Emission Factor Calculations:** Required as attachment for each process for which you calculated your own emission factors.
8. **Data Certification Form or Data Certification/Fee Calculation Form:** Only those major sources with a **Title V** permit are required to pay annual emissions fees, and thus need to use the Data Certification/Fee Calculation Form. All other sources use the Data Certification Form.

STEP 2: Complete the applicable forms. Verify all preprinted information, and make corrections where necessary. When making corrections, strike out the preprinted data and write in corrections beside it. Please make all changes readily noticeable. Detailed information on how to complete the most common forms is included in this document. The packet you received also contains information about other resources (workshops, one-on-one assistance, etc.) available to help you in completing the necessary forms.

STEP 3: Make a copy of your completed emissions inventory report. Make sure to **KEEP COPIES** of all forms submitted and copies of all records and calculations used in completing the forms. Air pollution control regulations require that you keep all documentation for at least **FIVE YEARS** at the location where pollution is being emitted.

STEP 4: Make sure the Data Certification Form (or Data Certification/Fee Calculation Form for Title V sources) is **signed** by a company representative. **Include your air quality permit number on all correspondence and applicable checks submitted with your report.** Return the **original**, signed copy of your annual emission report, with payment for any applicable emission fees to:

Maricopa County Air Quality Department
Emissions Inventory Unit
1001 North Central Avenue, Suite 125
Phoenix, AZ 85004

II. REPORTING REQUIREMENTS

POLLUTANTS TO BE REPORTED:

Your emissions inventory must include your business's emissions of the following air pollutants:

- CO = Carbon monoxide
- NO_x = Nitrogen oxides
- PM₁₀ = Particulate matter less than 10 microns
- SO_x = Sulfur oxides
- VOC = Volatile organic compounds *
- HAP&NON = Hazardous Air Pollutant (HAP) that is also NOT a volatile organic compound (VOC)**
- NH_x = Ammonia and ammonium compounds
- Pb = Lead

* A ***volatile organic compound (VOC)*** is defined as any compound of carbon that participates in atmospheric photochemical reactions. This definition ***excludes***: carbon monoxide, carbon dioxide, acetone, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, as well as certain other organic compounds. (See Maricopa County Air Pollution Control Rule 100, Sections 200.129 and 200.80 for a full definition.)

** ***HAP&NON***: Usage of certain materials that are: (1) a Hazardous Air Pollutant (HAP) **and** (2) **not** also a VOC (that is, not also an ozone precursor) should also be reported if:

- (a) your site is subject to a Federal MACT (Maximum Achievable Control Technology) standard ***or***
- (b) your air quality permit contains specific quantitative limits for HAP emissions.

The most common materials categorized as "HAP&NON" include:

- methylene chloride (dichloromethane)
- perchloroethylene
- 111-trichloroethane (111-TCA or methyl chloroform)
- hydrochloric acid
- hydrofluoric acid

NOTE: HAPs that are also considered volatile organic compounds are reported as VOC.

EMISSION CALCULATION METHOD HIERARCHY:

When preparing emission information for your report, the most accurate method for calculating **actual** emissions must be used. The hierarchy listed below outlines the preferred methods for calculating emission estimates (taken from County Rule 280, Section 304.1).

- (1) Whenever available, emissions estimates should be calculated from continuous emissions monitors certified under 40 CFR Part 75, Subpart C, or data quality assured pursuant to Appendix F of 40 CFR, Part 60.
- (2) When sufficient data obtained using the methods described in paragraph 1 is not available, emissions estimates should be calculated from source performance tests conducted pursuant to Rule 270 in Maricopa County's Air Pollution Control Rules and Regulations.
- (3) When sufficient data obtained using the methods described in paragraphs 1 or 2 is not available, emissions estimates should be calculated from material balance using engineering knowledge of the process.
- (4) When sufficient data obtained using the methods described in paragraphs 1 through 3 is not available, emissions estimates shall be calculated using emissions factors from EPA Publication No. AP-42 "Compilation of Air Pollutant Emission Factors," Volume I: Stationary Point and Area Sources.
- (5) When sufficient data obtained using the methods described in paragraphs 1 through 4 is not available, emissions estimates should be calculated by equivalent methods supported by back-up documentation that will substantiate the chosen method.

REPORTING FORMS:

- Some **preprinted information** on your report may be different from last year's version. Please review the enclosed forms carefully, and **VERIFY THOROUGHLY** that the information you provide on all reporting forms match the information presented on the preprinted forms from MCAQD.
- Many of our reporting forms have changed in past years. If you develop your own forms, or a computerized reproduction of our forms, the forms used ***must*** conform to the current information requirements and **FORMAT** as supplied on our preprinted forms for 2017. "Homemade" reporting forms that vary significantly from the preprinted forms sent to you will ***not*** be accepted.

NON-OPERATIONAL FACILITIES:

- Any facility that has been issued an air quality permit, but that did NOT operate at any time during 2017, must still respond **in writing** to this request for annual emissions information, as a condition of its air quality permit. Please provide ALL information requested on both the "Business Form" and the "Data Certification Form", and submit these forms, along with a letter certifying that there were no operations at the facility during calendar year 2017, by the due date shown on the Business Form.

III. CONFIDENTIALITY OF DATA SUBMITTED

Information submitted in your annual emissions reports must be made available to the public unless it meets certain criteria described in Arizona Revised Statutes and Maricopa County Rules. Applicable excerpts concerning confidentiality of data are reproduced below.

A.R.S. § 49-487 D. ...the following information shall be available to the public:...

2. The chemical constituents, concentrations and amounts of any emission of any air contaminant. ...

MARICOPA COUNTY AIR POLLUTION CONTROL RULES AND REGULATIONS, Rule 100:

§ 200.126 **TRADE SECRETS** - Information to which all of the following apply:

- a. A person has taken reasonable measures to protect from disclosure and the person intends to continue to take such measures.
- b. The information is not, and has not been, reasonably obtainable without the person's consent by other persons, other than governmental bodies, by use of legitimate means, other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding.
- c. No statute, including ARS §49-487, specifically requires disclosure of the information to the public.
- d. The person has satisfactorily shown that disclosure of the information is likely to cause substantial harm to the business's competitive position.

§ 402 **CONFIDENTIALITY OF INFORMATION:**

402.2 Any records, reports or information obtained from any person under these rules shall be available to the public ... unless a person:

- a. Precisely identifies the information in the permit(s), records, or reports which is considered confidential.
- b. Provides sufficient supporting information to allow the Control Officer to evaluate whether such information satisfies the requirements related to trade secrets as defined in Section 200.107 of this rule.

For emissions inventory information to be deemed confidential, the following steps must be followed:

- Specific data which you request be held confidential must be identified by marking an "X" in the corresponding gray confidentiality box(es) on the relevant report forms.
- Provide a written explanation which gives factual information satisfactorily describing why releasing this information could cause substantial harm to the business's competitive position.
- Use the gray-shaded boxes on the reporting forms to indicate which data are to be held confidential. Do NOT stamp "Confidential", highlight data, or otherwise mark the page.

NOTE: No data can be held confidential without proper justification. We will reply in writing to all requests for confidentiality, detailing which individual data elements for each process have been deemed confidential.

IV. HELPFUL HINTS AND INFORMATION

Be sure to verify all preprinted information on forms. If any information is incorrect or blank, please provide correct information. Making a change on the Business Form will **NOT** transfer the permit ownership or location. You must contact the Department's Engineering & Permitting Division at (602) 506-6702 to accomplish this.

WHAT IS A PROCESS? A **process** is a business activity at your location that emits one or more of the pollutants listed on page 3, and has only **one** material type as input and **one** operating schedule. For each applicable process at your business, you must assign a unique Process ID number to differentiate each process.

PROCESSES AND MATERIALS THAT DO **NOT** HAVE TO BE REPORTED:

- Welding.
- Acetone usage.
- Fuel use for forklifts or other vehicles. (Note: Fuel use in **non-vehicle** engines **is** reportable.)
- Soil remediation activities. (Note: Other periodic reporting requirements may exist; consult your permit.)
- Storage emissions from fuels or organic chemicals in any tank with a capacity of 250 gallons or less.
- Storage emissions of diesel and Jet A fuel in underground tanks of any size.
- Storage emissions of diesel and Jet A fuel in aboveground tanks, with throughput < 4,000,000 gal/yr.
- Routine pesticide usage, housekeeping cleaners, and routine maintenance painting at your facility.

Please group all similar equipment and materials together before applying the following limitations:

- Internal combustion engines (e.g., emergency generators) or external combustion equipment (e.g., boilers and heaters) that operated less than 100 hrs. and burned less than 200 gals. diesel or gas, or less than 100,000 cubic feet of natural gas.
- Materials with usage of less than 15 gallons or 100 pounds per year.

GROUPING MATERIALS AND/OR EQUIPMENT UNDER ONE PROCESS ID:

You can group together under one process ID:

- All internal combustion engines **less than 600 hp** if they burn the same fuel and have similar operating schedules.
- All external combustion equipment (boilers, heaters) with a capacity of **less than 10,000,000 Btu** per hour if they burn the same fuel and have similar operating schedules.
- All similar evaporative materials with similar emission factors that have similar operating schedules and process descriptions. For example, group low-VOC red paint, green paint and white paint together as one material: "Paint: Low-VOC." Do **not** group dissimilar materials together, such as thinners and paints. Attach documentation (see example, p. 20) showing how the grouped emission factor was determined.
- All underground tanks with the same fuel and same type of vapor recovery system.

ASSIGNING IDENTIFICATION NUMBERS (IDs):

Unique IDs are required for the following report elements: Stacks, Control Devices and Processes. For processes, that means a process ID number may be used only once on each General Process form and for each material reported on the Evaporative Process Forms.

These numbers are usually assigned by the person who prepares the original report. If you are adding a new item to a preprinted report, assign a number not already in use. Once an ID number is assigned, continue using the same number for that item each year. If that item is no longer reportable, mark it with 'DELETE' and return the preprinted form with a brief explanation. Do not use that ID number again.

INDUSTRY-SPECIFIC INSTRUCTIONS: Additional help sheets, detailed examples, and special instructions are available for a number of specific processes or industries listed below. To get copies of any of these documents, please call (602) 506-6790, or visit our web site at:

<https://www.maricopa.gov/2648/Emissions-Inventory-Instructions-Help-Sh>

- Bakeries
- Concrete Batch Plants
- Fuel Storage and Handling
- Incinerators and Crematories
- Lg. Aboveground Storage Tanks
- Natural Gas Boilers/Heaters
- Polyester Resin
- Printing Plants
- Roofing Asphalt
- Sand and Gravel Plants
- Using EPA's TANKS 4.09d Program
- Vehicle Refinishing
- Vehicle Travel on Unpaved Roads
- Woodworking

COMMONLY USED CONVERSION FACTORS:

1 gram/liter	= 0.00834 lbs/gal	1 foot	= 0.0001894 mile
1 liter	= 0.2642 gallon (US)	1 square foot	= 0.000022957 acre
1 therm	= 0.0000952 MMCF	1 pound	= 0.0005 ton

NOTE: MM = 1,000,000 Example: MMCF = 1,000,000 cubic feet
M = 1,000 Example: MGAL = 1,000 gallons

ADDITIONAL RESOURCES AND ASSISTANCE:

The Maricopa County Emissions Inventory web site at:

<https://www.maricopa.gov/2651/Other-Inventory-Resources>

contains additional reference materials, such as:

- blank copies of most emissions reporting forms.
- an updated list of emission factors for a large number of industrial processes, including SCC codes.
- a list of Tier Codes for industrial processes.
- detailed help sheets for a number of specific industries or processes.

To receive any of the above materials by fax or mail, or for additional information or assistance in how to calculate and report your emissions, please call us at (602) 506-6790 or email at EmissionsInventory@mail.maricopa.gov.

V. INSTRUCTIONS AND EXAMPLES FOR COMPLETING EMISSIONS REPORTING FORMS

Business Form Instructions

Verify all preprinted information, and make corrections where necessary. When making corrections, strike out the preprinted data and write in corrections beside it. Please make all changes readily noticeable.

NOTE: Making a change on the Business Form will **NOT** transfer the permit ownership or location. You must contact the Department's Engineering & Permitting Division at (602) 506-6702 to accomplish this.

Data fields:

- 6 Number of employees: This should be the annual average number of full-time equivalent (FTE) employee positions *at this business location*.
- 9 NAICS Code: This 5- or 6-digit North American Industrial Classification System (NAICS) code has been introduced to replace the 4-digit Standard Industrial Classification (SIC) codes. Please list the primary and secondary NAICS codes for your business, if known. (Consult our website, at: <https://www.maricopa.gov/2651/Other-Inventory-Resources>, for a link to a full list of NAICS codes.)
- 10 Preparer of the Inventory (primary contact for technical questions concerning this report): This should be the person who knows the most about the data in the report. If this person has an e-mail address used for business purposes, please provide it.
- 11 Who should receive the Annual Emissions Inventory Form next year?: This should be a person who is directly employed with the business. This person should not be a consultant for the business.

Control Device Form Instructions

EXAMPLE Control Device Form Information

1	2	3	4	5	6
Control ID	Installation/ Reconstruction* Date	Size or Rated Capacity**	Control Type Code	Control Device Name/Description	Stack ID
1	05/09/98	25,000.0 cfm	021	Thermal oxidizer	2
4	03/10/97	cfm	217	Watering with water trucks	

Data fields:

- 1 **Control ID:** (See “Assigning Identification Numbers” on page 6.) A unique number (up to three digits) that you assign to identify a specific control device.
- 2 **Installation/Reconstruction Date:** The completion date (given in *mm/dd/yy* format) of installation or the most recent reconstruction of the identified control device. This is not a date on which routine repair or maintenance was done. “Reconstruction” means any component of the control device was replaced and the cost (fixed capital) of the new component(s) was more than half of what it would have cost to purchase or construct a new control device.
- 3 **Size or Rated Capacity:** Report the air or water flow rate in **cubic feet per minute**. Some devices (e.g., water trucks for dust control) will not include a value in this field.
- 4 **Control Type Code:** A 3-digit code designating the type of control device. A complete list of all EPA control device codes can be found on the Web at: <https://www.maricopa.gov/2648/Emissions-Inventory-Instructions-Help-Sh> or call (602) 506-6790 for assistance.
- 6 **Stack ID:** Not all businesses require a Stack ID. This is required if the Stack Form is used for your site (see page 9) **and** the control device is vented through that identified stack. This is the ID number shown in column 1 of the Stack Form. The Stack ID can be entered on this form after the Stack Form has been filled out.

General Process Form Instructions

The General Process Form is used to record data on all emissions-producing processes except evaporative processes. A “**general process**” is normally characterized by the burning or handling of a material. One form reports all the pollutants for one process. For example, several pollutants are produced by burning fuel, and PM₁₀ is emitted by processing rock products, processing materials such as wood or cotton, and driving on unpaved areas.

Data fields: (See sample forms on pages 13 and 14.)

- 1 Process ID: A number (up to three digits) that is preprinted or you assign. (See “Assigning Identification Numbers” on page 6.) This Process ID number is unique and cannot be used for any other process at this location.
- 2 Process Type/Description: Brief details on the type of activity that is occurring.
- 3 Stack ID(s): The stack ID number(s) shown in column 1 of the Stack Form that identify the stack(s) which vent pollution created by this process. Not all businesses are required to report stacks. This is only required if the Stack Form is required for your site (see page 9) **and** the process has a stack.
- 4 Process Tier Code and
5 SCC Code: If these codes are not preprinted on your form, please consult the section “Other Resources” on our web site, or call (602) 506-6790.
- 6 Seasonal Throughput Percent: Enter the percent of total annual operating time that occurred per season, rounded to the nearest percent. For example, “Dec-Feb 30%” means 30% of total annual activity occurred in January, February and December 2017. The total for all four seasons must equal 100%.
- 7 Normal Operating Schedule and
8 Typical Hours of Operation: These reflect the normal daily, weekly, and annual operating parameters of **this process** during 2017.
- 9 Emissions Based on: Provide the **name** of the material used, fuel used, product produced, or whatever was measured for the purpose of calculating emissions, such as “natural gas”, “hours of operation,” “vehicle miles traveled,” or “acres.”
- 10 Used, Produced or Existing: Indicate whether calculated emissions are based on a material type or fuel *used* (an input, such as “paint” or “natural gas”), or an *output* (such as “sawdust produced” or “finished product”). Use “Existing” if the parameter reported on line 9 is not directly used or produced in the process (such as “vehicle miles traveled” or “acres”).
- 11 Annual Amount: The annual amount (a number) of material that was used, fuel combusted, product produced, hours of operation, vehicle miles traveled, or acres.
- 12 Fuel Sulfur Content (in percent): For processes that involve the combustion of oil or diesel fuels, report the sulfur content of the fuel as a decimal value. Example: 0.05 % (= 500 ppm)
- 13 Unit of Measure: Units of the material used, fuel used or product produced shown on line 9. For example: gallons, pounds, tons, therms, acres, vehicle miles traveled, units produced.
- 14 Unit Conversion Factor: You must provide this if you use an emission factor with an emission factor unit (see item 17 below) that is **not** the same as the unit of measure (from line 13). This is the standard number you would multiply your amount (line 11) by to convert it to the units of the emission factor. See page 7 for a list of commonly used conversion factors.

General Process Form Instructions (continued)

- 15 Pollutant: See page 3 for a list of pollutants that need to be reported.
- 16 Emission Factor (EF): The number to be multiplied by the annual amount (line 11) to determine how much of the pollutant was emitted. If you calculate your own emission factor or change the preprinted emission factor, you must provide details of your calculations in an attachment.
- 17 Emission Factor (EF) Units: Enter the appropriate Emission Factor Units in pounds (lb) per unit; e.g., lb/ton, lb/MMCF, lb/gal.
- 18 Controlled Emission Factor (EF)? YES or NO: Indicate “YES” if: 1) you have your own emission factor from testing **and** included the control device efficiency within the factor, or 2) the emission factor used is clearly identified as a controlled emission factor. A “YES” response requires the use of Formula A (see #25 below). Indicate “NO” if: 1) there is no emission control device, or 2) the emission factor represents emission rates **before** controls. A “NO” response requires the use of Formula B (see #25 below).
- 19 Calculation Method: Enter the number code (listed at the bottom of the General Process Form) which best describes the method you used to obtain this emission factor. Code 5, “AP-42/FIRE Method or Emission Factor” means that the factor comes from EPA documents or software. **NOTE**: If you have continuous emissions monitors (CEMs) data or conducted a source test that was required and approved by the County for a specific process or piece of equipment, you **must** use the emission data from the CEMs or test results. Report “1” in this column for CEMs data or “4” for performance test data.
- 20 through 24: Leave blank if there is no control device.
- 20 Capture % Efficiency: The percent of the pollutant that is captured and sent to the primary control device in this process. Be sure to list capture efficiency separately for **each** pollutant affected.
- 21 Primary Control Device ID: If this pollutant is being controlled in this process, enter the Control Device ID number which represents the first control device affecting the pollutant.
- 22 Secondary Control Device ID: If this pollutant is being controlled sequentially by 2 devices, enter the Control Device ID number which represents the second control device; otherwise leave this field blank.
- 23 Control Device(s) % Efficiency: Enter the total control efficiency of the control device(s). Be sure to list control device efficiency separately for **each** pollutant affected. If you report control device efficiency, you must **also** show capture efficiency in column 20.
- 24 Efficiency Reference Code: Enter the code (1 through 6) that best describes how you determined the **control device efficiency**. A list of possible codes is included at the bottom of the form.
- 25 Estimated Actual Emissions (in pounds/year): You may round the calculated emissions values to the nearest pound. Calculate as follows:
- A. Emissions with no controls or controls are reflected in the emission factor:
Column 25 = line 11 × line 14 × column 16
- B. Emissions after control:
Column 25 = line 11 × line 14 × column 16 × (1 – [column 20 × column 23])
Use the decimal equivalent for columns 20 and 23. Example: 96.123% = 0.96123

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process ID 80

2- Process Type/Description: 3 ENGINES FOR CRUSHING (EACH LESS THAN 600 HP)

3- Stack ID(s) (only if required on Stack Form) _____

4- Process TIER Code: 020599 FUEL COMB. INDUSTRIAL: INTERNAL COMBUSTION

5- SCC Code 20200102 (8 digit number) IND:DIESEL-RECIPROCATING

6- Seasonal Throughput Percent: Dec-Feb 20 % Mar-May 25 % Jun-Aug 30 % Sep-Nov 25 %

7- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

8- Typical Hours of Operation: (military time) Start 0700 End 1530

9- Emissions based on (name of material or other parameter, e.g. "rock", "diesel", "vehicle miles traveled") DIESEL

10- Used (input) or Produced (output) or Existing (e.g. VMT, acres)

11- Annual Amount: (a number) 16,250 12- Fuel Sulfur Content (in percent) 0.05 %

13- Unit of Measure: (for example: tons, gallons, million cu ft, acres, units produced, etc.) GALLONS

14- Unit Conversion Factor (if needed to convert Unit of Measure to correlate with emission factor units) 0.001

Emission Factor (EF) Information				Control Device Information						
15	16	17	18	19	20	21	22	23	24	25
Pollutant	Emission Factor (EF) (number)	Emission Factor Unit (lb per)	Controlled EF? Yes or No	Calculation Method Code*	Capture % Efficiency	Primary Control Device ID	Secondary Control Device ID	Control Device(s) % Efficiency	Efficiency Reference Code**	Estimated Actual Emissions
<i>CO</i>	<i>130</i>	<i>M GALS</i>	<i>N</i>	<i>5</i>						<i>2,113</i> lbs
<i>NOx</i>	<i>604</i>	<i>M GALS</i>	<i>N</i>	<i>5</i>						<i>9,815</i> lbs
<i>PM-10</i>	<i>42.5</i>	<i>M GALS</i>	<i>N</i>	<i>5</i>						<i>691</i> lbs
<i>SOx</i>	<i>39.7</i>	<i>M GALS</i>	<i>N</i>	<i>5</i>						<i>645</i> lbs
<i>VOC</i>	<i>49.3</i>	<i>M GALS</i>	<i>N</i>	<i>5</i>						<i>801</i> lbs

* Calculation Method Codes:
 1 = Continuous Emissions Monitoring Measurements
 2 = Best Guess / Engineering Judgment
 3 = Material Balance
 4 = Source Test Measurements (Stack Test)
 5 = AP-42 / FIRE Method or Emission Factor

6 = State or Local Agency Emission Factor
 7 = Manufacturer Specifications
 8 = Site-Specific Emission Factor
 9 = Vendor Emission Factor
 10 = Trade Group Emission Factor

** Control Efficiency Reference Codes:
 1 = Tested efficiency / EPA reference method
 2 = Tested efficiency / other source test method
 3 = Design value from manufacturer
 4 = Best guess / engineering estimate
 5 = Calculated based on material balance
 6 = Estimated, based on a published value

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process ID 28

2- Process Type/Description: UNPAVED ROAD TRAVEL: HEAVY-DUTY TRUCKS @ 15 MPH

3- Stack ID(s) (only if required on Stack Form) _____

4- Process TIER Code: 140799 MISCELLANEOUS: FUGITIVE DUST

5- SCC Code 30502504 (8 digit number) SAND/GRAVEL: HAULING

6- Seasonal Throughput Percent: Dec-Feb 25 % Mar-May 25 % Jun-Aug 25 % Sep-Nov 25 %

7- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

8- Typical Hours of Operation: (military time) Start 0700 End 1530

9- Emissions based on (name of material or other parameter, e.g. "rock", "diesel", "vehicle miles traveled") VEHICLE MILES TRAVELED (VMT)

10- Used (input) or Produced (output) or Existing (e.g. VMT, acres)

11- Annual Amount: (a number) 7,500 12- Fuel Sulfur Content (in percent) _____%

13- Unit of Measure: (for example: tons, gallons, million cu ft, acres, units produced, etc.) VMT

14- Unit Conversion Factor (if needed to convert Unit of Measure to correlate with emission factor units) _____

Emission Factor (EF) Information				Control Device Information						
15	16	17	18	19	20	21	22	23	24	25
Pollutant	Emission Factor (EF) (number)	Emission Factor Unit (lb per)	Controlled EF? Yes or No	Calculation Method Code*	Capture % Efficiency	Primary Control Device ID	Secondary Control Device ID	Control Device(s) % Efficiency	Efficiency Reference Code**	Estimated Actual Emissions
<i>PM-10</i>	<i>3.2</i>	<i>VMT</i>	<i>N</i>	<i>6</i>	<i>100</i>	<i>4</i>		<i>90</i>	<i>6</i>	<i>2400</i> lbs
										lbs
										lbs
										lbs
										lbs

NOTE: Emissions in col. 25 are calculated as follows: (line 11 × col. 16) × (1 – [col. 20 × col. 23])

- * Calculation Method Codes:**
- 1 = Continuous Emissions Monitoring Measurements
 - 2 = Best Guess / Engineering Judgment
 - 3 = Material Balance
 - 4 = Source Test Measurements (Stack Test)
 - 5 = AP-42 / FIRE Method or Emission Factor

- 6 = State or Local Agency Emission Factor
- 7 = Manufacturer Specifications
- 8 = Site-Specific Emission Factor
- 9 = Vendor Emission Factor
- 10 = Trade Group Emission Factor

- ** Control Efficiency Reference Codes**
- 1 = Tested efficiency / EPA reference method
 - 2 = Tested efficiency / other source test method
 - 3 = Design value from manufacturer
 - 4 = Best guess / engineering estimate
 - 5 = Calculated based on material balance
 - 6 = Estimated, based on a published value

Evaporative Process Form Instructions

The Evaporative Process Form is used to report all emissions produced by evaporation. Examples include: cleaning with solvents, painting and other coatings, printing, using resin, evaporation of fuels from storage tanks, ammonia use, etc. All other processes should be shown on the General Process Form.

One Evaporative Process Form may be used to report numerous materials, with each material given a separate process ID number, as long as the information on lines 1–5 apply to all items on that form. Use a separate form for each group of materials that has a different Process Type/Description (shown on line 1), different Tier Code (line 2) or different operating schedule (lines 3, 4, or 5).

Data fields: (See sample forms on pages 17 and 18.)

- 1 Process Type/Description: Brief details of the activity in which the listed materials were used.
- 2 Process Tier Code: If this 6-digit code is not preprinted on your form, please refer to the Tier Code list at: <https://www.maricopa.gov/2648/Emissions-Inventory-Instructions-Help-Sh> or call (602) 506-6790.
- 3 Seasonal Throughput Percent: Enter the percent of total annual operating time that occurred per season (rounded to the nearest percent). For example, “Dec-Feb 30%” means 30% of the total annual activity occurred during January, February and December 2017. The total for all four seasons must equal 100%.
- 4 Normal Operating Schedule and
5 Typical Hours of Operation: These represent the usual number of hours, time of day and weeks per year when ***this process*** occurred during the calendar year.
- 6 Process ID: A number (up to three digits) that represents this specific material (process). Each process on one form must have the same tier code and operating schedule as that shown in the top portion of the form. This Process ID number are unique and can ***not*** be used for any other process at this business location. See page 6 of these instructions for more explanation of ID numbers and for exclusions and guidance on grouping materials.
- 7 Stack ID(s): The stack ID number(s) shown in column 1 of the Stack Form that identify the stack(s) which vent pollution created by this process. Not all businesses are required to report stacks. This is only required if the Stack Form is required for your site (see page 9) ***and*** the process has a stack.
- 8 Material Type: Provide the information on the type of the material used in this process. Give the chemical name for pure chemicals or a name that reflects its use (paint, ink, etc.), rather than just a brand name or code number. Examples of materials include: paint, thinner, degreasing solvent (plus its common name), ink, fountain solution, ammonia, alcohol, ETO (ethylene oxide), gasoline (in a storage tank).
- 9 Annual Material Usage/Input: Amount of this material used during the year. In most cases, the amount purchased is suitable. Write in “lbs” or “gal” (pounds or gallons).
- 10 Pollutant: The only pollutants reported on this form are VOC, HAP&NON and NH_x (see definitions on page 3). When one process (or material) has more than one of these pollutants, list each pollutant on a separate line, using the same process ID number.

Evaporative Process Form (continued)

11 **Emission Factor (EF):** An emission factor is a number used to calculate the pounds of pollutant emitted based on the quantity of material used in a process. Emission factors can be obtained from your supplier (usually provided on a Material Safety Data Sheet or environmental data sheet), and must correspond with the material units reported in column 9. If the material unit is “gal,” then the emission factor must be in pounds of pollutant per gallon. If the material unit is “lb,” then the emission factor must be in pounds of pollutant per pound of material.

Verify (and correct, where necessary) all preprinted emission factors, as the composition of materials used may have changed since your last report. A “lb/gal” emission factor is almost always less than 8 and never greater than 14. A “lb/lb” emission factor is never larger than 1.0.

12 **Pounds of pollutant sent off-site:** Required only if you wish to take credit for reduced emissions because waste of this material is sent off-site for recycling or disposal. Only waste generated during the report year may be claimed. The Off-Site Recycling/Disposal Form **must** be completed if you wish to claim a credit. The number of pounds reported in column 12 **must** equal the number of pounds reported on the Off-Site Recycling/Disposal Form(s) for the same Process ID number.

13 and 14: Leave these fields blank if there is no control device present.

13 **Capture % Efficiency:** The percent of the pollutant from this process that is captured and sent to the control device.

14 **Control ID:** If this pollutant is being controlled in this process, enter the Control Device ID number from column 1 of the Control Device Form.

Control % Efficiency: Enter the percent of this pollutant that is controlled by this control device.

Code: Select the Control Efficiency Reference Code from the list at the bottom of the form.

15 **Estimated Emissions (lbs/yr):** Estimated pounds of the pollutant emitted during the year, after off-site recycling/disposal and controls if applicable. **Credit will not be given for off-site recycling/disposal unless it is shown on the Off-Site Recycling/Disposal Form.** Round to the nearest pound. If the answer is 0, give a decimal answer to the first significant digit. Column 15 is calculated as follows:

Process without off-site recycling/disposal or control device:

$$\text{Column 15} = \text{column 9} \times \text{column 11}$$

Process with off-site recycling/disposal:

$$\text{Column 15} = (\text{column 9} \times \text{column 11}) - \text{column 12}$$

Process with control device:

$$\text{Column 15} = (\text{column 9} \times \text{column 11}) \times (1 - [\text{column 13} \times \text{column 14}])$$

Process with both off-site recycling/disposal and control device:

$$\text{Column 15} = ([\text{column 9} \times \text{column 11}] - \text{column 12}) \times (1 - [\text{column 13} \times \text{column 14}])$$

Use the decimal equivalent for columns 13 and 14. Example: 96.123% = 0.96123

EXAMPLE: Coating and Painting

Evaporative Process Form 2017

Permit number(s) V99999

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process Type/Description: Coating metal parts

2- Process TIER Code: 080415 SOLVENT USE: SURFACE COATING - MISC METAL PARTS

3- Seasonal Throughput Percent: Dec-Feb 25 % Mar-May 25 % Jun-Aug 25 % Sep-Nov 25 %

4- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

5- Typical Hours of Operation (military time) Start 0800 End 1700

6	7	8	9	10	11	12	13	14	15				
Process ID	Stack ID(s)	Material Type	Annual Usage Input	lb or gal	VOC, HAP&NON or NH _x	Emission Factor	EF Units (lbs per)	Pounds of pollutant* sent off site	Capture Efficiency %	Control ID	Control Efficiency %	Control Efficiency Code**	Estimated Emissions (lbs/yr)
800	1	Lacquer 6455-06	95	gal	VOC	4.7	gal		%		%		447
801	1	lacq thinner	120	gal	VOC	7.1	gal		%		%		852
802	1	Paint red 4039-03	940	gal	VOC	4.2	gal		%		%		3,948
803	1	Toro-Red Paint	707	gal	VOC	7.0	gal		%		%		4,949
803	1	Toro-Red Paint	707	gal	HAP&NON	0.5	gal		%		%		354
804	1	powder paint 8730-11	20,200	lb	VOC	0.001	lb		%		%		20

Note: Do NOT change preprinted Process ID numbers. See page 6 of these instructions for information on how to delete materials that are no longer used, or to assign Process ID numbers for new materials.

* If you have off-site recycling/disposal of any of the materials listed above, you must complete an Off-site Recycling/Disposal Form to receive credit for reduced emissions.

NOTE: Emissions in col. 15 are calculated as follows: $([\text{col. 9} \times \text{col. 11}] - \text{col. 12}) \times (1 - [\text{col. 13} \times \text{col. 14}])$

**** Control Efficiency Reference Codes**

1 = Tested efficiency / EPA reference method
4 = Best guess / engineering estimate

2 = Tested efficiency / other source test method
5 = Calculated based on material balance

3 = Design value from manufacturer
6 = Estimated, based on a published value.

EXAMPLE: Cleaning solvent (with recycling)

Evaporative Process Form 2017

Permit number(s) V99999

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process Type/Description: CLEANING METAL PARTS

2- Process TIER Code: 080103 **SOLVENT USE: DEGREASING - COLD CLEANING**

3- Seasonal Throughput Percent: Dec-Feb 25 % Mar-May 25 % Jun-Aug 25 % Sep-Nov 25 %

4- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

5- Typical Hours of Operation (military time) Start 1300 End 1700

6	7	8	9		10	11		12	13	14			15
Process ID	Stack ID(s)	Material Type	Annual Usage Input	lb or gal	VOC, HAP&NON or NHx	Emission Factor	EF Units (lbs per)	Pounds of pollutant* sent off site	Capture Efficiency %	Control ID	Control Efficiency %	Control Efficiency Code**	Estimated Emissions (lbs/yr)
3	2	SANITIZER	716	lb	VOC	1.0	lb		95 %	1	80 %	3	172
6		GUN CLEANER	180	gal	VOC	7.2	gal	569	%		%		727
7		XYZ STRIPPER	1300	gal	VOC	3.3	gal	1,884	%		%		2,406
8		CLEANING SOLVENTS	358	gal	VOC	6.4	gal	1,006	%		%		1,285
9		MEGASOLVE	2258	gal	VOC	6.8	gal	6,741	%		%		8,613
									%		%		

Note: Do NOT change preprinted Process ID numbers. See page 6 of these instructions for information on how to delete materials that are no longer used, or to assign Process ID numbers for new materials.

* If you have off-site recycling/disposal of any of the materials listed above, you must complete an Off-site Recycling/Disposal Form to receive credit for reduced emissions.

NOTE: This example shows the case where 2,400 of the original 4,096 gallons of materials #6 through 9 were captured for off-site recycling, and the pollutant content of the waste material was estimated to be 75% of the original. The pounds of pollutant sent off-site shown in column 12 is calculated on the example Off-Site Recycling/Disposal Form on the next page.

EXAMPLE

Off-Site Recycling/Disposal Form 2017

Permit number(s) V99999

NOTE: If you need blank copies of this form, call the Emissions Inventory Unit at (602) 506-6790 or consult our web page at http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx

Provide one off-site recycling/disposal form for each waste stream at your business location. A waste stream is the waste from one or more processes mixed together to make one waste product before it is taken off site for recycling, disposal or combustion.

- 1) Assign a unique two-digit ID number to identify the waste stream that will be described below. 01
(Start with ID# 01 for first waste stream. Make copies of a blank Off-Site Recycling/Disposal form and use 02 for second, etc.)

- 2) What was the quantity of this waste stream in 2017?
Indicate whether this quantity is reported in pounds or gallons. Keep waste 2,400 pounds gallons disposal
company manifests as proof that this amount of waste was taken off-site.

- 3) What was the **average** pollutant content of the waste stream? NOTE: Report in the same units (pounds or gallons) as used in line 2.

 VOC 4.25 lbs/unit HAP&NON _____ lbs/ unit NHx _____ lbs/ unit

NOTE: Waste normally has less pollutant content than the new product. Some of the pollutant evaporates during the use of the product, and there is usually dirt, water or other contaminants in the waste stream. The estimated pollutant content of the waste is usually between 50% and 95% of the new product. This example estimates an average VOC content (on line 3) to be 75% of the original VOC content of 5.67 lbs/gal., to account for evaporation and contaminants. See page 20 to calculate a weighted average.

- 4) Calculate the **total** annual pollutant content of the waste in this waste stream.
(volume of waste, from Line 2) × (pollutant content, from Line 3) = Total pollutants in waste stream, in lbs/yr.

 VOC 10,200 lbs/yr HAP&NON _____ lbs/yr NHx _____ lbs/yr

- 5) List the process ID numbers of the processes contributing to this waste stream. Also estimate the pounds of pollutant that each process contributed to this waste stream.

NOTE: In this example, the amount each process material contributed to total pollutants in the waste stream (Line 4) is based on the percentage, by weight, of each material that contributed to the waste stream (e.g., Process ID #6 contributed 5.6%, therefore 5.6% × 10,200 lbs/yr = 569 lbs. See example on page 20).

NOTE: Column totals in the table below must equal the total for each pollutant type reported on line 4. The quantities you report below for each pollutant and process must also be reported in column 12 on the Evaporative Process Form.

Process ID	Annual VOC (lbs)	Annual HAP&NON (lbs)	Annual NHx (lbs)
<u>6</u> Contributed about	<u>569</u> lbs	lbs	lbs
<u>7</u> Contributed about	<u>1,884</u> lbs	lbs	lbs
<u>8</u> Contributed about	<u>1,006</u> lbs	lbs	lbs
<u>9</u> Contributed about	<u>6,741</u> lbs	lbs	lbs

EXAMPLE: Documentation of Emission Factor Calculations

Identify the process ID number(s) and pollutant(s). Show calculations made to obtain the emission factors used for the process(es). Include references to data sources used, including the document name, date published, page numbers, etc.

Emission Factor Calculation

Process ID 201

Permit number V99999

Emission factors derived from source test performed 12/2/00 by XYZ Engineering Company (copy of summary tables also attached).

Outlet (after controls):

$$\begin{aligned} CO &= 0.43 \text{ lb/hr} \times 1 \text{ hr}/60 \text{ min} \times 1 \text{ min}/77.9 \text{ cu. ft} \times 1,000,000 \text{ cu. ft/MMCF} \\ &= 92.0 \text{ lb/MMCF} \end{aligned}$$

$$\begin{aligned} NOx &= 0.09 \text{ lb/hr} \times 1 \text{ hr}/60 \text{ min} \times 1 \text{ min}/77.9 \text{ cu. ft} \times 1,000,000 \text{ cu. ft/MMCF} \\ &= 19.3 \text{ lb/MMCF} \end{aligned}$$

Weighted average sample calculation

NOTE: The example below shows how the weighted average of the materials going into the waste stream is calculated. A weighted-average emission factor has been calculated by listing usage amounts and emission factors for each material, summing each column, and then dividing the total emissions by the total gallons used.

In this example: 23,231 lbs ÷ 4,096 gal = 5.67 lb/gal average VOC content. This emission factor is then used to calculate the average pollutant content in the Off-site Recycling/Disposal Form example.

This process can also be used to find the weighted average emission factor for similar materials if you are reporting them together as a single line item on the Evaporative Process form. Refer to the explanation of "grouping" on page 6.

Process ID #	Material Type	2017 Usage	Units	VOC (lbs/unit)	VOC Emissions (= Usage × VOC content)	Percent contributed to waste stream
6	gun cleaner	180	gal	7.2	1,296 lbs.	5.6 %
7	xyz stripper	1,300	gal	3.3	4,290 lbs.	18.5 %
8	cleaning solvent	358	gal	6.4	2,291 lbs.	9.9 %
9	MEGASOLVE	2,258	gal	6.8	15,354 lbs.	66.1 %
	Totals:	4,096	gal		23,231 lbs.	100.0 %

<i>Average VOC content:</i>	$\frac{23,231 \text{ lbs.}}{4,096 \text{ gals}}$	=	5.67 lb/gal
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EXAMPLE (for all sources except Title V sources)

Data Certification Form 2017

Permit number 999999

For EACH pollutant listed, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, "Totals from Process Forms." Report any emissions from accidental releases in column 2. Add the figures in each row across, and enter the result in column 3, "Total Emissions".

NOTE: "Accidental Releases" reported in column 2 should include all excess emissions reported to the Department under Rule 140, Section 500.

Summary of 2017 Annual Emissions:	(1) Totals from Process Forms	(2) + Accidental Releases	(3) = TOTAL 2017 Emissions
CO	2,113	0	2,113
NH _x	0	0	0
Lead	0	0	0
HAP&NON	354	0	354
VOC	24,220	0	24,220
NO _x	9,815	0	9,815
SO _x	645	0	645
PM ₁₀	3,091	0	3,091

NOTE: Review specific requirements for data confidentiality on page 5. We cannot hold any data confidential without the required documentation.

TO COMPLETE YOUR EMISSIONS INVENTORY REPORT:

- Complete the Confidentiality Statement below.
- Sign and date this form below where indicated.
- Send the **original** copy of your completed forms to: Maricopa County Air Quality Dept., Emissions Inventory Unit, 1001 North Central Avenue, Suite 125, Phoenix, AZ 85004.
- Keep a copy of all forms for your records.

CONFIDENTIALITY STATEMENT:

This annual emissions report contains requests to keep some data confidential. YES NO
 If you check "YES", you must submit documentation and meet certain requirements before your data can be deemed confidential.
 See enclosed instructions for further details.

NOTE: The Data Certification form must be signed by a responsible company official.

CERTIFICATION STATEMENT:

I declare under penalty of perjury that the data (e.g. inputs, emission factors, controls, and annual emissions) presented herein represents the best available information and is true, accurate and complete to the best of my knowledge.

Signature of owner/business officer	Date of signature	Telephone number
Type or print full name of owner/business officer	Type or print full title	

How to calculate an emission fee (for Title V sources only):

- For each pollutant listed on the “Data Certification/Fee Calculation” form, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, “Totals from Process Forms.”

NOTE: While most processes that generate PM₁₀ should be reported on line 5 of the Data Certification/Fee Calculation form, “[f]ugitive emissions of PM₁₀ from activities other than crushing, belt transfers, screening, or stacking” (County Rule 280, § 304.2d) are NOT subject to annual emission fees. The most common occurrences of these PM₁₀-producing activities that are NON-billable are listed below:

SCC codes and description of PM₁₀-producing processes that are NOT subject to emission fees

SCC	Major Category	Subcategory	Facility / Process Type	Process Description
30200814	Industrial Processes	Food and Agriculture	Feed Manufacture	Storage
30300834	Industrial Processes	Primary Metal Production	Iron Production	Paved Road Travel
30400737	Industrial Processes	Secondary Metal Production	Steel Foundries	Raw Material Silo
30500120	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Storage Bins: Ferric Chloride
30500121	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Storage Bins: Mineral Stabilizer
30500134	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Blown Saturant Storage
30500135	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Blown Coating Storage
30500141	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Granules Storage
30500143	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Mineral Dust Storage
30500203	Industrial Processes	Mineral Products	Asphalt Concrete	Storage Piles
30500212	Industrial Processes	Mineral Products	Asphalt Concrete	Heated Asphalt Storage Tanks
30500213	Industrial Processes	Mineral Products	Asphalt Concrete	Storage Silo
30500290	Industrial Processes	Mineral Products	Asphalt Concrete	Haul Roads: General
30500303	Industrial Processes	Mineral Products	Brick Manufacture	Storage of Raw Materials
30500608	Industrial Processes	Mineral Products	Cement Manufacturing (Dry Process)	Raw Material Piles
30500708	Industrial Processes	Mineral Products	Cement Manufacturing (Wet Process)	Raw Material Piles
30501710	Industrial Processes	Mineral Products	Mineral Wool	Storage of Oils and Binders
30502007	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Open Storage
30502012	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Hauling
30502504	Industrial Processes	Mineral Products	Construction Sand and Gravel	Hauling
30502507	Industrial Processes	Mineral Products	Construction Sand and Gravel	Storage Piles
30502760	Industrial Processes	Mineral Products	Industrial Sand and Gravel	Sand Handling, Transfer, & Storage
30531090	Industrial Processes	Mineral Products	Coal Mining, Cleaning, Material Handling	Haul Roads: General
30532007	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Open Storage
30704002	Industrial Processes	Pulp/Paper & Wood Products	Bulk Handling and Storage – Wood/Bark	Stockpiles
31100199	Industrial Processes	Building Construction	Construction: Building Contractors	Other Not Classified
31100299	Industrial Processes	Building Construction	Demolitions/Special Trade Contracts	Other Construction/Demolition
50100401	Waste Disposal	Solid Waste Disposal	Landfill Dump	Unpaved Road Traffic
50100402	Waste Disposal	Solid Waste Disposal	Landfill Dump	Fugitive Emissions
50100403	Waste Disposal	Solid Waste Disposal	Landfill Dump	Area Method
50100404	Waste Disposal	Solid Waste Disposal	Landfill Dump	Trench Method
50100405	Waste Disposal	Solid Waste Disposal	Landfill Dump	Ramp Method

- Report any accidental releases in column 2. Add columns 1 and 2 together for each pollutant, and enter the sum in column 3. Sum lines 1 through 5 together, and enter the total on line 6.
- Divide your facility's total billable emissions (on line 6) by 2,000 to convert pounds into tons. **Round to the nearest ton**, and enter this value (a whole number) on line 7. Multiply this number by **\$43.60**, and enter the result on line 8. This is your 2017 emission fee.

EXAMPLE (for Title V sources only)

Data Certification/Fee Calculation Form 2017

Permit number V99999

For EACH pollutant listed, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, "Totals from Process Forms." Report any emissions from accidental releases in column 2. Add the figures in each row across, and enter the result in column 3, "Total Emissions". Carefully follow the instructions on lines 6 through 8 to calculate any emission fee owed.

NOTE: "Accidental Releases" reported in column 2 should include all excess emissions reported to the Department under Rule 140, Section 500.

Summary of 2017 Annual Emissions:	(1) Totals from Process Forms	(2) + Accidental Releases	(3) = TOTAL 2017 Emissions
CO	2,113	0	2,113
NH _x	0	0	0
Lead	0	0	0
PM ₁₀ (non-billable; see page 22)	2,400	0	2,400

Emissions fees are based on your emissions of the following pollutants ONLY:

1	HAP&NON	354	0	354
2	VOC	24,220	0	24,220
3	NO _x	9,815	0	9,815
4	SO _x	645	0	645
5	PM ₁₀ (billable; see page 22)	691	0	691
6	Add "TOTAL" column from lines 1 through 5 ONLY:			35,725 lbs.
7	Divide the total on line 6 by 2000 (pounds per ton) to get tons, and round the number to the nearest ton. (Drop any decimal of .499 or less. Increase to the next whole number any decimal of .500 or more.) Enter the resulting WHOLE NUMBER here.			18 TONS
8	Multiply line 7 (a WHOLE number) by \$ 43.60. This is your 2017 ANNUAL EMISSION FEE.			\$ 784.80

NOTE: Review specific requirements for data confidentiality on page 5. We cannot hold any data confidential without the required documentation.

TO COMPLETE YOUR EMISSIONS INVENTORY REPORT:

- Include a check (made payable to Maricopa County Air Quality Department) for the amount calculated on line 8 above.
- Complete the Confidentiality Statement below.
- Sign and date this form below where indicated.
- Send the **Original** copy of your completed forms along with any emission fee due to: Maricopa County Air Quality Department, Emissions Inventory Unit, 1001 North Central Avenue, Suite 125, Phoenix, AZ 85004.
- Keep a copy of all forms for your records.

CONFIDENTIALITY STATEMENT:

This annual emissions report contains requests to keep some data confidential. YES NO
 If you check "YES", you must submit documentation and meet certain requirements before your data can be deemed confidential.
 See enclosed instructions for further details.

NOTE: The Data Certification form must be signed by a responsible company official.

CERTIFICATION STATEMENT:

I declare under penalty of perjury that the data (e.g. inputs, emission factors, controls, and annual emissions) presented herein represents the best available information and is true, accurate and complete to the best of my knowledge.

Signature of owner/business officer	Date of signature	Telephone number
Type or print full name of owner/business officer	Type or print full title	

Appendix B. Rule Effectiveness (RE) Studies

1. Introduction

Rule effectiveness (RE) studies are designed to assess the success of regulatory rules at controlling their targeted emissions. It is acknowledged that facilities and source categories subject to control techniques and devices mandated by rules do not always achieve 100% compliance with those requirements. Given this reality, the US EPA recommends the use of rule effectiveness studies to improve the quality of emission estimates presented in emission inventories.

Once an RE rate has been calculated, its value is applied to relevant sources at an individual process level, thus adjusting (i.e., increasing) emission estimates to reflect a lower degree of control efficiency. The following example illustrates how the application of rule effectiveness can significantly affect the resulting emission estimates. The calculations below reflect a process whose reported emissions are controlled via a control device with a nominal 90% control efficiency (CE). In the second equation, an RE rate of 83% is applied to the controlled process.

A. Emissions before the application of rule effectiveness:

$$\text{Uncontrolled emissions} \times [1 - (CE)] = \text{Emissions after control}$$

$$100 \text{ tons} \times [1 - (0.90)] = \mathbf{10.0 \text{ tons}}$$

B. Emissions including the application of an 83% rule effectiveness (RE):

$$\text{Uncontrolled emissions} \times [1 - (CE \times RE)] = \text{Emissions after control and RE}$$

$$100 \text{ tons} \times [1 - (0.90 \times \mathbf{0.83})] = \mathbf{25.3 \text{ tons}}$$

In general, the RE rate is applied to all processes where a control device or control technique is in use. There are, however, some limitations to this blanket rule, as expressed in US EPA's most recent guidance:

...not all emission estimates involving use of a control device or technique need to be adjusted to account for RE... For example, a state or local agency may conclude that a control device that operates in conjunction with a continuous emissions monitor, or is equipped with an automatic shutdown device, may provide a sufficient level of assurance that intended emission reductions will be achieved, and therefore an adjustment for rule effectiveness is not necessary. Another example would be in instances where a direct determination of emissions, such as via a mass balance calculation, can be made. (US EPA, 2005)

Another complication in any attempt to apply a blanket RE percentage rate occurs where control device efficiencies are extremely high. Some categories of control devices routinely operate at efficiencies of 99% or greater (e.g., baghouses, thermal oxidizers). For these activities, even small adjustments through the application of RE can cause a dramatic, and unrealistic, increase in reported emissions. As an example, a process with a control device of 99.9% efficiency may report controlled emissions of 10 tons. If an RE rate of 85% were applied to this process, the adjusted emissions would total 1,508.5 tons (an increase of nearly 15,000%). In these types of instances, the department evaluated the affected processes on a case-by-case basis to determine the appropriateness of applying an RE adjustment.

2. Calculating Rule Effectiveness Rates for Title V and Non-Title V Facilities

The observed compliance rate in some cases, such as multi-source Title V and non-Title V facilities, can be better described as a rate at which inspection staff issue violations. Inspection staff has a range of experience and training which influences their proficiency in issuing appropriate violations. There may be instances when a rule violation goes unnoticed by staff, or conversely a violation may be issued in error. Even when a compliance rate has a high statistical measure of accuracy, it can fail to reflect a number of programmatic measures that affect overall rule effectiveness; measures like the strength of rule language, departmental enforcement and penalty actions, inspector training programs, educational and public outreach efforts, etc. This reality is reflected in earlier US EPA guidance:

A percentage effectiveness rating is not enough to describe the compliance effectiveness of a rule for a source category. An SSCD [Stationary Source Compliance Division] study should attempt to link the rating to a regulatory agency's overall effort. The study should address the factors that affect the percentage effectiveness rating such as the compliance rate of the sources in a category, inspection frequency and thoroughness, the language of the rule (i.e., whether or not it has loopholes), and the reporting and recordkeeping by the regulatory agency. Evaluating these factors will provide a more complete evaluation of the effectiveness of a rule. (US EPA, 1994)

In order to incorporate all the salient factors described above, a matrix was created to produce a final RE rate. US EPA's latest guidance (2005) provides a listing of factors that can impact rule effectiveness rates (e.g., inspector training, frequency of inspections, media outreach, enforcement policies, recordkeeping requirements, etc.), grouped into major categories such as most important factors, important factors and other factors. The department used these suggested factors as the basis for developing the RE matrices contained in Tables B-2 and B-3.

In brief, the compliance rate developed from inspection data accounts for 70% of the overall RE rate, while all other factors account for the remaining 30%. Each factor is scored individually, based upon the department's success in implementing that factor. As an example, the score for the factor "Compliance History" is the compliance rate developed from the study period inspection data, while the score for "Enforcement Penalties" is based upon the department's timely response to, and settlement of, observed violations associated with the subject rule or source category. The complete matrices for each applicable rule or source category for which rule effectiveness was addressed, are contained in Tables B-2 and B-3.

The data and methods used to develop RE rates for Title V and non-Title V permitted facilities are described below. The resulting rule effectiveness values for 2017 are summarized in Table B-1 below.

Table B-1. Rates of compliance and rule effectiveness for 2017, by permit category.

Source category	Compliance rate *	Rule Effectiveness (RE) rate
Title V facilities	93.50%	94.29%
Non-Title V facilities	89.33%	91.37%

* Compliance rates for both Title V and Non-Title V facilities are based upon 2016-14 inspection data, and reflect compliance self-monitoring recordkeeping practices, in addition to violation data.

For the remaining emission processes that include a control device or technique that limits ozone formation, separate multi-rule RE rates have been calculated for permitted Title V and non-Title V facilities. Factor-based matrices have been utilized to develop RE rates for Title V and non-Title V facilities. Compliance rates for both Title V and non-Title V facilities are based on two full years of data (2016 and 2017), since compliance information for these sources tends to be more detailed (as reflected in the matrix). The compliance rate for these facilities also includes data on self-monitoring recordkeeping practices in addition to inspection data. The combined scores of the monitoring data and inspection data divided by the 70% of the overall RE rate comprise the “compliance rate” portion of the RE calculation matrix, as shown in Tables B–2 and B–3 below.

3. Calculating Rule Effectiveness Rates for Rules 310, 310.01, and 316

Rule effectiveness studies adjust the emissions from subject facilities and source categories to account for times of non-compliance and control device equipment failure. Of particular importance to the Maricopa County Air Quality Department (MCAQD) are those rules that control particulate matter release, since parts of the county have been designated as nonattainment areas in regard to US EPA PM₁₀ standards. Consequently, the rule effectiveness studies presented in this section deal with the control of criteria pollutant PM₁₀.

Source-specific rule effectiveness studies were undertaken as part of this project to adjust the emissions from subject facilities and source categories to account for times of non-compliance and control device equipment failure by incorporating applicable compliance history data to ascribe a percentage rate (RE rate) at which the subject rule(s) attains the intended emissions reductions. These source-specific studies use data from inspections conducted for calendar year 2017 to determine the rate of compliance of subject facilities and source categories with Rule 310 (Fugitive Dust from Dust-Generating Operations), Rule 310.01 (Fugitive Dust from Non-Traditional Sources of Fugitive Dust), and Rule 316 (Nonmetallic Mineral Processing).

Rule effectiveness rates were calculated separately for Title V and non-Title V permitted facilities. These are described in Section 2.3. Final RE rates are listed in Table B–2 below.

Table B–2. Rule effectiveness rates for 2017, listed by rule or source category analyzed.

Rule/ Source category	Rule Effectiveness (RE) rate
Rule 310	92.64%
Rule 310.01	98.67%
Rule 316	85.60%

The resulting rule effectiveness rates shown above have been applied to relevant point and area source inventory categories and are reflected in the emission estimates presented in applicable sections of Chapters 2 and 3.

The US EPA has provided a number of guidance documents that detail the use and formulation of rule effectiveness studies (US EPA, 2005; 1994; 1992). The most recent of these documents states, “First and foremost, an agency responsible for emissions inventory preparation should attempt to obtain facility specific data from as many sources as possible, and use the collected information to make a refined source or source category RE determination” (US EPA, 2005). Given this directive, MCAQD developed a rule effectiveness study methodology that utilizes all available compliance data to produce a RE rate that best reflects the field effectiveness of the

rule. By using the entire population of data for the prescribed time period, (calendar year 2014) the statistical validity of the RE rate greatly improves.

The source-specific RE rates presented here are developed from statistical examination of recorded inspection data. This is the rate at which inspection staff is observing facility and source category compliance in the field. While this provides the most direct measure of rule effectiveness, it can still be an incomplete picture of overall rule effectiveness. In the case of the source-specific studies for those sources directly affected by a county air quality rule (Rules 310, 310.01, and 316) the compliance rate is used as the RE rate. These sources tend to have a focused, homogeneous set of processes. This, combined with the fact that these studies not only contain the entire population of affected sources but are also very large sample sizes, gives confidence that inconsistencies of individual inspections are already addressed in practice. To further focus the study of these sources each unique permit was classified as “in violation” if any inspection during the allotted time period resulted in an emission based violation or as “in compliance” if no violations were issued or an administrative based violation was issued.

A total of five distinct rule effectiveness rates were calculated for use in this emissions inventory: three source-specific rule effectiveness determinations (Rule 310, Rule 310.01, and Rule 316) along with two multi-rule determinations (Title V and non-Title V permitted facilities). The following three sections describe in further detail the data and methods used in developing the Rule 310, Rule 310.01, and Rule 316 RE factors.

3.1 Calculating Rule Effectiveness for Sources Subject to Rule 310

Sources subject to the department Rule 310 (Fugitive Dust from Dust-Generating Operations) are most often those construction sites where the disturbance of earth is occurring. The RE rate for Rule 310 sources is developed from the observed compliance rate of permitted sites.

The compliance rate for Rule 310 sources uses inspection data of issued dust permits between January 2017 and December 2017. Only inspections that result in a finding of compliance or non-compliance (i.e., “in violation”) are considered in the compliance rate. Inspections conducted solely to confirm the closing of a permit, or inspections where a compliance determination could not be made, were not included in the development of the compliance rate. Using these criteria, a total of 8,596 inspections were conducted on 4,563 issued permits, out of a possible pool of 7,122 issued permits. Dust Control Permits are only valid for 12 months, and expire on the anniversary of their issue date; for instance a permit issued on January 22, 2016 would have a January 22, 2017 expiration date. This permit would therefore only have “operated” 22 days in the inspection period on which this compliance data is based. Some issued permits also experience limited operations, perhaps only a month or two, but in most cases these permits are left open by the permit holder for the entire 12 months. Given these realities, it is not unexpected that 2,559 out of the pool of 7,122 permits received no compliance determination inspection during the 12-month period of January 2017–December 2017. Conversely, over 41% of all issued permits that received a compliance determination inspection were inspected two or more times.

Of the inspected sources listed above, individual compliance rates are determined on a permit by permit basis. Any permit that received at least one emissions-related violation during any inspection conducted between January 2017 and December 2017 received a compliance rate of 0%. Permitted sites that had no recorded emissions-related violations during the study period received a compliance rate of 100%. Of the permits with violations noted, 349 (80%) were emissions-related (track-out, visible emissions, recordkeeping, silt content, etc.), with the

remaining 89 (20%) violating permits being procedural (inadequate dust control plan, late fees, etc.). The permit-specific compliance rates were summed and averaged to produce an overall grouped compliance rate of 92.64%.

3.2 Calculating Rule Effectiveness for Sources Subject to Rule 310.01

The majority of sources subject to Rule 310.01 (Fugitive Dust from Non-Traditional Sources of Fugitive Dust) are vacant lots. It is estimated that there are presently more than 100,000 vacant lots in Maricopa County. Rule 310.01 sources generally do not require a permit, unlike Rule 310 and Rule 316 sources. The RE rate for Rule 310.01 sources is calculated based upon vacant lot inspection compliance rates.

During the study period (January 2017 – December 2017), the department inspectors performed a total of 3,223 inspections on 3,017 unique vacant lots in Maricopa County. The primary purpose of a Rule 310.01 inspection is to verify whether or not the vacant lot in question has a stabilized surface. If the surface is determined to be stable (through a variety of tests), the lot is deemed to be in compliance. Conversely, if the lot's surface is deemed to be unstable, then a violation of Rule 310.01 has occurred. As with Rule 310, a compliance rate is determined individually for each vacant lot, and then summed and averaged to produce a group compliance rate. The overall compliance rate for Rule 310.01 sites is 98.67%. All 43 violations noted by inspectors were emissions-related violations, as all the violations are for unstable soil conditions.

3.3 Calculating Rule Effectiveness for Sources Subject to Rule 316

Facilities subject to Rule 316 (Nonmetallic Mineral Processing) include those involved in the mining of sand and gravel and the production of concrete products. All such "Rule 316 sites" are required to have either a Title V or non-Title V permit issued by the department. At present, all facilities that are subject to Rule 316 have only non-Title V permits. (One class of sources that has long been an exception to this is portable sources that may operate in more than one county during the life of the permit; thus these sources are issued permits by the Arizona Department of Environmental Quality.) The RE rate for Rule 316 sites was determined in a similar fashion as for Rules 310 and 310.01; i.e., calculated on the basis of the actual observed compliance rates of permitted sites.

Inspection data for the period January 2017 through December 2017 reveal that 175 Rule 316 facilities were inspected. Overall, 647 inspections that resulted in a compliance determination were performed during the study period. Of the violating facilities noted, 25 (81%) were emissions-related, with the remaining 6 (19%) primarily procedural in nature. As with Rules 310 and 310.01, a compliance rate is computed for each facility, and then summed and averaged for the group, resulting in an overall compliance rate of 85.60%.

4. References

- US EPA, 1992. Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories. EPA Rep. 452/R-92-010, November 1992.
- US EPA, 1994. Rule Effectiveness Guidance: Integration of Inventory, Compliance and Assessment Applications. EPA Rep. 452/R-94-001, January 1994.

US EPA, 2005. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. EPA Rep. 454/R-05-001, November 2005.

Table B–2. Rule Effectiveness Matrix for Title V Facilities

A. Most important factors (2 criteria, each assigned weighting of 35% of total):

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Monitoring	94%	100%	97%	Source-specific monitoring used for compliance purposes, and monitoring records filed with regulatory agency at least every 4 months.			
	87%	93%	90%	Source-specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency every 6–9 months.	35%	90%	31.50%
	81%	86%	84%	Source-specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency each year.			
	70%	80%	75%	General guidance exists for source-specific enhanced monitoring, and monitoring records required but aren't submitted to regulatory agency.			
		< 70%	35%	No requirements for any type of monitoring.			

Compliance History	94%	100%	97%	The facility has been in compliance for the past eight quarters.	35%	8 of 16 facilities	16.98%
	87%	93%	90%	The facility is believed to have been in compliance for the past eight quarters, although inspection frequency is such that this can't be positively confirmed.			
	81%	86%	84%	On schedule; the facility is meeting its compliance schedule.			
	70%	80%	75%	In Violation; facility is in violation of emissions and/or procedural requirements.		8 of 16 facilities	13.13%
		< 70%	35%	High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA.			

Overall compliance rate for Title V facilities: 88.45%

B. Other important factors (4 criteria, each assigned weighting of 3% of total):

Type of Inspection	94%	100%	97%	Inspections involve compliance test methods with a high degree of accuracy, such as stack testing or other types of precise emissions measurement.	3%	97%	2.91%
	87%	93%	90%	Inspections involve detailed review of process parameters & inspection of control equipment.			
	81%	86%	84%	Inspections involve review of process and inspection of control equipment.			
	70%	80%	75%	Inspections generally consist of only a records review.			
		< 70%	35%	Inspections most likely consist of visual inspection (e.g., opacity), or drive by.			

Operation & Maintenance	94%	100%	97%	Control equipment operators follow and sign daily O&M instructions.	3%	97%	2.91%
	87%	93%	90%	Control equipment operators follow daily O&M instructions.			
	81%	86%	84%	Control equipment operators follow daily or weekly O&M instructions.			
	70%	80%	75%	O&M requirements exist, but on no specific schedule.			
		< 70%	35%	No specific O&M requirements.			

Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Unannounced Inspections	94%	100%	97%	Routinely conducted.	3%	97%	2.91%
	87%	93%	90%	Sometimes done.			
	81%	86%	84%	Done, but infrequently.			
	70%	80%	75%	Rarely done.			
		< 70%	35%	Never done.			

Enforcement Penalties	94%	100%	97%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.	3%	97%	2.91%
	87%	93%	90%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	81%	86%	84%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	70%	80%	75%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
		< 70%	35%	Agency does not have sufficient authority to impose punitive measures towards violators.			

C. Other factors (9 criteria, each assigned weighting of 2% of total):

Compliance Certifications	94%	100%	97%	Source subject to Title V or other type of compliance certification.	2%	97%	1.94%
	87%	93%	90%	Source subject to Title V or other type of compliance certification.			
	81%	86%	84%	Source not subject to any type of compliance certification.			
	70%	80%	75%	Source not subject to any type of compliance certification.			
		< 70%	35%	Source not subject to any type of compliance certification.			

Inspection Frequency	94%	100%	97%	Source(s) are inspected once every 2 years or more frequently.	2%	97%	1.94%
	87%	93%	90%	Source(s) are inspected once every 3 years or more frequently.			
	81%	86%	84%	Source(s) are inspected once every 5 years or more frequently.			
	70%	80%	75%	Inspection of source(s) infrequent; > every 5 years.			
		< 70%	35%	Inspections rarely, if ever, performed.			

Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
EPA HPV Enforcement	94%	100%	97%	Agency has sufficient resources to implement EPA’s 12/22/98 HPV policy.	2%	97%	1.94%
	87%	93%	90%	Agency’s resources allow it to implement EPA’s 12/22/98 HPV policy in most instances.			
	81%	86%	84%	Agency’s resources allow it to implement EPA’s 12/22/98 HPV policy in most instances.			
	70%	80%	75%	Agency’s resources allow it to implement EPA’s 12/22/98 HPV policy more often than not.			
		< 70%	35%	Resource constraints prohibit agency from implementing EPA’s 12/22/98 HPV policy in most instances.			
Operator Training	94%	100%	97%	Control equipment operators complete a formal training program on use of the equipment, and such program is kept up to date and has been reviewed by the regulatory agency.			
	87%	93%	90%	Control equipment operators complete formal training program, and such program is kept up to date and available for review by the regulatory agency upon request.			
	81%	86%	84%	Control equipment operators complete some amount of formal training.	2%	84%	1.68%
	70%	0.8	75%	Control equipment operators receive only on the job training.			
		< 70%	35%	Control equipment operators receive no specific training.			
Media Publicity	94%	100%	97%	Media publicity of enforcement actions.	2%	97%	1.94%
	87%	93%	90%	Media publicity of enforcement actions.			
	81%	86%	84%	Media publicity of enforcement actions.			
	70%	80%	75%	Media publicity of enforcement actions.			
		< 70%	35%	No media publicity of enforcement actions.			
Regulatory Workshops	94%	100%	97%	Regulatory workshops are available annually, and/or the implementing agency mails regulatory information packages each year.	2%	97%	1.94%
	87%	93%	90%	Regulatory workshops are available every 1–2 years, and/or the implementing agency mails regulatory information packages every 1–2 years.			
	81%	86%	84%	Regulatory workshops are available every 2–3 years, and/or the implementing agency mails regulatory information packages once every 2–3 years.			
	70%	80%	75%	Regulatory workshop not routinely available, but implementing agency mails regulatory information packages out about once every 2–3 years.			
		< 70%	35%	Regulatory workshops not routinely available. Implementing agency mails regulatory information packages infrequently, if ever.			

Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Inspector Training	94%	100%	97%	Inspectors must undergo 2 weeks of comprehensive basic training, and 1–2 weeks of source-specific training, and such training is updated each year.	2%	97%	1.94%
	87%	93%	90%	Inspectors must undergo 1–2 weeks of basic training and 1 week of source-specific training and such training is updated every 1–2 years.			
	81%	86%	84%	Inspectors must undergo 1–2 weeks of basic training and 3–5 days of source-specific training, and such training is updated every 1–2 years.			
	70%	80%	75%	Inspectors must undergo 1–2 weeks of basic training and 1 to 3 days of source-specific training, and such training is updated every 1–2 years.			
		< 70%	35%	Inspectors must undergo less than 5 days of basic training less than 3 days of source-specific training, and such training is updated only every 2 years or less frequently.			

Testing Guidelines	94%	100%	97%	Specific guidelines and schedule for testing and test methods exist.	2%	97%	1.94%
	87%	93%	90%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	81%	86%	84%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	70%	80%	75%	Specific guidelines on testing and test methods, but no schedule for testing.			
		< 70%	35%	Only general guidance on testing, or no mention of testing requirements.			

Follow-up Inspections	94%	100%	97%	Follow-up inspections always or almost always conducted (90 % of the time or more).	2%	97%	1.94%
	87%	93%	90%	Follow-up inspections usually conducted (approximately 75% of the time).			
	81%	86%	84%	Follow-up inspections sometimes conducted (approximately 50% of the time).			
	70%	80%	75%	Follow-up inspections infrequently conducted (approximately 25% of the time).			
		< 70%	35%	Follow-up inspections rarely or never conducted (10% of the time or less)			

Overall rule effectiveness score for Title V facilities:

90.44%

Table B-3. Rule Effectiveness Matrix for Non-Title V Facilities

A. Most important factors (2 criteria, each assigned weighting of 35% of total):

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Monitoring	94%	100%	97%	Source-specific monitoring used for compliance purposes, and monitoring records filed with regulatory agency at least every 4 months.			
	87%	93%	90%	Source-specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency every 6–9 months.			
	81%	86%	84%	Source-specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency each year.			
	70%	80%	75%	General guidance exists for source-specific enhanced monitoring, and monitoring records required but aren't submitted to regulatory agency.	35%	75%	26.25%
		< 70%	35%	No requirements for any type of monitoring.			

Compliance History	94%	100%	97%	The facility has been in compliance for the past eight quarters.	35%	82 of 137 facilities	20.32%
	87%	93%	90%	The facility is believed to have been in compliance for the past eight quarters, although inspection frequency is such that this can't be positively confirmed.		2 of 137 facilities	0.46%
	81%	86%	84%	On schedule; the facility is meeting its compliance schedule.			
	70%	80%	75%	In Violation; facility is in violation of emissions and/or procedural requirements.		57 of 137 facilities	13.13%
		< 70%	35%	High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA.			

Overall compliance rate for Non-Title V facilities: 85.94%

B. Other important factors (4 criteria, each assigned weighting of 3% of total):

Type of Inspection	94%	100%	97%	Inspections involve compliance test methods with a high degree of accuracy, such as stack testing or other types of precise emissions measurement.	3%	97%	2.91%
	87%	93%	90%	Inspections involve detailed review of process parameters & inspection of control equipment.			
	81%	86%	84%	Inspections involve review of process and inspection of control equipment.			
	70%	80%	75%	Inspections generally consist of only a records review.			
		< 70%	35%	Inspections most likely consist of visual inspection (e.g., opacity), or drive by.			

Operation & Maintenance	94%	100%	97%	Control equipment operators follow and sign daily O&M instructions.	3%	97%	2.91%
	87%	93%	90%	Control equipment operators follow daily O&M instructions.			
	81%	86%	84%	Control equipment operators follow daily or weekly O&M instructions.			
	70%	80%	75%	O&M requirements exist, but on no specific schedule.			
		< 70%	35%	No specific O&M requirements.			

Table B-3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

Factor	Range		Midpoint value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Unannounced Inspections	94%	100%	97%	Routinely conducted.	3%	97%	2.91%
	87%	93%	90%	Sometimes done.			
	81%	86%	84%	Done, but infrequently.			
	70%	80%	75%	Rarely done.			
		< 70%	35%	Never done.			

Enforcement Penalties	94%	100%	97%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.	3%	97%	2.91%
	87%	93%	90%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	81%	86%	84%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	70%	80%	75%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
		< 70%	35%	Agency does not have sufficient authority to impose punitive measures towards violators.			

C. Other factors (9 criteria, each assigned weighting of 2% of total):

Compliance Certifications	94%	100%	97%	Source subject to Title V or other type of compliance certification.	2%	97%	1.94%
	87%	93%	90%	Source subject to Title V or other type of compliance certification.			
	81%	86%	84%	Source not subject to any type of compliance certification.			
	70%	80%	75%	Source not subject to any type of compliance certification.			
		< 70%	35%	Source not subject to any type of compliance certification.			

Inspection Frequency	94%	100%	97%	Source(s) are inspected once every 2 years or more frequently.	2%	97%	1.94%
	87%	93%	90%	Source(s) inspected every 3 years or more frequently.			
	81%	86%	84%	Source(s) inspected every 5 years or more frequently.			
	70%	80%	75%	Inspection of source(s) infrequent; > every 5 years.			
		< 70%	35%	Inspections rarely, if ever, performed.			

Table B-3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

Factor	Range	Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)	
EPA HPV Enforcement	94%	100%	97%	Agency has sufficient resources to implement EPA's 12/22/98 HPV policy.	2%	97%	1.94%
	87%	93%	90%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	81%	86%	84%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	70%	80%	75%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy more often than not.			
		< 70%	35%	Resource constraints prohibit agency from implementing EPA's 12/22/98 HPV policy in most instances.			

Operator Training	94%	100%	97%	Control equipment operators complete a formal training program on use of the equipment; the program is kept up to date and has been reviewed by the regulatory agency.			
	87%	93%	90%	Control equipment operators complete formal training program, and such program is kept up to date and available for review by the regulatory agency upon request.			
	81%	86%	84%	Control equipment operators complete some amount of formal training.	2%	84%	1.68%
	70%	0.8	75%	Control equipment operators receive only on the job training.			
		< 70%	35%	Control equipment operators receive no specific training.			

Media Publicity	94%	100%	97%	Media publicity of enforcement actions.	2%	97%	1.94%
	87%	93%	90%	Media publicity of enforcement actions.			
	81%	86%	84%	Media publicity of enforcement actions.			
	70%	80%	75%	Media publicity of enforcement actions.			
		< 70%	35%	No media publicity of enforcement actions.			

Regulatory Workshops	94%	100%	97%	Regulatory workshops are available annually, and/or the implementing agency mails regulatory information packages each year.	2%	97%	1.94%
	87%	93%	90%	Regulatory workshops are available every 1-2 years, and/or the implementing agency mails regulatory information packages every 1-2 years.			
	81%	86%	84%	Regulatory workshops are available every 2-3 years, and/or the implementing agency mails regulatory information packages once every 2-3 years.			
	70%	80%	75%	Regulatory workshop not routinely available, but implementing agency mails regulatory information packages out about once every 2-3 years.			
		< 70%	35%	Regulatory workshops not routinely available. The implementing agency mails regulatory information packages infrequently, if ever.			

Table B-3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score(= weight × value)
Inspector Training	94%	100%	97%	Inspectors must undergo 2 weeks of comprehensive basic training, and 1–2 weeks of source-specific training, and such training is updated each year.	2%	97%	1.94%
	87%	93%	90%	Inspectors must undergo 1–2 weeks of basic training and 1 week of source-specific training and such training is updated every 1–2 years.			
	81%	86%	84%	Inspectors must undergo 1–2 weeks of basic training and 3–5 days of source-specific training, and such training is updated every 1–2 years.			
	70%	80%	75%	Inspectors must undergo 1–2 weeks of basic training and 1 to 3 days of source-specific training, and such training is updated every 1–2 years.			
		< 70%	35%	Inspectors must undergo less than 5 days of basic training less than 3 days of source-specific training, and such training is updated only every 2 years or less frequently.			

Testing Guidelines	94%	100%	97%	Specific guidelines and schedule for testing and test methods exist.	2%	97%	1.94%
	87%	93%	90%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	81%	86%	84%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	70%	80%	75%	Specific guidelines on testing and test methods, but no schedule for testing.			
		< 70%	35%	Only general guidance on testing, or no mention of testing requirements.			

Follow-up Inspections	94%	100%	97%	Follow-up inspections always or almost always conducted (90 % of the time or more).	2%	97%	1.94%
	87%	93%	90%	Follow-up inspections usually conducted (approximately 75% of the time).			
	81%	86%	84%	Follow-up inspections sometimes conducted (approximately 50% of the time).			
	70%	80%	75%	Follow-up inspections infrequently conducted (approximately 25% of the time).			
		< 70%	35%	Follow-up inspections rarely or never conducted (10% of the time or less)			

Overall rule effectiveness score for non-Title V facilities:

89.00%

Appendix C. MOVES2014b Local Input Data and RunSpecs

MOVES2014b Local Input Data and RunSpecs

In order to calculate the 2017 annual and ozone season-day onroad source emissions, MOVES2014b was executed using local input data for each month of the year and each geographical area (the PM₁₀ nonattainment area and Maricopa County).

A portion of the MOVES2014b RunSpec Summary, RunSpec, and local input data for Maricopa County are provided in this appendix as an example.

MOVES2014b RunSpec Summary (Maricopa County)

* Output Database Server Name: [using default]

* Scale:

Domain/Scale: County
Calculation Type: Inventory

* Time Spans:

Time Aggregation Level: Hour
Years: 2017
Months: January - December
Days: Weekend & Weekdays
Hours: Start Hour 00:00 - 00:59 | End Hour 23:00 - 23:59

* Geographic Bounds:

Region: County
Selections: ARIZONA - Maricopa County
Domain Input Database: c04013y2017_20180424

* Vehicles/Equipment

On Road Vehicle Equipment:
Compressed natural Gas (CNG) - Transit Bus
Diesel Fuel - Combination Long-haul Truck
Diesel Fuel - Combination Short-haul Truck
Diesel Fuel - Intercity Bus
Diesel Fuel - Light Commercial Truck
Diesel Fuel - Motor Home
Diesel Fuel - Passenger Car
Diesel Fuel - Passenger Truck
Diesel Fuel - Refuse Truck
Diesel Fuel - School Bus
Diesel Fuel - Single Unit Long-haul Truck
Diesel Fuel - Single Unit Short-haul Truck
Diesel Fuel - Transit Bus
Electricity - Light Commercial Truck
Electricity - Passenger Car
Electricity - Passenger Truck
Ethanol (E-85) - Light Commercial Truck
Ethanol (E-85) - Passenger Car
Ethanol (E-85) - Passenger Truck
Gasoline - Combination Short-haul Truck
Gasoline - Light Commercial Truck
Gasoline - Motor Home
Gasoline - Motorcycle
Gasoline - Passenger Car
Gasoline - Passenger Truck
Gasoline - Refuse Truck
Gasoline - School Bus
Gasoline - Single Unit Long-haul Truck
Gasoline - Single Unit Short-haul Truck
Gasoline - Transit Bus

* Road Type

Off-Network
Rural Restricted Access
Rural Unrestricted Access
Urban Restricted Access
Urban Unrestricted Access

* Pollutants and Processes

Ammonia (NH3) - Running Exhaust
Ammonia (NH3) - Start Exhaust
Ammonia (NH3) - Crankcase Running Exhaust
Ammonia (NH3) - Crankcase Start Exhaust
Ammonia (NH3) - Crankcase Extended Idle Exhaust
Ammonia (NH3) - Extended Idle Exhaust
Ammonia (NH3) - Auxiliary Power Exhaust
Composite - NonECPM - Running Exhaust
Composite - NonECPM - Start Exhaust
Composite - NonECPM - Crankcase Running Exhaust
Composite - NonECPM - Crankcase Start Exhaust
Composite - NonECPM - Crankcase Extended Idle Exhaust

Composite - NonECPM - Extended Idle Exhaust
Composite - NonECPM - Auxiliary Power Exhaust
Elemental Carbon - Running Exhaust
Elemental Carbon - Start Exhaust
Elemental Carbon - Crankcase Running Exhaust
Elemental Carbon - Crankcase Start Exhaust
Elemental Carbon - Crankcase Extended Idle Exhaust
Elemental Carbon - Extended Idle Exhaust
Elemental Carbon - Auxiliary Power Exhaust
H2O (aerosol) - Running Exhaust
H2O (aerosol) - Start Exhaust
H2O (aerosol) - Crankcase Running Exhaust
H2O (aerosol) - Crankcase Start Exhaust
H2O (aerosol) - Crankcase Extended Idle Exhaust
H2O (aerosol) - Extended Idle Exhaust
H2O (aerosol) - Auxiliary Power Exhaust
Organic Carbon - Running Exhaust
Organic Carbon - Start Exhaust
Organic Carbon - Crankcase Running Exhaust
Organic Carbon - Crankcase Start Exhaust
Organic Carbon - Crankcase Extended Idle Exhaust
Organic Carbon - Extended Idle Exhaust
Organic Carbon - Auxiliary Power Exhaust
Oxides of Nitrogen (NOx) - Running Exhaust
Oxides of Nitrogen (NOx) - Start Exhaust
Oxides of Nitrogen (NOx) - Crankcase Running Exhaust
Oxides of Nitrogen (NOx) - Crankcase Start Exhaust
Oxides of Nitrogen (NOx) - Crankcase Extended Idle Exhaust
Oxides of Nitrogen (NOx) - Extended Idle Exhaust
Oxides of Nitrogen (NOx) - Auxiliary Power Exhaust
Primary Exhaust PM10 - Total - Running Exhaust
Primary Exhaust PM10 - Total - Start Exhaust
Primary Exhaust PM10 - Total - Crankcase Running Exhaust
Primary Exhaust PM10 - Total - Crankcase Start Exhaust
Primary Exhaust PM10 - Total - Crankcase Extended Idle Exhaust
Primary Exhaust PM10 - Total - Extended Idle Exhaust
Primary Exhaust PM10 - Total - Auxiliary Power Exhaust
Primary Exhaust PM2.5 - Total - Running Exhaust
Primary Exhaust PM2.5 - Total - Start Exhaust
Primary Exhaust PM2.5 - Total - Crankcase Running Exhaust
Primary Exhaust PM2.5 - Total - Crankcase Start Exhaust
Primary Exhaust PM2.5 - Total - Crankcase Extended Idle Exhaust
Primary Exhaust PM2.5 - Total - Extended Idle Exhaust
Primary Exhaust PM2.5 - Total - Auxiliary Power Exhaust
Primary PM10 - Brakewear Particulate - Brakewear
Primary PM10 - Tirewear Particulate - Tirewear
Primary PM2.5 - Brakewear Particulate - Brakewear
Primary PM2.5 - Tirewear Particulate - Tirewear
Sulfate Particulate - Running Exhaust
Sulfate Particulate - Start Exhaust
Sulfate Particulate - Crankcase Running Exhaust
Sulfate Particulate - Crankcase Start Exhaust
Sulfate Particulate - Crankcase Extended Idle Exhaust
Sulfate Particulate - Extended Idle Exhaust
Sulfate Particulate - Auxiliary Power Exhaust
Sulfur Dioxide (SO2) - Running Exhaust
Sulfur Dioxide (SO2) - Start Exhaust
Sulfur Dioxide (SO2) - Crankcase Running Exhaust
Sulfur Dioxide (SO2) - Crankcase Start Exhaust
Sulfur Dioxide (SO2) - Crankcase Extended Idle Exhaust
Sulfur Dioxide (SO2) - Extended Idle Exhaust
Sulfur Dioxide (SO2) - Auxiliary Power Exhaust
Total Energy Consumption - Running Exhaust
Total Energy Consumption - Start Exhaust
Total Energy Consumption - Extended Idle Exhaust
Total Energy Consumption - Auxiliary Power Exhaust

* Output

General Output:

Output Database: c04013y2017_20180424_out

Units: Mass Units (Grams)
Energy Units (Joules)
Distance Units (Miles)

Activity: Distance Traveled
Source Hours
Hotelling Hours
Source Hours Operating
Source Hours Parked
Population
Starts

Output Emissions Detail:

Always: Time (Month)
Location (COUNTY)
Pollutant

For All Vehicle/Equipment Categories: Fuel Type
Emission Process

On Road/Off Road: On Road/Off Road
Road Type
Source Use Type
SCC

MOVES2014b RunSpec (Maricopa County)

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    <pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="16" processname="Crankcase Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="90" processname="Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="118" pollutantname="Composite - NonECPM" processkey="91" processname="Auxiliary Power Exhaust"/>
    <pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="1" processname="Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="2" processname="Start Exhaust"/>
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<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="16" processname="Crankcase Start Exhaust"/>
<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
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<pollutantprocessassociation pollutantkey="112" pollutantname="Elemental Carbon" processkey="91" processname="Auxiliary Power Exhaust"/>
<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="119" pollutantname="H2O (aerosol)" processkey="2" processname="Start Exhaust"/>
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<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" processname="Start Exhaust"/>
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<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90" processname="Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91" processname="Auxiliary Power Exhaust"/>
<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="2" processname="Start Exhaust"/>
<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="15" processname="Crankcase Running Exhaust"/>
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<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="100" pollutantname="Primary Exhaust PM10 - Total" processkey="90" processname="Extended Idle Exhaust"/>
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<pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="2" processname="Start Exhaust"/>
<pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="15" processname="Crankcase Running Exhaust"/>
<pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="16" processname="Crankcase Start Exhaust"/>
<pollutantprocessassociation pollutantkey="110" pollutantname="Primary Exhaust PM2.5 - Total" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
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<pollutantprocessassociation pollutantkey="106" pollutantname="Primary PM10 - Brakewear Particulate" processkey="9" processname="Brakewear"/>
<pollutantprocessassociation pollutantkey="107" pollutantname="Primary PM10 - Tirewear Particulate" processkey="10" processname="Tirewear"/>
<pollutantprocessassociation pollutantkey="116" pollutantname="Primary PM2.5 - Brakewear Particulate" processkey="9" processname="Brakewear"/>
<pollutantprocessassociation pollutantkey="117" pollutantname="Primary PM2.5 - Tirewear Particulate" processkey="10" processname="Tirewear"/>
<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="2" processname="Start Exhaust"/>
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<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="16" processname="Crankcase Start Exhaust"/>
<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="90" processname="Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="115" pollutantname="Sulfate Particulate" processkey="91" processname="Auxiliary Power Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="2" processname="Start Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="15" processname="Crankcase Running Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="16" processname="Crankcase Start Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="17" processname="Crankcase Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="90" processname="Extended Idle Exhaust"/>
<pollutantprocessassociation pollutantkey="31" pollutantname="Sulfur Dioxide (SO2)" processkey="91" processname="Auxiliary Power Exhaust"/>
<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="1" processname="Running Exhaust"/>
<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="2" processname="Start Exhaust"/>
<pollutantprocessassociation pollutantkey="91" pollutantname="Total Energy Consumption" processkey="90" processname="Extended Idle Exhaust"/>
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<internalcontrolstrategies>
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useParameters No
]]></internalcontrolstrategy>
</internalcontrolstrategies>
<inputdatabase servername="" databasename="" description=""/>
<uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numbersimulations="0"/>
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<outputemissionsbreakdownselection>
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<fuelsubtype selected="false"/>
<emissionprocess selected="true"/>
<onroadoffroad selected="true"/>
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<outputmestep value="Month"/>
<outputvmtdata value="true"/>
<outputsho value="true"/>
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<outputstarts value="true"/>
<outputpopulation value="true"/>
<scaleinputdatabase servername="localhost" databasename="c04013y2017_20180424" description=""/>
<pmsize value="0"/>
<outputfactors>
  <timefactors selected="true" units="Months"/>
  <distancefactors selected="true" units="Miles"/>
  <massfactors selected="true" units="Grams" energyunits="Joules"/>
</outputfactors>
<savedata>
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<donotexecute>
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<generatordatabase shouldsave="false" servername="" databasename="" description=""/>
  <donotperformfinalaggregation selected="false"/>
  <lookuptableflags scenarioid="MOVE:SLINK2014" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
</runspec>
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MOVES2014b Local Input Data (Maricopa County)

[HPMSvTypeYear]

HPMSvTypeID	yearID	HPMSBaseYearVMT
10	2017	194,156,930
25	2017	32,154,500,908
40	2017	86,775,403
50	2017	1,275,034,707
60	2017	1,059,783,258

[Source TypeYear]

yearID	sourceTypeID	sourceTypePopulation
2017	11	101,931
2017	21	2,447,392
2017	31	510,638
2017	32	128,977
2017	41	251
2017	42	893
2017	43	8,396
2017	51	1,116
2017	52	39,150
2017	53	1,659
2017	54	10,286
2017	61	6,690
2017	62	7,488

[CountyYear]

countyID	yearID	refuelingVaporProgramAdjust	refuelingSpillProgramAdjust
4013	2017	0.5	0.000

[Fuel Formulation]

Fuel Formulation ID	Fuel Subtype ID	RVP	Sulfur Level	ETOH Volume	MTBE Volume	ETBE Volume	TAME Volume	Aromatic Content	Olefin Content	Benzene Content	e200	e300	BioDiesel Ester Volume	Cetane Index	PAH Content	T50	T90
10	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	218	329
20	20	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	30	0	7.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	51	7.7	11	85	0	0	0	0	0	0	49.9	89.5	0	0	0	200	300
90	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	10	8.7	338	0	0	0	0	26.4	11.9	1.64	50	83	0	0	0	199.816	329.40
97	10	6.6	150	0	11.7581	0	0	24	11	0.8	52	84	0	0	0	195.735	324.86
98	10	6.9	30	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	218	329
99	10	6.9	90	0	0	0	0	26.1	5.6	1	41.09	83.09	0	0	0	218	329
3577	12	6.73	17.07	10.41	0	0	0	21.862	4.66603	0.53	44.9124	88.8208	0	0	0	210.199	302.95
3578	12	8.56	12.48	10.22	0	0	0	21.8745	4.55423	0.53	46.8717	89.6605	0	0	0	206.201	299.13
3579	12	8.05	13.7	10.43	0	0	0	21.7833	4.56239	0.53	46.5506	89.4528	0	0	0	206.856	300.07
25005	21	0	5.67	0	0	0	0	0	0	0	0	0	2.62	0	0	0	0
27001	51	10.5	8	74	0	0	0	0	0	0	49.9	89.5	0	0	0	200	300
27002	51	7.7	8	74	0	0	0	0	0	0	49.9	89.5	0	0	0	200	300
28001	30	0	7.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[Fuel Usage Fraction]

countyID	fuelYearID	modelYearGroupID	sourceBinFuelTypeID	fuelSupplyFuelTypeID	usageFraction
4013	2017	0	1	1	1
4013	2017	0	2	2	1
4013	2017	0	3	3	1
4013	2017	0	5	1	0.947025
4013	2017	0	5	5	0.052975
4013	2017	0	9	9	1

[FuelSupply]

fuelRegionID	fuelYearID	monthGroupID	fuelFormulationID	marketShare	marketShareCV
1570011000	2017	1	90	1	0.5
1570011000	2017	2	90	1	0.5
1570011000	2017	3	90	1	0.5
1570011000	2017	4	90	1	0.5
1570011000	2017	5	90	1	0.5
1570011000	2017	6	90	1	0.5
1570011000	2017	7	90	1	0.5
1570011000	2017	8	90	1	0.5
1570011000	2017	9	90	1	0.5
1570011000	2017	10	90	1	0.5
1570011000	2017	11	90	1	0.5
1570011000	2017	12	90	1	0.5
1570011000	2017	5	3577	1	0.5
1570011000	2017	6	3577	1	0.5
1570011000	2017	7	3577	1	0.5
1570011000	2017	8	3577	1	0.5
1570011000	2017	9	3577	1	0.5
1570011000	2017	1	3578	1	0.5
1570011000	2017	2	3578	1	0.5
1570011000	2017	3	3578	1	0.5
1570011000	2017	11	3578	1	0.5
1570011000	2017	12	3578	1	0.5
1570011000	2017	4	3579	1	0.5
1570011000	2017	10	3579	1	0.5
1570011000	2017	1	25005	1	0.5
1570011000	2017	2	25005	1	0.5
1570011000	2017	3	25005	1	0.5
1570011000	2017	4	25005	1	0.5
1570011000	2017	5	25005	1	0.5
1570011000	2017	6	25005	1	0.5
1570011000	2017	7	25005	1	0.5
1570011000	2017	8	25005	1	0.5
1570011000	2017	9	25005	1	0.5
1570011000	2017	10	25005	1	0.5
1570011000	2017	11	25005	1	0.5
1570011000	2017	12	25005	1	0.5
1570011000	2017	1	27001	1	0.5
1570011000	2017	2	27001	1	0.5
1570011000	2017	3	27001	1	0.5
1570011000	2017	11	27001	1	0.5
1570011000	2017	12	27001	1	0.5
1570011000	2017	4	27002	1	0.5
1570011000	2017	5	27002	1	0.5
1570011000	2017	6	27002	1	0.5
1570011000	2017	7	27002	1	0.5
1570011000	2017	8	27002	1	0.5
1570011000	2017	9	27002	1	0.5
1570011000	2017	10	27002	1	0.5
1570011000	2017	1	28001	1	0.5
1570011000	2017	2	28001	1	0.5
1570011000	2017	3	28001	1	0.5
1570011000	2017	4	28001	1	0.5
1570011000	2017	5	28001	1	0.5
1570011000	2017	6	28001	1	0.5
1570011000	2017	7	28001	1	0.5
1570011000	2017	8	28001	1	0.5
1570011000	2017	9	28001	1	0.5
1570011000	2017	10	28001	1	0.5
1570011000	2017	11	28001	1	0.5
1570011000	2017	12	28001	1	0.5

[ZoneMonthHour]

monthID	zoneID	HourID	temperature	relHumidity
1	40130	1	52	66
1	40130	2	51	68
1	40130	3	50	68
1	40130	4	49	71
1	40130	5	49	72
1	40130	6	48	72
1	40130	7	48	73
1	40130	8	48	72
1	40130	9	51	64
1	40130	10	54	57
1	40130	11	56	51
1	40130	12	59	46
1	40130	13	61	43
1	40130	14	62	41
1	40130	15	63	41
1	40130	16	63	40
1	40130	17	62	41
1	40130	18	61	45
1	40130	19	59	48
1	40130	20	57	53
1	40130	21	56	57
1	40130	22	54	60
1	40130	23	53	61
1	40130	24	52	63
2	40130	1	58	57
2	40130	2	57	59
2	40130	3	56	61
2	40130	4	55	62
2	40130	5	54	63
2	40130	6	54	64
2	40130	7	53	65
2	40130	8	54	65
2	40130	9	57	57
2	40130	10	61	50
2	40130	11	63	45
2	40130	12	66	40
2	40130	13	68	37
2	40130	14	70	34
2	40130	15	70	33
2	40130	16	71	32
2	40130	17	70	32
2	40130	18	69	35
2	40130	19	67	37
2	40130	20	64	44
2	40130	21	63	48
2	40130	22	61	51
2	40130	23	60	54
2	40130	24	59	57
3	40130	1	65	40
3	40130	2	64	42
3	40130	3	61	46
3	40130	4	61	48
3	40130	5	60	48
3	40130	6	59	48
3	40130	7	59	50
3	40130	8	61	45
3	40130	9	65	37
3	40130	10	70	30
3	40130	11	73	25
3	40130	12	76	22
3	40130	13	79	20
3	40130	14	81	18
3	40130	15	82	17
3	40130	16	83	16
3	40130	17	82	16
3	40130	18	81	16
3	40130	19	79	18
3	40130	20	77	23
3	40130	21	73	27
3	40130	22	72	28
3	40130	23	70	30
3	40130	24	67	35
4	40130	1	71	22
4	40130	2	69	23
4	40130	3	67	25
4	40130	4	66	27
4	40130	5	64	29
4	40130	6	63	31

monthID	zoneID	HourID	temperature	relHumidity
4	40130	7	64	30
4	40130	8	68	26
4	40130	9	71	23
4	40130	10	75	19
4	40130	11	79	17
4	40130	12	81	14
4	40130	13	83	12
4	40130	14	85	11
4	40130	15	86	10
4	40130	16	87	10
4	40130	17	87	10
4	40130	18	86	10
4	40130	19	84	10
4	40130	20	82	12
4	40130	21	79	14
4	40130	22	76	16
4	40130	23	75	17
4	40130	24	73	19
5	40130	1	77	23
5	40130	2	75	25
5	40130	3	74	27
5	40130	4	72	28
5	40130	5	71	30
5	40130	6	70	30
5	40130	7	72	27
5	40130	8	76	24
5	40130	9	79	21
5	40130	10	82	19
5	40130	11	85	17
5	40130	12	88	15
5	40130	13	90	13
5	40130	14	91	12
5	40130	15	93	11
5	40130	16	93	11
5	40130	17	92	11
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5	40130	19	90	13
5	40130	20	88	14
5	40130	21	85	16
5	40130	22	83	17
5	40130	23	82	18
5	40130	24	80	20
6	40130	1	90	16
6	40130	2	88	18
6	40130	3	86	18
6	40130	4	85	20
6	40130	5	83	22
6	40130	6	82	23
6	40130	7	84	22
6	40130	8	87	20
6	40130	9	91	17
6	40130	10	94	15
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6	40130	19	105	8
6	40130	20	102	8
6	40130	21	99	10
6	40130	22	96	12
6	40130	23	95	12
6	40130	24	93	15
7	40130	1	90	41
7	40130	2	89	42
7	40130	3	88	43
7	40130	4	87	44
7	40130	5	86	46
7	40130	6	86	47
7	40130	7	87	46
7	40130	8	89	44
7	40130	9	91	41
7	40130	10	93	37
7	40130	11	96	33
7	40130	12	99	29

monthID	zoneID	HourID	temperature	relHumidity
7	40130	13	101	27
7	40130	14	102	25
7	40130	15	104	24
7	40130	16	104	23
7	40130	17	104	22
7	40130	18	103	24
7	40130	19	101	25
7	40130	20	99	29
7	40130	21	97	30
7	40130	22	95	33
7	40130	23	93	37
7	40130	24	92	40
8	40130	1	90	33
8	40130	2	89	36
8	40130	3	88	38
8	40130	4	86	40
8	40130	5	85	41
8	40130	6	85	42
8	40130	7	85	41
8	40130	8	88	38
8	40130	9	91	34
8	40130	10	93	31
8	40130	11	96	28
8	40130	12	99	25
8	40130	13	101	22
8	40130	14	102	20
8	40130	15	104	18
8	40130	16	104	18
8	40130	17	103	18
8	40130	18	102	20
8	40130	19	100	21
8	40130	20	99	23
8	40130	21	97	25
8	40130	22	95	28
8	40130	23	92	31
8	40130	24	92	32
9	40130	1	83	28
9	40130	2	82	30
9	40130	3	81	32
9	40130	4	79	35
9	40130	5	78	37
9	40130	6	77	38
9	40130	7	78	38
9	40130	8	80	36
9	40130	9	84	33
9	40130	10	87	29
9	40130	11	90	26
9	40130	12	93	23
9	40130	13	95	21
9	40130	14	97	19
9	40130	15	97	17
9	40130	16	98	17
9	40130	17	97	17
9	40130	18	96	18
9	40130	19	94	19
9	40130	20	92	20
9	40130	21	89	22
9	40130	22	88	23
9	40130	23	86	25
9	40130	24	84	26
10	40130	1	75	26
10	40130	2	73	28
10	40130	3	72	28
10	40130	4	70	30
10	40130	5	70	31
10	40130	6	69	32
10	40130	7	68	32
10	40130	8	72	29
10	40130	9	76	25
10	40130	10	81	20
10	40130	11	84	18
10	40130	12	87	16
10	40130	13	90	15
10	40130	14	91	13
10	40130	15	92	13
10	40130	16	92	13
10	40130	17	92	13
10	40130	18	90	14

monthID	zoneID	HourID	temperature	relHumidity
10	40130	19	87	16
10	40130	20	84	18
10	40130	21	82	20
10	40130	22	80	22
10	40130	23	78	24
10	40130	24	76	27
11	40130	1	65	42
11	40130	2	64	43
11	40130	3	63	44
11	40130	4	62	45
11	40130	5	61	46
11	40130	6	61	45
11	40130	7	60	47
11	40130	8	62	44
11	40130	9	66	37
11	40130	10	70	33
11	40130	11	74	28
11	40130	12	77	26

monthID	zoneID	HourID	temperature	relHumidity
11	40130	13	79	24
11	40130	14	81	22
11	40130	15	82	21
11	40130	16	82	21
11	40130	17	81	21
11	40130	18	78	24
11	40130	19	75	27
11	40130	20	74	29
11	40130	21	72	32
11	40130	22	70	35
11	40130	23	68	38
11	40130	24	67	40
12	40130	1	54	41
12	40130	2	53	43
12	40130	3	52	43
12	40130	4	51	46
12	40130	5	50	46
12	40130	6	50	47

monthID	zoneID	HourID	temperature	relHumidity
12	40130	7	50	46
12	40130	8	49	47
12	40130	9	53	41
12	40130	10	57	33
12	40130	11	61	28
12	40130	12	65	24
12	40130	13	67	21
12	40130	14	69	19
12	40130	15	70	18
12	40130	16	70	18
12	40130	17	69	19
12	40130	18	66	21
12	40130	19	64	24
12	40130	20	61	29
12	40130	21	59	31
12	40130	22	58	35
12	40130	23	56	38
12	40130	24	55	40

[SourceTypeAgeDistribution]

Source TypeID	YearID	AgeID	AgeFraction
11	2017	0	0.024416
11	2017	1	0.053866
11	2017	2	0.065539
11	2017	3	0.062005
11	2017	4	0.054616
11	2017	5	0.047226
11	2017	6	0.032234
11	2017	7	0.024952
11	2017	8	0.052795
11	2017	9	0.054401
11	2017	10	0.072821
11	2017	11	0.070893
11	2017	12	0.060291
11	2017	13	0.043371
11	2017	14	0.051403
11	2017	15	0.041765
11	2017	16	0.034804
11	2017	17	0.029664
11	2017	18	0.024952
11	2017	19	0.017670
11	2017	20	0.014136
11	2017	21	0.013065
11	2017	22	0.010602
11	2017	23	0.008460
11	2017	24	0.008139
11	2017	25	0.005890
11	2017	26	0.004498
11	2017	27	0.004069
11	2017	28	0.003962
11	2017	29	0.003748
11	2017	30	0.003748
21	2017	0	0.043300
21	2017	1	0.071600
21	2017	2	0.077400
21	2017	3	0.069900
21	2017	4	0.068600
21	2017	5	0.056200
21	2017	6	0.045900
21	2017	7	0.040500
21	2017	8	0.032800
21	2017	9	0.049400
21	2017	10	0.057600
21	2017	11	0.054600
21	2017	12	0.050900
21	2017	13	0.044500
21	2017	14	0.039200
21	2017	15	0.034000
21	2017	16	0.029100
21	2017	17	0.025900
21	2017	18	0.020300
21	2017	19	0.015000
21	2017	20	0.012400
21	2017	21	0.008500
21	2017	22	0.007600
21	2017	23	0.005500
21	2017	24	0.004100
21	2017	25	0.003200
21	2017	26	0.002900
21	2017	27	0.002300
21	2017	28	0.002000
21	2017	29	0.001600
21	2017	30	0.023200
31	2017	0	0.035158
31	2017	1	0.062192
31	2017	2	0.055434
31	2017	3	0.056503
31	2017	4	0.048126
31	2017	5	0.038142
31	2017	6	0.035713
31	2017	7	0.024063
31	2017	8	0.019443
31	2017	9	0.046363
31	2017	10	0.059500
31	2017	11	0.062020
31	2017	12	0.053038
31	2017	13	0.054190
31	2017	14	0.044888

Source TypeID	YearID	AgeID	AgeFraction
31	2017	15	0.040283
31	2017	16	0.043877
31	2017	17	0.037444
31	2017	18	0.028221
31	2017	19	0.021563
31	2017	20	0.021812
31	2017	21	0.015086
31	2017	22	0.014732
31	2017	23	0.012193
31	2017	24	0.008158
31	2017	25	0.005702
31	2017	26	0.004727
31	2017	27	0.004281
31	2017	28	0.004462
31	2017	29	0.003285
31	2017	30	0.039401
32	2017	0	0.040066
32	2017	1	0.064156
32	2017	2	0.056935
32	2017	3	0.056635
32	2017	4	0.049370
32	2017	5	0.040652
32	2017	6	0.036535
32	2017	7	0.023959
32	2017	8	0.020252
32	2017	9	0.047249
32	2017	10	0.063102
32	2017	11	0.063436
32	2017	12	0.053418
32	2017	13	0.051482
32	2017	14	0.042465
32	2017	15	0.037822
32	2017	16	0.041487
32	2017	17	0.036690
32	2017	18	0.027156
32	2017	19	0.020501
32	2017	20	0.020659
32	2017	21	0.014414
32	2017	22	0.014056
32	2017	23	0.011531
32	2017	24	0.007767
32	2017	25	0.005420
32	2017	26	0.004532
32	2017	27	0.004117
32	2017	28	0.004238
32	2017	29	0.003134
32	2017	30	0.036763
41	2017	0	0.065200
41	2017	1	0.089500
41	2017	2	0.078900
41	2017	3	0.056200
41	2017	4	0.051800
41	2017	5	0.049500
41	2017	6	0.030400
41	2017	7	0.015500
41	2017	8	0.021100
41	2017	9	0.037800
41	2017	10	0.083200
41	2017	11	0.081100
41	2017	12	0.056100
41	2017	13	0.038000
41	2017	14	0.028000
41	2017	15	0.021200
41	2017	16	0.030100
41	2017	17	0.034100
41	2017	18	0.030800
41	2017	19	0.017300
41	2017	20	0.016600
41	2017	21	0.015200
41	2017	22	0.013500
41	2017	23	0.008500
41	2017	24	0.006000
41	2017	25	0.004200
41	2017	26	0.003200
41	2017	27	0.004400
41	2017	28	0.003200
41	2017	29	0.002200

Source TypeID	YearID	AgeID	AgeFraction
41	2017	30	0.007200
42	2017	0	0.080627
42	2017	1	0.049272
42	2017	2	0.095185
42	2017	3	0.109742
42	2017	4	0.123180
42	2017	5	0.041433
42	2017	6	0.043673
42	2017	7	0.010078
42	2017	8	0.036954
42	2017	9	0.083987
42	2017	10	0.172452
42	2017	11	0.060470
42	2017	12	0.003359
42	2017	13	0.034714
42	2017	14	0.024636
42	2017	15	0.000000
42	2017	16	0.030235
42	2017	17	0.000000
42	2017	18	0.000000
42	2017	19	0.000000
42	2017	20	0.000000
42	2017	21	0.000000
42	2017	22	0.000000
42	2017	23	0.000000
42	2017	24	0.000000
42	2017	25	0.000000
42	2017	26	0.000000
42	2017	27	0.000000
42	2017	28	0.000000
42	2017	29	0.000000
42	2017	30	0.000000
43	2017	0	0.091712
43	2017	1	0.083511
43	2017	2	0.071610
43	2017	3	0.056508
43	2017	4	0.061108
43	2017	5	0.066809
43	2017	6	0.044706
43	2017	7	0.022803
43	2017	8	0.028804
43	2017	9	0.056408
43	2017	10	0.101714
43	2017	11	0.079111
43	2017	12	0.058108
43	2017	13	0.023603
43	2017	14	0.017602
43	2017	15	0.012602
43	2017	16	0.016902
43	2017	17	0.029204
43	2017	18	0.016302
43	2017	19	0.009601
43	2017	20	0.008801
43	2017	21	0.007501
43	2017	22	0.006802
43	2017	23	0.004550
43	2017	24	0.003298
43	2017	25	0.002360
43	2017	26	0.002356
43	2017	27	0.002387
43	2017	28	0.001907
43	2017	29	0.001627
43	2017	30	0.009684
51	2017	0	0.091701
51	2017	1	0.083501
51	2017	2	0.071601
51	2017	3	0.056500
51	2017	4	0.061100
51	2017	5	0.066800
51	2017	6	0.044700
51	2017	7	0.022800
51	2017	8	0.028800
51	2017	9	0.056400
51	2017	10	0.101701
51	2017	11	0.079101
51	2017	12	0.058100
51	2017	13	0.023600

Source TypeID	YearID	AgeID	AgeFraction
51	2017	14	0.017600
51	2017	15	0.012600
51	2017	16	0.016900
51	2017	17	0.029200
51	2017	18	0.016300
51	2017	19	0.009600
51	2017	20	0.008800
51	2017	21	0.007500
51	2017	22	0.006900
51	2017	23	0.004600
51	2017	24	0.003400
51	2017	25	0.002399
51	2017	26	0.002400
51	2017	27	0.002399
51	2017	28	0.001899
51	2017	29	0.001599
51	2017	30	0.009497
52	2017	0	0.075902
52	2017	1	0.077979
52	2017	2	0.067451
52	2017	3	0.057001
52	2017	4	0.057925
52	2017	5	0.058872
52	2017	6	0.042343
52	2017	7	0.023165
52	2017	8	0.026167
52	2017	9	0.053632
52	2017	10	0.089651
52	2017	11	0.074040
52	2017	12	0.056426
52	2017	13	0.031902
52	2017	14	0.024974
52	2017	15	0.020074
52	2017	16	0.024214
52	2017	17	0.031331
52	2017	18	0.019495
52	2017	19	0.012833
52	2017	20	0.012325
52	2017	21	0.009555
52	2017	22	0.009115
52	2017	23	0.006738
52	2017	24	0.004834
52	2017	25	0.003357
52	2017	26	0.003105
52	2017	27	0.002947
52	2017	28	0.002629
52	2017	29	0.002082
52	2017	30	0.017936
53	2017	0	0.090747
53	2017	1	0.083523
53	2017	2	0.071648
53	2017	3	0.056944
53	2017	4	0.061293
53	2017	5	0.066373
53	2017	6	0.044669
53	2017	7	0.022803
53	2017	8	0.028607
53	2017	9	0.056219

Source TypeID	YearID	AgeID	AgeFraction
53	2017	10	0.100683
53	2017	11	0.078455
53	2017	12	0.057687
53	2017	13	0.023775
53	2017	14	0.017728
53	2017	15	0.012730
53	2017	16	0.017052
53	2017	17	0.029110
53	2017	18	0.016319
53	2017	19	0.009654
53	2017	20	0.008869
53	2017	21	0.007538
53	2017	22	0.007412
53	2017	23	0.004958
53	2017	24	0.003962
53	2017	25	0.002656
53	2017	26	0.002685
53	2017	27	0.002534
53	2017	28	0.001967
53	2017	29	0.001593
53	2017	30	0.009806
54	2017	0	0.091779
54	2017	1	0.083572
54	2017	2	0.071662
54	2017	3	0.056549
54	2017	4	0.061153
54	2017	5	0.066858
54	2017	6	0.044738
54	2017	7	0.022820
54	2017	8	0.028825
54	2017	9	0.056449
54	2017	10	0.101788
54	2017	11	0.079168
54	2017	12	0.058150
54	2017	13	0.023620
54	2017	14	0.017615
54	2017	15	0.012611
54	2017	16	0.016915
54	2017	17	0.029225
54	2017	18	0.016314
54	2017	19	0.009608
54	2017	20	0.008808
54	2017	21	0.007506
54	2017	22	0.006554
54	2017	23	0.004374
54	2017	24	0.003038
54	2017	25	0.002238
54	2017	26	0.002240
54	2017	27	0.002340
54	2017	28	0.001882
54	2017	29	0.001651
54	2017	30	0.009954
61	2017	0	0.091783
61	2017	1	0.083575
61	2017	2	0.071664
61	2017	3	0.056551
61	2017	4	0.061155
61	2017	5	0.066860

Source TypeID	YearID	AgeID	AgeFraction
61	2017	6	0.044740
61	2017	7	0.022821
61	2017	8	0.028826
61	2017	9	0.056451
61	2017	10	0.101792
61	2017	11	0.079171
61	2017	12	0.058152
61	2017	13	0.023621
61	2017	14	0.017616
61	2017	15	0.012611
61	2017	16	0.016915
61	2017	17	0.029226
61	2017	18	0.016315
61	2017	19	0.009609
61	2017	20	0.008808
61	2017	21	0.007507
61	2017	22	0.006866
61	2017	23	0.004472
61	2017	24	0.003355
61	2017	25	0.002337
61	2017	26	0.002374
61	2017	27	0.002362
61	2017	28	0.001809
61	2017	29	0.001510
61	2017	30	0.009148
62	2017	0	0.091735
62	2017	1	0.083532
62	2017	2	0.071627
62	2017	3	0.056522
62	2017	4	0.061123
62	2017	5	0.066826
62	2017	6	0.044717
62	2017	7	0.022809
62	2017	8	0.028811
62	2017	9	0.056422
62	2017	10	0.101739
62	2017	11	0.079130
62	2017	12	0.058122
62	2017	13	0.023609
62	2017	14	0.017607
62	2017	15	0.012605
62	2017	16	0.016906
62	2017	17	0.029211
62	2017	18	0.016306
62	2017	19	0.009604
62	2017	20	0.008803
62	2017	21	0.007503
62	2017	22	0.006886
62	2017	23	0.004550
62	2017	24	0.003382
62	2017	25	0.002374
62	2017	26	0.002388
62	2017	27	0.002383
62	2017	28	0.001864
62	2017	29	0.001563
62	2017	30	0.009340

[IMCoverage]

polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	useIMyn	Compliance Factor
101	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
101	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
101	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
101	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
101	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
101	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
101	4	4013	2017	32	1	103	1967	1980	1	13	N	57.6164
101	4	4013	2017	32	1	106	1981	1995	2	31	N	64.12
101	4	4013	2017	32	1	110	1996	2013	2	51	N	90.0428
101	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
102	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
102	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
102	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
102	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
102	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
102	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
102	4	4013	2017	32	1	103	1967	1980	1	13	N	57.6164
102	4	4013	2017	32	1	106	1981	1995	2	31	N	64.12
102	4	4013	2017	32	1	110	1996	2013	2	51	N	90.0428
102	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
112	4	4013	2017	21	1	108	1996	2013	2	43	N	83.814
112	4	4013	2017	21	1	109	1981	1995	2	44	N	64.12
112	4	4013	2017	31	1	108	1996	2013	2	43	N	83.814
112	4	4013	2017	31	1	109	1981	1995	2	44	N	64.12
112	4	4013	2017	32	1	108	1996	2013	2	43	N	83.814
112	4	4013	2017	32	1	109	1981	1995	2	44	N	64.12
112	4	4013	2017	52	1	107	1981	2013	1	41	N	86.2872
201	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
201	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
201	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
201	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
201	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
201	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
201	4	4013	2017	32	1	103	1967	1980	1	13	N	57.6164
201	4	4013	2017	32	1	106	1981	1995	2	31	N	64.12
201	4	4013	2017	32	1	110	1996	2013	2	51	N	90.0428
201	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
202	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
202	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
202	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
202	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
202	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
202	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
202	4	4013	2017	32	1	103	1967	1980	1	13	N	57.6164
202	4	4013	2017	32	1	106	1981	1995	2	31	N	64.12
202	4	4013	2017	32	1	110	1996	2013	2	51	N	90.0428
202	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
301	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
301	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
301	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
301	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
301	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
301	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
301	4	4013	2017	32	1	103	1967	1980	1	13	N	57.6164
301	4	4013	2017	32	1	106	1981	1995	2	31	N	64.12
301	4	4013	2017	32	1	110	1996	2013	2	51	N	90.0428
301	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
302	4	4013	2017	21	1	103	1967	1980	1	13	N	57.6164
302	4	4013	2017	21	1	106	1981	1995	2	31	N	64.12
302	4	4013	2017	21	1	110	1996	2013	2	51	N	90.0428
302	4	4013	2017	31	1	103	1967	1980	1	13	N	57.6164
302	4	4013	2017	31	1	106	1981	1995	2	31	N	64.12
302	4	4013	2017	31	1	110	1996	2013	2	51	N	90.0428
302	4	4013	2017	52	1	103	1967	2013	1	13	N	87.2032
101	4	4013	2017	21	5	303	1967	1980	1	13	N	57.6164
101	4	4013	2017	21	5	306	1981	1995	2	31	N	64.12
101	4	4013	2017	21	5	310	1996	2013	2	51	N	90.0428
101	4	4013	2017	31	5	303	1967	1980	1	13	N	57.6164
101	4	4013	2017	31	5	306	1981	1995	2	31	N	64.12
101	4	4013	2017	31	5	310	1996	2013	2	51	N	90.0428
101	4	4013	2017	32	5	303	1967	1980	1	13	N	57.6164
101	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
101	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
101	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
102	4	4013	2017	21	5	303	1967	1980	1	13	N	57.6164
102	4	4013	2017	21	5	306	1981	1995	2	31	N	64.12
102	4	4013	2017	21	5	310	1996	2013	2	51	N	90.0428
102	4	4013	2017	31	5	303	1967	1980	1	13	N	57.6164
102	4	4013	2017	31	5	306	1981	1995	2	31	N	64.12

polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	uselMyn	Compliance Factor
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102	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
102	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
102	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
112	4	4013	2017	21	5	308	1996	2013	2	43	N	83.814
112	4	4013	2017	21	5	309	1981	1995	2	44	N	64.12
112	4	4013	2017	31	5	308	1996	2013	2	43	N	83.814
112	4	4013	2017	31	5	309	1981	1995	2	44	N	64.12
112	4	4013	2017	32	5	308	1996	2013	2	43	N	83.814
112	4	4013	2017	32	5	309	1981	1995	2	44	N	64.12
112	4	4013	2017	52	5	307	1981	2013	1	41	N	86.2872
201	4	4013	2017	21	5	303	1967	1980	1	13	N	57.6164
201	4	4013	2017	21	5	306	1981	1995	2	31	N	64.12
201	4	4013	2017	21	5	310	1996	2013	2	51	N	90.0428
201	4	4013	2017	31	5	303	1967	1980	1	13	N	57.6164
201	4	4013	2017	31	5	306	1981	1995	2	31	N	64.12
201	4	4013	2017	31	5	310	1996	2013	2	51	N	90.0428
201	4	4013	2017	32	5	303	1967	1980	1	13	N	57.6164
201	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
201	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
201	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
202	4	4013	2017	21	5	303	1967	1980	1	13	N	57.6164
202	4	4013	2017	21	5	306	1981	1995	2	31	N	64.12
202	4	4013	2017	21	5	310	1996	2013	2	51	N	90.0428
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202	4	4013	2017	31	5	310	1996	2013	2	51	N	90.0428
202	4	4013	2017	32	5	303	1967	1980	1	13	N	57.6164
202	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
202	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
202	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
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301	4	4013	2017	31	5	310	1996	2013	2	51	N	90.0428
301	4	4013	2017	32	5	303	1967	1980	1	13	N	57.6164
301	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
301	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
301	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
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302	4	4013	2017	21	5	310	1996	2013	2	51	N	90.0428
302	4	4013	2017	31	5	303	1967	1980	1	13	N	57.6164
302	4	4013	2017	31	5	306	1981	1995	2	31	N	64.12
302	4	4013	2017	31	5	310	1996	2013	2	51	N	90.0428
302	4	4013	2017	32	5	303	1967	1980	1	13	N	57.6164
302	4	4013	2017	32	5	306	1981	1995	2	31	N	64.12
302	4	4013	2017	32	5	310	1996	2013	2	51	N	90.0428
302	4	4013	2017	52	5	303	1967	2013	1	13	N	87.2032
101	4	4013	2017	21	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	21	1	6	1981	1995	2	33	Y	63.6192228
101	4	4013	2017	21	1	10	1996	2013	2	51	Y	83.1594264
101	4	4013	2017	31	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	31	1	6	1981	1995	2	33	Y	63.6192228
101	4	4013	2017	31	1	10	1996	2013	2	51	Y	78.1698828
101	4	4013	2017	32	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	32	1	6	1981	1995	2	33	Y	63.6192228
101	4	4013	2017	32	1	10	1996	2013	2	51	Y	73.1802476
101	4	4013	2017	41	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	42	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	43	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	51	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	52	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	53	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	54	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	61	1	3	1967	1980	1	13	Y	57.207864
101	4	4013	2017	62	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	21	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	21	1	6	1981	1995	2	33	Y	63.6192228
102	4	4013	2017	21	1	10	1996	2013	2	51	Y	83.1594264
102	4	4013	2017	31	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	31	1	6	1981	1995	2	33	Y	63.6192228
102	4	4013	2017	31	1	10	1996	2013	2	51	Y	78.1698828
102	4	4013	2017	32	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	32	1	6	1981	1995	2	33	Y	63.6192228
102	4	4013	2017	32	1	10	1996	2013	2	51	Y	73.1802476
102	4	4013	2017	41	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	42	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	43	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	51	1	3	1967	1980	1	13	Y	57.207864
102	4	4013	2017	52	1	3	1967	1980	1	13	Y	57.207864

polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	uselMyn	Compliance Factor
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102	4	4013	2017	54	1	3	1967	1980	1	13	Y	57.207864
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102	4	4013	2017	62	1	3	1967	1980	1	13	Y	57.207864
112	4	4013	2017	21	1	8	1996	2013	2	45	Y	89.3395868
112	4	4013	2017	21	1	9	1981	1995	2	44	Y	63.6192228
112	4	4013	2017	21	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	31	1	8	1996	2013	2	45	Y	83.9791548
112	4	4013	2017	31	1	9	1981	1995	2	44	Y	59.8020676
112	4	4013	2017	31	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	32	1	8	1996	2013	2	45	Y	78.6188144
112	4	4013	2017	32	1	9	1981	1995	2	44	Y	55.9849124
112	4	4013	2017	32	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	41	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	41	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	42	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	42	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	43	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	43	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	51	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	51	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	52	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	52	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	53	1	7	1981	2013	1	41	Y	85.6132988
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112	4	4013	2017	54	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	61	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	61	1	11	1967	1980	1	41	Y	86.7668176
112	4	4013	2017	62	1	7	1981	2013	1	41	Y	85.6132988
112	4	4013	2017	62	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	21	1	8	1996	2013	2	45	Y	89.3395868
113	4	4013	2017	21	1	9	1981	1995	2	44	Y	63.6192228
113	4	4013	2017	21	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	31	1	8	1996	2013	2	45	Y	83.9791548
113	4	4013	2017	31	1	9	1981	1995	2	44	Y	59.8020676
113	4	4013	2017	31	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	32	1	8	1996	2013	2	45	Y	78.6188144
113	4	4013	2017	32	1	9	1981	1995	2	44	Y	55.9849124
113	4	4013	2017	32	1	11	1967	1980	1	41	Y	86.7668176
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113	4	4013	2017	41	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	42	1	7	1981	2013	1	41	Y	85.6132988
113	4	4013	2017	42	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	43	1	7	1981	2013	1	41	Y	85.6132988
113	4	4013	2017	43	1	11	1967	1980	1	41	Y	86.7668176
113	4	4013	2017	51	1	7	1981	2013	1	41	Y	85.6132988
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113	4	4013	2017	62	1	7	1981	2013	1	41	Y	85.6132988
113	4	4013	2017	62	1	11	1967	1980	1	41	Y	86.7668176
201	4	4013	2017	21	1	3	1967	1980	1	13	Y	57.207864
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201	4	4013	2017	31	1	3	1967	1980	1	13	Y	57.207864
201	4	4013	2017	31	1	6	1981	1995	2	33	Y	63.6192228
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202	4	4013	2017	31	1	6	1981	1995	2	33	Y	63.6192228
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202	4	4013	2017	32	1	3	1967	1980	1	13	Y	57.207864
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polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	uselMyn	Compliance Factor
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301	4	4013	2017	32	1	10	1996	2013	2	51	Y	73.1802476
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101	4	4013	2017	52	1	4	1981	2013	2	13	Y	86.522154
101	4	4013	2017	53	1	4	1981	2013	2	13	Y	86.522154
101	4	4013	2017	54	1	4	1981	2013	2	13	Y	86.522154
101	4	4013	2017	61	1	4	1981	2013	2	13	Y	86.522154
101	4	4013	2017	62	1	4	1981	2013	2	13	Y	86.522154
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302	4	4013	2017	41	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	42	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	43	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	51	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	52	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	53	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	54	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	61	5	504	1981	2013	2	13	Y	86.522154
302	4	4013	2017	62	5	504	1981	2013	2	13	Y	86.522154

[RoadType]

roadTypeID	rampFraction
2	0.048474983
4	0.132656588

[RoadTypeDistribution]

sourceTypeID	roadTypeID	roadTypeVMTFraction
11	1	0.00000
11	2	0.01553
11	3	0.07407
11	4	0.31380
11	5	0.59660
21	1	0.00000
21	2	0.01535
21	3	0.05868
21	4	0.38280
21	5	0.54317
31	1	0.00000
31	2	0.01535
31	3	0.05868
31	4	0.38280
31	5	0.54317
32	1	0.00000
32	2	0.01535
32	3	0.05868
32	4	0.38280
32	5	0.54317
41	1	0.00000
41	2	0.12898
41	3	0.06703
41	4	0.46862
41	5	0.33537
42	1	0.00000
42	2	0.12898
42	3	0.06703
42	4	0.46862
42	5	0.33537
43	1	0.00000
43	2	0.12898
43	3	0.06703
43	4	0.46862
43	5	0.33537
51	1	0.00000
51	2	0.03917
51	3	0.05784
51	4	0.54790
51	5	0.35509
52	1	0.00000
52	2	0.03917
52	3	0.05784
52	4	0.54790
52	5	0.35509
53	1	0.00000
53	2	0.03917
53	3	0.05784
53	4	0.54790
53	5	0.35509
54	1	0.00000
54	2	0.03917
54	3	0.05784
54	4	0.54790
54	5	0.35509
61	1	0.00000
61	2	0.21741
61	3	0.06175
61	4	0.51666
61	5	0.20418
62	1	0.00000
62	2	0.21741
62	3	0.06175
62	4	0.51666
62	5	0.20418

[MonthVMTFraction]

sourceTypeID	monthID	monthVMTFraction
11	1	0.084746
21	1	0.084746
31	1	0.084746
32	1	0.084746
41	1	0.084746
42	1	0.084746
43	1	0.084746
51	1	0.084746
52	1	0.084746
53	1	0.084746
54	1	0.084746
61	1	0.084746
62	1	0.084746
11	2	0.079142
21	2	0.079142
31	2	0.079142
32	2	0.079142
41	2	0.079142
42	2	0.079142
43	2	0.079142
51	2	0.079142
52	2	0.079142
53	2	0.079142
54	2	0.079142
61	2	0.079142
62	2	0.079142
11	3	0.087837
21	3	0.087837
31	3	0.087837
32	3	0.087837
41	3	0.087837
42	3	0.087837
43	3	0.087837
51	3	0.087837
52	3	0.087837
53	3	0.087837
54	3	0.087837
61	3	0.087837
62	3	0.087837
11	4	0.084785
21	4	0.084785
31	4	0.084785
32	4	0.084785
41	4	0.084785
42	4	0.084785
43	4	0.084785
51	4	0.084785
52	4	0.084785
53	4	0.084785
54	4	0.084785
61	4	0.084785
62	4	0.084785
11	5	0.085945
21	5	0.085945
31	5	0.085945
32	5	0.085945
41	5	0.085945
42	5	0.085945
43	5	0.085945
51	5	0.085945
52	5	0.085945
53	5	0.085945
54	5	0.085945
61	5	0.085945
62	5	0.085945
11	6	0.081088
21	6	0.081088
31	6	0.081088
32	6	0.081088
41	6	0.081088
42	6	0.081088
43	6	0.081088
51	6	0.081088
52	6	0.081088
53	6	0.081088
54	6	0.081088
61	6	0.081088
62	6	0.081088

sourceTypeID	monthID	monthVMTFraction
11	7	0.079795
21	7	0.079795
31	7	0.079795
32	7	0.079795
41	7	0.079795
42	7	0.079795
43	7	0.079795
51	7	0.079795
52	7	0.079795
53	7	0.079795
54	7	0.079795
61	7	0.079795
62	7	0.079795
11	8	0.082268
21	8	0.082268
31	8	0.082268
32	8	0.082268
41	8	0.082268
42	8	0.082268
43	8	0.082268
51	8	0.082268
52	8	0.082268
53	8	0.082268
54	8	0.082268
61	8	0.082268
62	8	0.082268
11	9	0.081392
21	9	0.081392
31	9	0.081392
32	9	0.081392
41	9	0.081392
42	9	0.081392
43	9	0.081392
51	9	0.081392
52	9	0.081392
53	9	0.081392
54	9	0.081392
61	9	0.081392
62	9	0.081392
11	10	0.085131
21	10	0.085131
31	10	0.085131
32	10	0.085131
41	10	0.085131
42	10	0.085131
43	10	0.085131
51	10	0.085131
52	10	0.085131
53	10	0.085131
54	10	0.085131
61	10	0.085131
62	10	0.085131
11	11	0.082995
21	11	0.082995
31	11	0.082995
32	11	0.082995
41	11	0.082995
42	11	0.082995
43	11	0.082995
51	11	0.082995
52	11	0.082995
53	11	0.082995
54	11	0.082995
61	11	0.082995
62	11	0.082995
11	12	0.084877
21	12	0.084877
31	12	0.084877
32	12	0.084877
41	12	0.084877
42	12	0.084877
43	12	0.084877
51	12	0.084877
52	12	0.084877
53	12	0.084877
54	12	0.084877
61	12	0.084877
62	12	0.084877

[DayVMTFraction] (July 2017)

Source TypeID	Month ID	Road TypeID	dayID	Day VMTFraction
11	7	1	5	0.780527
21	7	1	5	0.780527
31	7	1	5	0.780527
32	7	1	5	0.780527
41	7	1	5	0.780527
42	7	1	5	0.780527
43	7	1	5	0.780527
51	7	1	5	0.780527
52	7	1	5	0.780527
53	7	1	5	0.780527
54	7	1	5	0.780527
61	7	1	5	0.780527
62	7	1	5	0.780527
11	7	2	5	0.783228
21	7	2	5	0.783228
31	7	2	5	0.783228
32	7	2	5	0.783228
41	7	2	5	0.783228
42	7	2	5	0.783228
43	7	2	5	0.783228
51	7	2	5	0.783228
52	7	2	5	0.783228
53	7	2	5	0.783228
54	7	2	5	0.783228
61	7	2	5	0.783228
62	7	2	5	0.783228
11	7	3	5	0.778523
21	7	3	5	0.778523
31	7	3	5	0.778523
32	7	3	5	0.778523
41	7	3	5	0.778523
42	7	3	5	0.778523
43	7	3	5	0.778523
51	7	3	5	0.778523
52	7	3	5	0.778523
53	7	3	5	0.778523
54	7	3	5	0.778523
61	7	3	5	0.778523
62	7	3	5	0.778523
11	7	4	5	0.783228
21	7	4	5	0.783228
31	7	4	5	0.783228
32	7	4	5	0.783228
41	7	4	5	0.783228
42	7	4	5	0.783228
43	7	4	5	0.783228
51	7	4	5	0.783228
52	7	4	5	0.783228
53	7	4	5	0.783228
54	7	4	5	0.783228
61	7	4	5	0.783228
62	7	4	5	0.783228
11	7	5	5	0.778523
21	7	5	5	0.778523
31	7	5	5	0.778523
32	7	5	5	0.778523
41	7	5	5	0.778523
42	7	5	5	0.778523
43	7	5	5	0.778523
51	7	5	5	0.778523
52	7	5	5	0.778523
53	7	5	5	0.778523
54	7	5	5	0.778523
61	7	5	5	0.778523
62	7	5	5	0.778523
11	7	1	2	0.219473

Source TypeID	Month ID	Road TypeID	dayID	Day VMTFraction
21	7	1	2	0.219473
31	7	1	2	0.219473
32	7	1	2	0.219473
41	7	1	2	0.219473
42	7	1	2	0.219473
43	7	1	2	0.219473
51	7	1	2	0.219473
52	7	1	2	0.219473
53	7	1	2	0.219473
54	7	1	2	0.219473
61	7	1	2	0.219473
62	7	1	2	0.219473
11	7	2	2	0.216772
21	7	2	2	0.216772
31	7	2	2	0.216772
32	7	2	2	0.216772
41	7	2	2	0.216772
42	7	2	2	0.216772
43	7	2	2	0.216772
51	7	2	2	0.216772
52	7	2	2	0.216772
53	7	2	2	0.216772
54	7	2	2	0.216772
61	7	2	2	0.216772
62	7	2	2	0.216772
11	7	3	2	0.221477
21	7	3	2	0.221477
31	7	3	2	0.221477
32	7	3	2	0.221477
41	7	3	2	0.221477
42	7	3	2	0.221477
43	7	3	2	0.221477
51	7	3	2	0.221477
52	7	3	2	0.221477
53	7	3	2	0.221477
54	7	3	2	0.221477
61	7	3	2	0.221477
62	7	3	2	0.221477
11	7	4	2	0.216772
21	7	4	2	0.216772
31	7	4	2	0.216772
32	7	4	2	0.216772
41	7	4	2	0.216772
42	7	4	2	0.216772
43	7	4	2	0.216772
51	7	4	2	0.216772
52	7	4	2	0.216772
53	7	4	2	0.216772
54	7	4	2	0.216772
61	7	4	2	0.216772
62	7	4	2	0.216772
11	7	5	2	0.221477
21	7	5	2	0.221477
31	7	5	2	0.221477
32	7	5	2	0.221477
41	7	5	2	0.221477
42	7	5	2	0.221477
43	7	5	2	0.221477
51	7	5	2	0.221477
52	7	5	2	0.221477
53	7	5	2	0.221477
54	7	5	2	0.221477
61	7	5	2	0.221477
62	7	5	2	0.221477

[HourVMTFraction] (SourceTypeID 21: Passenger Car)

Source TypeID	Road TypeID	dayID	hourID	hourVMT Fraction
21	1	5	1	0.007634
21	1	5	2	0.005215
21	1	5	3	0.004896
21	1	5	4	0.006994
21	1	5	5	0.019983
21	1	5	6	0.035384
21	1	5	7	0.052788
21	1	5	8	0.066238
21	1	5	9	0.060727
21	1	5	10	0.051529
21	1	5	11	0.050067
21	1	5	12	0.053712
21	1	5	13	0.056889
21	1	5	14	0.059262
21	1	5	15	0.063777
21	1	5	16	0.068091
21	1	5	17	0.070577
21	1	5	18	0.071309
21	1	5	19	0.058079
21	1	5	20	0.041175
21	1	5	21	0.033501
21	1	5	22	0.028521
21	1	5	23	0.020484
21	1	5	24	0.013169
21	2	5	1	0.009714
21	2	5	2	0.006908
21	2	5	3	0.006883
21	2	5	4	0.010955
21	2	5	5	0.033927
21	2	5	6	0.048421
21	2	5	7	0.057932
21	2	5	8	0.061169
21	2	5	9	0.057327
21	2	5	10	0.053128
21	2	5	11	0.050390
21	2	5	12	0.052030
21	2	5	13	0.054821
21	2	5	14	0.060928
21	2	5	15	0.063510
21	2	5	16	0.064499
21	2	5	17	0.059918
21	2	5	18	0.058100
21	2	5	19	0.050322
21	2	5	20	0.038704
21	2	5	21	0.033058
21	2	5	22	0.029950
21	2	5	23	0.023936
21	2	5	24	0.016469
21	3	5	1	0.006081
21	3	5	2	0.003952
21	3	5	3	0.003413
21	3	5	4	0.004039
21	3	5	5	0.009578
21	3	5	6	0.025656
21	3	5	7	0.048950
21	3	5	8	0.070020
21	3	5	9	0.063264
21	3	5	10	0.050335
21	3	5	11	0.049826
21	3	5	12	0.054967
21	3	5	13	0.058433
21	3	5	14	0.058019
21	3	5	15	0.063976
21	3	5	16	0.073011
21	3	5	17	0.078530
21	3	5	18	0.081166
21	3	5	19	0.063868
21	3	5	20	0.043018
21	3	5	21	0.033831
21	3	5	22	0.027454
21	3	5	23	0.017909
21	3	5	24	0.010705
21	1	2	1	0.021553
21	1	2	2	0.015543
21	1	2	3	0.013842
21	1	2	4	0.010880
21	1	2	5	0.013879
21	1	2	6	0.021227
21	1	2	7	0.028774
21	1	2	8	0.035288
21	1	2	9	0.041332
21	1	2	10	0.048945
21	1	2	11	0.055256
21	1	2	12	0.059308
21	1	2	13	0.063521
21	1	2	14	0.064017
21	1	2	15	0.062895
21	1	2	16	0.062516
21	1	2	17	0.062882
21	1	2	18	0.061531
21	1	2	19	0.058339
21	1	2	20	0.050576
21	1	2	21	0.045160
21	1	2	22	0.041531
21	1	2	23	0.035595
21	1	2	24	0.025611
21	2	2	1	0.021879
21	2	2	2	0.016150
21	2	2	3	0.014371
21	2	2	4	0.011634
21	2	2	5	0.015883
21	2	2	6	0.023085
21	2	2	7	0.029735
21	2	2	8	0.035822
21	2	2	9	0.041262
21	2	2	10	0.048420
21	2	2	11	0.054548
21	2	2	12	0.058679
21	2	2	13	0.062843
21	2	2	14	0.063229
21	2	2	15	0.061805
21	2	2	16	0.061310

Source TypeID	Road TypeID	dayID	hourID	hourVMT Fraction
21	2	2	17	0.061686
21	2	2	18	0.059991
21	2	2	19	0.057141
21	2	2	20	0.050324
21	2	2	21	0.046109
21	2	2	22	0.042308
21	2	2	23	0.035832
21	2	2	24	0.025951
21	3	2	1	0.021315
21	3	2	2	0.015101
21	3	2	3	0.013457
21	3	2	4	0.010331
21	3	2	5	0.012420
21	3	2	6	0.019876
21	3	2	7	0.028075
21	3	2	8	0.034899
21	3	2	9	0.041383
21	3	2	10	0.049326
21	3	2	11	0.055770
21	3	2	12	0.059766
21	3	2	13	0.064014
21	3	2	14	0.064591
21	3	2	15	0.063689
21	3	2	16	0.063394
21	3	2	17	0.063753
21	3	2	18	0.062652
21	3	2	19	0.059210
21	3	2	20	0.050759
21	3	2	21	0.044469
21	3	2	22	0.040966
21	3	2	23	0.035423
21	3	2	24	0.025364
21	4	2	1	0.021879
21	4	2	2	0.016150
21	4	2	3	0.014371
21	4	2	4	0.011634
21	4	2	5	0.015883
21	4	2	6	0.023085
21	4	2	7	0.029735
21	4	2	8	0.035822
21	4	2	9	0.041262
21	4	2	10	0.048420
21	4	2	11	0.054548
21	4	2	12	0.058679
21	4	2	13	0.062843
21	4	2	14	0.063229
21	4	2	15	0.061805
21	4	2	16	0.061310

Source TypeID	Road TypeID	dayID	hourID	hourVMT Fraction
21	2	2	17	0.061686
21	2	2	18	0.059991
21	2	2	19	0.057141
21	2	2	20	0.050324
21	2	2	21	0.046109
21	2	2	22	0.042308
21	2	2	23	0.035832
21	2	2	24	0.025951
21	3	2	1	0.021315
21	3	2	2	0.015101
21	3	2	3	0.013457
21	3	2	4	0.010331
21	3	2	5	0.012420
21	3	2	6	0.019876
21	3	2	7	0.028075
21	3	2	8	0.034899
21	3	2	9	0.041383
21	3	2	10	0.049326
21	3	2	11	0.055770
21	3	2	12	0.059766
21	3	2	13	0.064014
21	3	2	14	0.064591
21	3	2	15	0.063689
21	3	2	16	0.063394
21	3	2	17	0.063753
21	3	2	18	0.062652
21	3	2	19	0.059210
21	3	2	20	0.050759
21	3	2	21	0.044469
21	3	2	22	0.040966
21	3	2	23	0.035423
21	3	2	24	0.025364

[AvgSpeedDistribution] (SourceTypeID 21: Passenger Car and RoadTypeID 5: Urban Restricted Access)

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	15	1	0.000000
21	5	15	2	0.000182
21	5	15	3	0.006560
21	5	15	4	0.026146
21	5	15	5	0.136614
21	5	15	6	0.263923
21	5	15	7	0.234566
21	5	15	8	0.250808
21	5	15	9	0.077113
21	5	15	10	0.002482
21	5	15	11	0.001245
21	5	15	12	0.000360
21	5	15	13	0.000000
21	5	15	14	0.000000
21	5	15	15	0.000000
21	5	15	16	0.000000
21	5	25	1	0.000000
21	5	25	2	0.000182
21	5	25	3	0.006560
21	5	25	4	0.026146
21	5	25	5	0.136614
21	5	25	6	0.263923
21	5	25	7	0.234566
21	5	25	8	0.250808
21	5	25	9	0.077113
21	5	25	10	0.002482
21	5	25	11	0.001245
21	5	25	12	0.000360
21	5	25	13	0.000000
21	5	25	14	0.000000
21	5	25	15	0.000000
21	5	25	16	0.000000
21	5	35	1	0.000000
21	5	35	2	0.000182
21	5	35	3	0.006560
21	5	35	4	0.026146
21	5	35	5	0.136614
21	5	35	6	0.263923
21	5	35	7	0.234566
21	5	35	8	0.250808
21	5	35	9	0.077113
21	5	35	10	0.002482
21	5	35	11	0.001245
21	5	35	12	0.000360
21	5	35	13	0.000000
21	5	35	14	0.000000
21	5	35	15	0.000000
21	5	35	16	0.000000
21	5	45	1	0.000000
21	5	45	2	0.000182
21	5	45	3	0.006560
21	5	45	4	0.026146
21	5	45	5	0.136614
21	5	45	6	0.263923
21	5	45	7	0.234566
21	5	45	8	0.250808
21	5	45	9	0.077113
21	5	45	10	0.002482
21	5	45	11	0.001245
21	5	45	12	0.000360
21	5	45	13	0.000000
21	5	45	14	0.000000
21	5	45	15	0.000000
21	5	45	16	0.000000
21	5	55	1	0.000000
21	5	55	2	0.000182
21	5	55	3	0.006560
21	5	55	4	0.026146
21	5	55	5	0.136614
21	5	55	6	0.263923
21	5	55	7	0.234566
21	5	55	8	0.250808
21	5	55	9	0.077113
21	5	55	10	0.002482
21	5	55	11	0.001245
21	5	55	12	0.000360
21	5	55	13	0.000000

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	55	14	0.000000
21	5	55	15	0.000000
21	5	55	16	0.000000
21	5	65	1	0.000000
21	5	65	2	0.000182
21	5	65	3	0.006560
21	5	65	4	0.026146
21	5	65	5	0.136614
21	5	65	6	0.263923
21	5	65	7	0.234566
21	5	65	8	0.250808
21	5	65	9	0.077113
21	5	65	10	0.002482
21	5	65	11	0.001245
21	5	65	12	0.000360
21	5	65	13	0.000000
21	5	65	14	0.000000
21	5	65	15	0.000000
21	5	65	16	0.000000
21	5	75	1	0.000000
21	5	75	2	0.002060
21	5	75	3	0.020325
21	5	75	4	0.076327
21	5	75	5	0.198773
21	5	75	6	0.309004
21	5	75	7	0.193188
21	5	75	8	0.149650
21	5	75	9	0.047484
21	5	75	10	0.002036
21	5	75	11	0.001041
21	5	75	12	0.000111
21	5	75	13	0.000000
21	5	75	14	0.000000
21	5	75	15	0.000000
21	5	75	16	0.000000
21	5	85	1	0.000000
21	5	85	2	0.002060
21	5	85	3	0.020325
21	5	85	4	0.076327
21	5	85	5	0.198773
21	5	85	6	0.309004
21	5	85	7	0.193188
21	5	85	8	0.149650
21	5	85	9	0.047484
21	5	85	10	0.002036
21	5	85	11	0.001041
21	5	85	12	0.000111
21	5	85	13	0.000000
21	5	85	14	0.000000
21	5	85	15	0.000000
21	5	85	16	0.000000
21	5	95	1	0.000000
21	5	95	2	0.002060
21	5	95	3	0.020325
21	5	95	4	0.076327
21	5	95	5	0.198773
21	5	95	6	0.309004
21	5	95	7	0.193188
21	5	95	8	0.149650
21	5	95	9	0.047484
21	5	95	10	0.002036
21	5	95	11	0.001041
21	5	95	12	0.000111
21	5	95	13	0.000000
21	5	95	14	0.000000
21	5	95	15	0.000000
21	5	95	16	0.000000
21	5	105	1	0.000000
21	5	105	2	0.000361
21	5	105	3	0.002221
21	5	105	4	0.025317
21	5	105	5	0.138786
21	5	105	6	0.265055
21	5	105	7	0.238469
21	5	105	8	0.245854
21	5	105	9	0.075613
21	5	105	10	0.002226
21	5	105	11	0.001767
21	5	105	12	0.000331
21	5	105	13	0.000000
21	5	105	14	0.000000
21	5	105	15	0.000000
21	5	105	16	0.000000

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	105	11	0.001767
21	5	105	12	0.000331
21	5	105	13	0.000000
21	5	105	14	0.000000
21	5	105	15	0.000000
21	5	105	16	0.000000
21	5	115	1	0.000000
21	5	115	2	0.000361
21	5	115	3	0.006221
21	5	115	4	0.025317
21	5	115	5	0.138786
21	5	115	6	0.265055
21	5	115	7	0.238469
21	5	115	8	0.245854
21	5	115	9	0.075613
21	5	115	10	0.002226
21	5	115	11	0.001767
21	5	115	12	0.000331
21	5	115	13	0.000000
21	5	115	14	0.000000
21	5	115	15	0.000000
21	5	115	16	0.000000
21	5	125	1	0.000000
21	5	125	2	0.000361
21	5	125	3	0.006221
21	5	125	4	0.025317
21	5	125	5	0.138786
21	5	125	6	0.265055
21	5	125	7	0.238469
21	5	125	8	0.245854
21	5	125	9	0.075613
21	5	125	10	0.002226
21	5	125	11	0.001767
21	5	125	12	0.000331
21	5	125	13	0.000000
21	5	125	14	0.000000
21	5	125	15	0.000000
21	5	125	16	0.000000
21	5	135	1	0.000000
21	5	135	2	0.000361
21	5	135	3	0.006221
21	5	135	4	0.025317
21	5	135	5	0.138786
21	5	135	6	0.265055
21	5	135	7	0.238469
21	5	135	8	0.245854
21	5	135	9	0.075613
21	5	135	10	0.002226
21	5	135	11	0.001767
21	5	135	12	0.000331
21	5	135	13	0.000000
21	5	135	14	0.000000
21	5	135	15	0.000000
21	5	135	16	0.000000
21	5	145	1	0.000000
21	5	145	2	0.000361
21	5	145	3	0.006221
21	5	145	4	0.025317
21	5	145	5	0.138786
21	5	145	6	0.265055
21	5	145	7	0.238469
21	5	145	8	0.245854
21	5	145	9	0.075613
21	5	145	10	0.002226
21	5	145	11	0.001767
21	5	145	12	0.000331
21	5	145	13	0.000000
21	5	145	14	0.000000
21	5	145	15	0.000000
21	5	145	16	0.000000
21	5	155	1	0.000000
21	5	155	2	0.004187
21	5	155	3	0.011052
21	5	155	4	0.071957
21	5	155	5	0.198122
21	5	155	6	0.350335
21	5	155	7	0.218862

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	155	8	0.115341
21	5	155	9	0.027730
21	5	155	10	0.001449
21	5	155	11	0.000812
21	5	155	12	0.000153
21	5	155	13	0.000000
21	5	155	14	0.000000
21	5	155	15	0.000000
21	5	155	16	0.000000
21	5	165	1	0.000000
21	5	165	2	0.004187
21	5	165	3	0.011052
21	5	165	4	0.071957
21	5	165	5	0.198122
21	5	165	6	0.350335
21	5	165	7	0.218862
21	5	165	8	0.115341
21	5	165	9	0.027730
21	5	165	10	0.001449
21	5	165	11	0.000812
21	5	165	12	0.000153
21	5	165	13	0.000000
21	5	165	14	0.000000
21	5	165	15	0.000000
21	5	165	16	0.000000
21	5	175	1	0.000000
21	5	175	2	0.004187
21	5	175	3	0.011052
21	5	175	4	0.071957
21	5	175	5	0.198122
21	5	175	6	0.350335
21	5	175	7	0.218862
21	5	175	8	0.115341
21	5	175	9	0.027730
21	5	175	10	0.001449
21	5	175	11	0.000812
21	5	175	12	0.000153
21	5	175	13	0.000000
21	5	175	14	0.000000
21	5	175	15	0.000000
21	5	175	16	0.000000
21	5	185	1	0.000000
21	5	185	2	0.004187
21	5	185	3	0.011052
21	5	185	4	0.071957
21	5	185	5	0.198122
21	5	185	6	0.350335
21	5	185	7	0.218862
21	5	185	8	0.115341
21	5	185	9	0.027730
21	5	185	10	0.001449
21	5	185	11	0.000812
21	5	185	12	0.000153
21	5	185	13	0.000000
21	5	185	14	0.000000
21	5	185	15	0.000000
21	5	185	16	0.000000
21	5	195	1	0.000000
21	5	195	2	0.000182
21	5	195	3	0.006560
21	5	195	4	0.026146
21	5	195	5	0.136614
21	5	195	6	0.263923
21	5	195	7	0.234566
21	5	195	8	0.250808
21	5	195	9	0.077113
21	5	195	10	0.002482
21	5	195	11	0.001245
21	5	195	12	0.000360
21	5	195	13	0.000000
21	5	195	14	0.000000
21	5	195	15	0.000000
21	5	195	16	0.000000
21	5	205	1	0.000000
21	5	205	2	0.000182
21	5	205	3	0.006560
21	5	205	4	0.026146
21	5	205	5	0.136614
21	5	205	6	0.263923

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	205	7	0.234566
21	5	205	8	0.250808
21	5	205	9	0.077113
21	5	205	10	0.002482
21	5	205	11	0.001245
21	5	205	12	0.000360
21	5	205	13	0.000000
21	5	205	14	0.000000
21	5	205	15	0.000000
21	5	205	16	0.000000
21	5	215	1	0.000000
21	5	215	2	0.000182
21	5	215	3	0.006560
21	5	215	4	0.026146
21	5	215	5	0.136614
21	5	215	6	0.263923
21	5	215	7	0.234566
21	5	215	8	0.250808
21	5	215	9	0.077113
21	5	215	10	0.002482
21	5	215	11	0.001245
21	5	215	12	0.000360
21	5	215	13	0.000000
21	5	215	14	0.000000
21	5	215	15	0.000000
21	5	215	16	0.000000
21	5	225	1	0.000000
21	5	225	2	0.000182
21	5	225	3	0.006560
21	5	225	4	0.026146
21	5	225	5	0.136614
21	5	225	6	0.263923
21	5	225	7	0.234566
21	5	225	8	0.250808
21	5	225	9	0.077113
21	5	225	10	0.002482
21	5	225	11	0.001245
21	5	225	12	0.000360
21	5	225	13	0.000000
21	5	225	14	0.000000
21	5	225	15	0.000000
21	5	225	16	0.000000
21	5	235	1	0.000000
21	5	235	2	0.000182
21	5	235	3	0.006560
21	5	235	4	0.026146
21	5	235	5	0.136614
21	5	235	6	0.263923
21	5	235	7	0.234566
21	5	235	8	0.250808
21	5	235	9	0.077113
21	5	235	10	0.002482
21	5	235	11	0.001245
21	5	235	12	0.000360
21	5	235	13	0.000000
21	5	235	14	0.000000
21	5	235	15	0.000000
21	5	235	16	0.000000
21	5	245	1	0.000000
21	5	245	2	0.000182
21	5	245	3	0.006560
21	5	245	4	0.026146
21	5	245	5	0.136614
21	5	245	6	0.263923
21	5	245	7	0.234566
21	5	245	8	0.250808
21	5	245	9	0.077113
21	5	245	10	0.002482
21	5	245	11	0.001245
21	5	245	12	0.000360
21	5	245	13	0.000000
21	5	245	14	0.000000
21	5	245	15	0.000000
21	5	245	16	0.000000
21	5	12	1	0.000000
21	5	12	2	0.000182
21	5	12	3	0.006560
21	5	12	4	0.026146
21	5	12	5	0.136614

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	12	6	0.263923
21	5	12	7	0.234566
21	5	12	8	0.250808
21	5	12	9	0.077113
21	5	12	10	0.002482
21	5	12	11	0.001245
21	5	12	12	0.000360
21	5	12	13	0.000000
21	5	12	14	0.000000
21	5	12	15	0.000000
21	5	12	16	0.000000
21	5	22	1	0.000000
21	5	22	2	0.000182
21	5	22	3	0.006560
21	5	22	4	0.026146
21	5	22	5	0.136614
21	5	22	6	0.263923
21	5	22	7	0.234566
21	5	22	8	0.250808
21	5	22	9	0.077113
21	5	22	10	0.002482
21	5	22	11	0.001245
21	5	22	12	0.000360
21	5	22	13	0.000000
21	5	22	14	0.000000
21	5	22	15	0.000000
21	5	22	16	0.000000
21	5	32	1	0.000000
21	5	32	2	0.000182
21	5	32	3	0.006560
21	5	32	4	0.026146
21	5	32	5	0.136614
21	5	32	6	0.263923
21	5	32	7	0.234566
21	5	32	8	0.250808
21	5	32	9	0.077113
21	5	32	10	0.002482
21	5	32	11	0.001245
21	5	32	12	0.000360
21	5	32	13	0.000000
21	5	32	14	0.000000
21	5	32	15	0.000000
21	5	32	16	0.000000
21	5	42	1	0.000000
21	5	42	2	0.000182
21	5	42	3	0.006560
21	5	42	4	0.026146
21	5	42	5	0.136614
21	5	42	6	0.263923
21	5	42	7	0.234566
21	5	42	8	0.250808
21	5	42	9	0.077113
21	5	42	10	0.002482
21	5	42	11	0.001245
21	5	42	12	0.000360
21	5	42	13	0.000000
21	5	42	14	0.000000
21	5	42	15	0.000000
21	5	42	16	0.000000
21	5	52	1	0.000000
21	5	52	2	0.000182
21	5	52	3	0.006560
21	5	52	4	0.026146
21	5	52	5	0.136614
21	5	52	6	0.263923
21	5	52	7	0.234566
21	5	52	8	0.250808
21	5	52	9	0.077113
21	5	52	10	0.002482
21	5	52	11	0.001245
21	5	52	12	0.000360
21	5	52	13	0.000000
21	5	52	14	0.000000
21	5	52	15	0.000000
21	5	52	16	0.000000
21	5	62	1	0.000000
21	5	62	2	0.000182
21	5	62	3	0.006560
21	5	62	4	0.026146

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	62	5	0.136614
21	5	62	6	0.263923
21	5	62	7	0.234566
21	5	62	8	0.250808
21	5	62	9	0.077113
21	5	62	10	0.002482
21	5	62	11	0.001245
21	5	62	12	0.000360
21	5	62	13	0.000000
21	5	62	14	0.000000
21	5	62	15	0.000000
21	5	62	16	0.000000
21	5	72	1	0.000000
21	5	72	2	0.000182
21	5	72	3	0.006560
21	5	72	4	0.026146
21	5	72	5	0.136614
21	5	72	6	0.263923
21	5	72	7	0.234566
21	5	72	8	0.250808
21	5	72	9	0.077113
21	5	72	10	0.002482
21	5	72	11	0.001245
21	5	72	12	0.000360
21	5	72	13	0.000000
21	5	72	14	0.000000
21	5	72	15	0.000000
21	5	72	16	0.000000
21	5	82	1	0.000000
21	5	82	2	0.000182
21	5	82	3	0.006560
21	5	82	4	0.026146
21	5	82	5	0.136614
21	5	82	6	0.263923
21	5	82	7	0.234566
21	5	82	8	0.250808
21	5	82	9	0.077113
21	5	82	10	0.002482
21	5	82	11	0.001245
21	5	82	12	0.000360
21	5	82	13	0.000000
21	5	82	14	0.000000
21	5	82	15	0.000000
21	5	82	16	0.000000
21	5	92	1	0.000000
21	5	92	2	0.000182
21	5	92	3	0.006560
21	5	92	4	0.026146
21	5	92	5	0.136614
21	5	92	6	0.263923
21	5	92	7	0.234566
21	5	92	8	0.250808
21	5	92	9	0.077113
21	5	92	10	0.002482
21	5	92	11	0.001245
21	5	92	12	0.000360
21	5	92	13	0.000000
21	5	92	14	0.000000
21	5	92	15	0.000000
21	5	92	16	0.000000
21	5	102	1	0.000000
21	5	102	2	0.000182
21	5	102	3	0.006560
21	5	102	4	0.026146
21	5	102	5	0.136614
21	5	102	6	0.263923
21	5	102	7	0.234566
21	5	102	8	0.250808
21	5	102	9	0.077113
21	5	102	10	0.002482
21	5	102	11	0.001245
21	5	102	12	0.000360
21	5	102	13	0.000000
21	5	102	14	0.000000
21	5	102	15	0.000000
21	5	102	16	0.000000
21	5	112	1	0.000000
21	5	112	2	0.000182
21	5	112	3	0.006560

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	112	4	0.026146
21	5	112	5	0.136614
21	5	112	6	0.263923
21	5	112	7	0.234566
21	5	112	8	0.250808
21	5	112	9	0.077113
21	5	112	10	0.002482
21	5	112	11	0.001245
21	5	112	12	0.000360
21	5	112	13	0.000000
21	5	112	14	0.000000
21	5	112	15	0.000000
21	5	112	16	0.000000
21	5	122	1	0.000000
21	5	122	2	0.000182
21	5	122	3	0.006560
21	5	122	4	0.026146
21	5	122	5	0.136614
21	5	122	6	0.263923
21	5	122	7	0.234566
21	5	122	8	0.250808
21	5	122	9	0.077113
21	5	122	10	0.002482
21	5	122	11	0.001245
21	5	122	12	0.000360
21	5	122	13	0.000000
21	5	122	14	0.000000
21	5	122	15	0.000000
21	5	122	16	0.000000
21	5	132	1	0.000000
21	5	132	2	0.000182
21	5	132	3	0.006560
21	5	132	4	0.026146
21	5	132	5	0.136614
21	5	132	6	0.263923
21	5	132	7	0.234566
21	5	132	8	0.250808
21	5	132	9	0.077113
21	5	132	10	0.002482
21	5	132	11	0.001245
21	5	132	12	0.000360
21	5	132	13	0.000000
21	5	132	14	0.000000
21	5	132	15	0.000000
21	5	132	16	0.000000
21	5	142	1	0.000000
21	5	142	2	0.000182
21	5	142	3	0.006560
21	5	142	4	0.026146
21	5	142	5	0.136614
21	5	142	6	0.263923
21	5	142	7	0.234566
21	5	142	8	0.250808
21	5	142	9	0.077113
21	5	142	10	0.002482
21	5	142	11	0.001245
21	5	142	12	0.000360
21	5	142	13	0.000000
21	5	142	14	0.000000
21	5	142	15	0.000000
21	5	142	16	0.000000
21	5	152	1	0.000000
21	5	152	2	0.000182
21	5	152	3	0.006560
21	5	152	4	0.026146
21	5	152	5	0.136614
21	5	152	6	0.263923
21	5	152	7	0.234566
21	5	152	8	0.250808
21	5	152	9	0.077113
21	5	152	10	0.002482
21	5	152	11	0.001245
21	5	152	12	0.000360
21	5	152	13	0.000000
21	5	152	14	0.000000
21	5	152	15	0.000000
21	5	152	16	0.000000
21	5	162	1	0.000000
21	5	162	2	0.000182

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	162	3	0.006560
21	5	162	4	0.026146
21	5	162	5	0.136614
21	5	162	6	0.263923
21	5	162	7	0.234566
21	5	162	8	0.250808
21	5	162	9	0.077113
21	5	162	10	0.002482
21	5	162	11	0.001245
21	5	162	12	0.000360
21	5	162	13	0.000000
21	5	162	14	0.000000
21	5	162	15	0.000000
21	5	162	16	0.000000
21	5	172	1	0.000000
21	5	172	2	0.000182
21	5	172	3	0.006560
21	5	172	4	0.026146
21	5	172	5	0.136614
21	5	172	6	0.263923
21	5	172	7	0.234566
21	5	172	8	0.250808
21	5	172	9	0.077113
21	5	172	10	0.002482
21	5	172	11	0.001245
21	5	172	12	0.000360
21	5	172	13	0.000000
21	5	172	14	0.000000
21	5	172	15	0.000000
21	5	172	16	0.000000
21	5	182	1	0.000000
21	5	182	2	0.000182
21	5	182	3	0.006560
21	5	182	4	0.026146
21	5	182	5	0.136614
21	5	182	6	0.263923
21	5	182	7	0.234566
21	5	182	8	0.250808
21	5	182	9	0.077113
21	5	182	10	0.002482
21	5	182	11	0.001245
21	5	182	12	0.000360
21	5	182	13	0.000000
21	5	182	14	0.000000
21	5	182	15	0.000000
21	5	182	16	0.000000
21	5	192	1	0.000000
21	5	192	2	0.000182
21	5	192	3	0.006560
21	5	192	4	0.026146
21	5	192	5	0.136614
21	5	192	6	0.263923
21	5	192	7	0.234566
21	5	192	8	0.250808
21	5	192	9	0.077113
21	5	192	10	0.002482
21	5	192	11	0.001245
21	5	192	12	0.000360
21	5	192	13	0.000000
21	5	192	14	0.000000
21	5	192	15	0.000000
21	5	192	16	0.000000
21	5	202	1	0.000000
21	5	202	2	0.000182
21	5	202	3	0.006560
21	5	202	4	0.026146
21	5	202	5	0.136614
21	5	202	6	0.263923
21	5	202	7	0.234566
21	5	202	8	0.250808
21	5	202	9	0.077113
21	5	202	10	0.002482
21	5	202	11	0.001245
21	5	202	12	0.000360
21	5	202	13	0.000000
21	5	202	14	0.000000
21	5	202	15	0.000000
21	5	202	16	0.000000
21	5	212	1	0.000000

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	212	2	0.000182
21	5	212	3	0.006560
21	5	212	4	0.026146
21	5	212	5	0.136614
21	5	212	6	0.263923
21	5	212	7	0.234566
21	5	212	8	0.250808
21	5	212	9	0.077113
21	5	212	10	0.002482
21	5	212	11	0.001245
21	5	212	12	0.000360
21	5	212	13	0.000000
21	5	212	14	0.000000
21	5	212	15	0.000000
21	5	212	16	0.000000
21	5	222	1	0.000000
21	5	222	2	0.000182
21	5	222	3	0.006560
21	5	222	4	0.026146
21	5	222	5	0.136614
21	5	222	6	0.263923
21	5	222	7	0.234566

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	222	8	0.250808
21	5	222	9	0.077113
21	5	222	10	0.002482
21	5	222	11	0.001245
21	5	222	12	0.000360
21	5	222	13	0.000000
21	5	222	14	0.000000
21	5	222	15	0.000000
21	5	222	16	0.000000
21	5	232	1	0.000000
21	5	232	2	0.000182
21	5	232	3	0.006560
21	5	232	4	0.026146
21	5	232	5	0.136614
21	5	232	6	0.263923
21	5	232	7	0.234566
21	5	232	8	0.250808
21	5	232	9	0.077113
21	5	232	10	0.002482
21	5	232	11	0.001245
21	5	232	12	0.000360
21	5	232	13	0.000000

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	5	232	14	0.000000
21	5	232	15	0.000000
21	5	232	16	0.000000
21	5	242	1	0.000000
21	5	242	2	0.000182
21	5	242	3	0.006560
21	5	242	4	0.026146
21	5	242	5	0.136614
21	5	242	6	0.263923
21	5	242	7	0.234566
21	5	242	8	0.250808
21	5	242	9	0.077113
21	5	242	10	0.002482
21	5	242	11	0.001245
21	5	242	12	0.000360
21	5	242	13	0.000000
21	5	242	14	0.000000
21	5	242	15	0.000000
21	5	242	16	0.000000

[AVFT] (SourceTypeID 42: Transit Bus)

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	1960	1	1	0.009615
42	1960	2	1	0.990385
42	1960	3	1	0.000000
42	1961	1	1	0.009615
42	1961	2	1	0.990385
42	1961	3	1	0.000000
42	1962	1	1	0.009615
42	1962	2	1	0.990385
42	1962	3	1	0.000000
42	1963	1	1	0.009615
42	1963	2	1	0.990385
42	1963	3	1	0.000000
42	1964	1	1	0.009615
42	1964	2	1	0.990385
42	1964	3	1	0.000000
42	1965	1	1	0.009615
42	1965	2	1	0.990385
42	1965	3	1	0.000000
42	1966	1	1	0.009615
42	1966	2	1	0.990385
42	1966	3	1	0.000000
42	1967	1	1	0.009615
42	1967	2	1	0.990385
42	1967	3	1	0.000000
42	1968	1	1	0.009615
42	1968	2	1	0.990385
42	1968	3	1	0.000000
42	1969	1	1	0.009615
42	1969	2	1	0.990385
42	1969	3	1	0.000000
42	1970	1	1	0.009615
42	1970	2	1	0.990385
42	1970	3	1	0.000000
42	1971	1	1	0.009615
42	1971	2	1	0.990385
42	1971	3	1	0.000000
42	1972	1	1	0.009615
42	1972	2	1	0.990385
42	1972	3	1	0.000000
42	1973	1	1	0.009615
42	1973	2	1	0.990385
42	1973	3	1	0.000000
42	1974	1	1	0.009615
42	1974	2	1	0.990385
42	1974	3	1	0.000000
42	1975	1	1	0.009615
42	1975	2	1	0.990385
42	1975	3	1	0.000000
42	1976	1	1	0.009615
42	1976	2	1	0.990385
42	1976	3	1	0.000000
42	1977	1	1	0.009615
42	1977	2	1	0.990385
42	1977	3	1	0.000000

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	1978	1	1	0.009615
42	1978	2	1	0.990385
42	1978	3	1	0.000000
42	1979	1	1	0.009615
42	1979	2	1	0.990385
42	1979	3	1	0.000000
42	1980	1	1	0.009615
42	1980	2	1	0.990385
42	1980	3	1	0.000000
42	1981	1	1	0.008696
42	1981	2	1	0.991304
42	1981	3	1	0.000000
42	1982	1	1	0.011321
42	1982	2	1	0.988679
42	1982	3	1	0.000000
42	1983	1	1	0.008081
42	1983	2	1	0.991919
42	1983	3	1	0.000000
42	1984	1	1	0.009671
42	1984	2	1	0.990329
42	1984	3	1	0.000000
42	1985	1	1	0.010448
42	1985	2	1	0.989552
42	1985	3	1	0.000000
42	1986	1	1	0.010243
42	1986	2	1	0.989757
42	1986	3	1	0.000000
42	1987	1	1	0.009825
42	1987	2	1	0.990175
42	1987	3	1	0.000000
42	1988	1	1	0.009990
42	1988	2	1	0.990010
42	1988	3	1	0.000000
42	1989	1	1	0.009441
42	1989	2	1	0.990559
42	1989	3	1	0.000000
42	1990	1	1	0.010174
42	1990	2	1	0.982645
42	1990	3	1	0.007181
42	1991	1	1	0.009632
42	1991	2	1	0.971979
42	1991	3	1	0.018389
42	1992	1	1	0.009752
42	1992	2	1	0.944149
42	1992	3	1	0.046099
42	1993	1	1	0.009238
42	1993	2	1	0.914550
42	1993	3	1	0.076212
42	1994	1	1	0.010211
42	1994	2	1	0.904914
42	1994	3	1	0.084876
42	1995	1	1	0.010022
42	1995	2	1	0.836860
42	1995	3	1	0.153118

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	1996	1	1	0.009941
42	1996	2	1	0.892002
42	1996	3	1	0.098057
42	1997	1	1	0.009676
42	1997	2	1	0.816155
42	1997	3	1	0.174169
42	1998	1	1	0.009992
42	1998	2	1	0.840892
42	1998	3	1	0.149116
42	1999	1	1	0.009928
42	1999	2	1	0.877256
42	1999	3	1	0.112816
42	2000	1	1	0.008437
42	2000	2	1	0.915627
42	2000	3	1	0.075935
42	2001	1	1	0.000000
42	2001	2	1	0.000000
42	2001	3	1	1.000000
42	2002	1	1	0.008957
42	2002	2	1	0.891072
42	2002	3	1	0.099971
42	2003	1	1	0.000000
42	2003	2	1	0.000000
42	2003	3	1	1.000000
42	2004	1	1	0.000000
42	2004	2	1	0.000000
42	2004	3	1	1.000000
42	2005	1	1	0.000000
42	2005	2	1	1.000000
42	2005	3	1	0.000000
42	2006	1	1	0.000000
42	2006	2	1	0.092593
42	2006	3	1	0.907407
42	2007	1	1	0.000000
42	2007	2	1	1.000000
42	2007	3	1	0.000000
42	2008	1	1	0.000000
42	2008	2	1	0.320000
42	2008	3	1	0.680000
42	2009	1	1	0.000000
42	2009	2	1	0.151515
42	2009	3	1	0.848485
42	2010	1	1	0.000000
42	2010	2	1	1.000000
42	2010	3	1	0.000000
42	2011	1	1	0.000000
42	2011	2	1	0.000000
42	2011	3	12	0.435897
42	2011	3	1	0.564103
42	2012	1	1	0.000000
42	2012	2	1	0.027027
42	2012	3	1	0.972973
42	2013	1	1	0.100000
42	2013	2	1	0.000000

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	2013	2	12	0.118182
42	2013	3	1	0.781818
42	2014	1	1	0.010204
42	2014	2	1	0.132653
42	2014	3	1	0.857143
42	2015	1	1	0.058824
42	2015	2	1	0.000000
42	2015	3	1	0.941176
42	2016	1	1	0.136364
42	2016	2	1	0.477273
42	2016	3	1	0.386364
42	2017	1	1	0.027778
42	2017	2	1	0.138889
42	2017	3	1	0.833333
42	2018	1	1	0.024619
42	2018	2	1	0.817351
42	2018	3	1	0.158030
42	2019	1	1	0.024619
42	2019	2	1	0.817351
42	2019	3	1	0.158030
42	2020	1	1	0.024619
42	2020	2	1	0.817351
42	2020	3	1	0.158030
42	2021	1	1	0.024619
42	2021	2	1	0.817351
42	2021	3	1	0.158030
42	2022	1	1	0.024619
42	2022	2	1	0.817351
42	2022	3	1	0.158030
42	2023	1	1	0.024619
42	2023	2	1	0.817351
42	2023	3	1	0.158030
42	2024	1	1	0.024619
42	2024	2	1	0.817351
42	2024	3	1	0.158030
42	2025	1	1	0.024619
42	2025	2	1	0.817351
42	2025	3	1	0.158030

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	2026	1	1	0.024619
42	2026	2	1	0.817351
42	2026	3	1	0.158030
42	2027	1	1	0.024619
42	2027	2	1	0.817351
42	2027	3	1	0.158030
42	2028	1	1	0.024619
42	2028	2	1	0.817351
42	2028	3	1	0.158030
42	2029	1	1	0.024619
42	2029	2	1	0.817351
42	2029	3	1	0.158030
42	2030	1	1	0.024619
42	2030	2	1	0.817351
42	2030	3	1	0.158030
42	2031	1	1	0.024619
42	2031	2	1	0.817351
42	2031	3	1	0.158030
42	2032	1	1	0.024619
42	2032	2	1	0.817351
42	2032	3	1	0.158030
42	2033	1	1	0.024619
42	2033	2	1	0.817351
42	2033	3	1	0.158030
42	2034	1	1	0.024619
42	2034	2	1	0.817351
42	2034	3	1	0.158030
42	2035	1	1	0.024619
42	2035	2	1	0.817351
42	2035	3	1	0.158030
42	2036	1	1	0.024619
42	2036	2	1	0.817351
42	2036	3	1	0.158030
42	2037	1	1	0.024619
42	2037	2	1	0.817351
42	2037	3	1	0.158030
42	2038	1	1	0.024619
42	2038	2	1	0.817351

Source TypeID	Model YearID	Fuel TypeID	Eng TechID	fuelEng Fraction
42	2038	3	1	0.158030
42	2039	1	1	0.024619
42	2039	2	1	0.817351
42	2039	3	1	0.158030
42	2040	1	1	0.024619
42	2040	2	1	0.817351
42	2040	3	1	0.158030
42	2041	1	1	0.024619
42	2041	2	1	0.817351
42	2041	3	1	0.158030
42	2042	1	1	0.024619
42	2042	2	1	0.817351
42	2042	3	1	0.158030
42	2043	1	1	0.024619
42	2043	2	1	0.817351
42	2043	3	1	0.158030
42	2044	1	1	0.024619
42	2044	2	1	0.817351
42	2044	3	1	0.158030
42	2045	1	1	0.024619
42	2045	2	1	0.817351
42	2045	3	1	0.158030
42	2046	1	1	0.024619
42	2046	2	1	0.817351
42	2046	3	1	0.158030
42	2047	1	1	0.024619
42	2047	2	1	0.817351
42	2047	3	1	0.158030
42	2048	1	1	0.024619
42	2048	2	1	0.817351
42	2048	3	1	0.158030
42	2049	1	1	0.024619
42	2049	2	1	0.817351
42	2049	3	1	0.158030
42	2050	1	1	0.024619
42	2050	2	1	0.817351
42	2050	3	1	0.158030

Appendix D. Emissions from Facilities Treated as Area Sources in the 2017 Periodic Emissions Inventory

The table below lists those facilities whose reported 2017 emissions have been included in the area source categories of this 2017 Periodic Emissions Inventory for PM-10.

Table D-1. Emissions (tons/yr) from facilities whose emissions are reflected in area source categories in the 2017 Periodic Emissions Inventory.

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
131509	21ST CENTURY INSURANCE	16001 N 28TH AVE	0.0	0.0	0.1	0.0	
1074	23RD AVE WASTEWATER TREATMENT PLANT	2470 S 22ND AVE	0.9	0.6	3.1	4.7	
135960	4283929 DELAWARE, LLC- AMES DIVERSIFIED	3131 W CLARENDON AVE	1.3	0.9	2.4	0.3	
130250	44 MONROE CONDOMINIUM ASSOCIATION	44 W MONROE ST	0.0	0.0	0.2	0.0	
131232	84 LUMBER COMPANY	275 E WILLIS RD	0.0	0.0			
133843	A LEGACY FUNERAL HOME LLC	1722 N BANNING #101	0.4	0.2	0.7	0.1	
120034	A T & T	1301 W UNIVERSITY DR	0.1	0.1	3.1	0.0	
120036	A T & T	1355 W UNIVERSITY DR	0.0	0.0	0.2	0.0	
131082	A-1 MATERIALS	9503 W BUCKEYE RD	0.1	0.0			
132976	ABEL FUNERAL SERVICES INC	1544 W GRANT ST	0.8	0.5	1.4	0.2	
1387	ABLE STEEL FABRICATORS	4150 E QUARTZ CIR	1.2	1.1			
1952	ADESA PHOENIX LLC	400 N BECK AVE #2	0.0	0.0	0.1	0.0	
131574	ADLER REALTY INVESTMENTS LLC	2600 N CENTRAL AVE	0.0	0.0	0.6	0.0	
131397	ADOA	100 N 15TH AVE	0.0	0.0	0.5	0.0	
126395	ADOT (AIR)	206 S 17TH AVE	0.0	0.0	0.0	0.0	
72104	AERSALE, INC.	1658 S LITCHFIELD RD	0.1	0.1	1.1	0.1	
969	AF LORTS MANUFACTURING COMPANY INC	15836 W EDDIE ALBERT WAY	0.0	0.0			
281	AGGREGATE INDUSTRIES - SWR, INC.	11500 W BEARDSLEY RD	2.6	0.3			
132575	AGP ARIZONA CENTER OWNER LLC	400 E VAN BUREN ST	0.0	0.0	0.3	0.0	
132778	ALASKA USA FEDERAL CREDIT UNION	16325 N 56TH AVE	0.0	0.0	0.4	0.0	
133228	ALL PRO HYDROJETTING AND PUMPING, LLC	6525 W STATE AVE	0.0	0.0	0.1	0.0	
90012	ALL STATE CREMATORY	1110 S HORNE #108	0.3	0.2	0.6	0.1	
34139	ALL WOOD TREASURES CO	2063 E CEDAR ST	0.0	0.0			
79727	ALLIANCE LUMBER LLC	6770 W NORTHERN AVE	0.0	0.0			
131474	ALLIED PACKAGING CORPORATION	5640 S 16TH ST	0.3	0.3	3.9	0.0	
35541	ALLIED TUBE AND CONDUIT	2525 N 27TH AVE	0.0	0.0	0.1	0.0	
135582	ALPINE VALLEY BREAD COMPANY	300 W SOUTHERN AVE	0.1	0.1	0.7	0.0	
131490	ALSCO	4707 W CAMELBACK RD	0.1	0.1	1.5	0.0	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
96683	AMERICAN EXPRESS	18850 N 56TH ST	0.0	0.0	1.2	0.0	
58431	AMERICAN EXPRESS SERVICE CENTER	20022 N 31ST AVE	0.0	0.0	1.4	0.0	
132483	AMERICAN FENCE & SECURITY CO INC	2737 W VIRGINIA AVE	0.6	0.4			
133188	ANIMAL CREMATION SERVICES	5348 W BETHANY HOME RD	0.2	0.2	0.4	0.1	
135352	APS - ALIGNED ENERGY DATA CENTER	2500 W UNION HILLS DR	0.2	0.2	8.5	0.0	
129696	ARCHITECTURAL MILLWORK DESIGN INC	330 W MELINDA LN	0.0	0.0			
131519	ARE-LEI PHOENIX GATEWAY ASSOCIATES, LLC	432 N 44TH ST	0.0	0.0	0.1	0.0	
3471	ARIZONA AIR NATIONAL GUARD	3200 E OLD TOWER RD	0.0	0.0	0.1	0.0	
35372	ARIZONA CUSTOM CABINETS INC	8729 N 78TH AVE	0.0	0.0			
131765	ARIZONA DEPARTMENT OF PUBLIC SAFETY	2102 W ENCANTO BLVD	0.1	0.1	1.1	0.0	
131996	ARIZONA DEPARTMENT OF TRANSPORTATION	I-10 MP146.0 3RD ST	0.0	0.0	0.3	0.0	
132011	ARIZONA DEPARTMENT OF TRANSPORTATION	NWC OF MCKELLIPS RD & SOSSAMAN RD	0.0	0.0	0.0	0.0	
132015	ARIZONA DEPARTMENT OF TRANSPORTATION	202 LOOP MP51.5 101 & 202	0.0	0.0	0.0	0.0	
3938	ARIZONA GALVANIZING INC	15775 W ELWOOD ST	1.0	0.7	4.1	0.0	0.0
134107	ARIZONA GOLF RESORT & HOTEL LLC	425 S POWER RD	0.0	0.0	0.2	0.0	
129079	ARIZONA GRAIN INC	811 N 1ST ST	0.1	0.0			
130470	ARIZONA LANDFILL LLC	2750 S 11TH AVE	0.8	0.3	6.4	0.2	
36772	ARIZONA MATERIALS	3636 S 43RD AVE	9.4	2.3			
53008	ARIZONA MATERIALS	12820 W ROOKS RD	1.0	0.1			
85545	ARIZONA MATERIALS	PORTABLE #4	4.5	0.9			
41257	ARIZONA MATERIALS LLC	21838 N 20TH ST	1.4	0.3			
131310	ARIZONA MILLS LLC	5000 S ARIZONA MILLS CIR	0.1	0.1	0.7	0.1	
626	ARIZONA MINI MIX CONCRETE OF MESA INC	540 W MCKELLIPS RD	0.6	0.1			
131021	ARIZONA NUTRITIONAL SUPPLEMENTS LLC	210 S BECK AVE	0.0	0.0			
130834	ARIZONA ST UNIVERSITY DOWNTWN PHX CAMPUS	522 N CENTRAL AVE	0.0	0.0	1.0	0.0	
4364	ARIZONA STATE UNIVERSITY	1551 S RURAL RD	5.8	4.6	9.1	0.2	
130835	ARIZONA STATE UNIVERSITY, WEST CAMPUS	4701 W THUNDERBIRD RD	0.0	0.0	0.4	0.0	
36898	ASPC-LEWIS	26700 S HWY 85	0.3	0.3	8.9	0.1	
1055	ASPHALT TERMINALS LLC	1935 W MCDOWELL RD	0.7	0.7	9.2	0.1	
4109	ASSOCIATED CONSTRUCTION ENTERPRISES INC	3645 N 40TH AVE	0.0	0.0			
93166	ASSOCIATED WOODWORKS	1401 N 26TH AVE	0.0	0.0			

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
4328	ASU MACROTECHNOLOGY WORKS	7700 S RIVER PKWY	0.1	0.1	1.4	0.0	0.0
1502	ATLAS ROOFING CORPORATION	40 S 45TH AVE	0.0	0.0	0.3	0.0	
130526	AVIATION DEPARTMENT - 44TH ST PUMP HOUSE	425 S 44TH ST	0.0	0.0	0.6	0.0	
134215	AVNET	60 S MCKEMY AVE	0.0	0.0	0.2	0.0	
131557	AZ DEPARTMENT OF JUVENILE CORRECTIONS	2800 W PINNACLE PEAK RD	0.0	0.0	0.4	0.2	
50422	BAE SYSTEMS AEROSPACE AND DEFENSE GROUP	7822 S 46TH ST	0.0	0.0	0.0	0.0	
31585	BANK OF AMERICA	2500 W FRYE RD	0.1	0.1	2.8	0.0	
128533	BANK OF AMERICA	1825 E BUCKEYE RD	0.0	0.0	1.1	0.0	
130233	BANK OF AMERICA N.A.	2595 W CHANDLER BLVD	0.0	0.0	1.6	0.0	0.0
129791	BANNER DEL E. WEBB MEDICAL CENTER	14502 W MEEKER BLVD	0.2	0.2	4.4	0.1	
781	BANNER GOOD SAMARITAN MEDICAL CENTER	1111 E MCDOWELL RD	0.6	0.6	8.0	0.2	
121830	BANNER HEALTH	1900 N HIGLEY RD	4.7	0.5		0.1	
29946	BANNER THUNDERBIRD MEDICAL CENTER	5555 W THUNDERBIRD RD	0.5	0.5	6.8	0.2	
273	BARKLEY SEED INC	2641 S SARIVAL AVE	0.8	0.0			
129595	BARREL O' FUN SNACK FOOD SOUTHWEST	7330 W SHERMAN ST	25.0	3.3	18.5	0.1	0.6
4511	BARTLETT LAKE MARINA	20808 E BARTLETT DAM RD	1.4	1.4	20.5	1.3	
130069	BASALITE BUILDING PRODUCTS, LLC	4902 W SUPERIOR AVE	0.3	0.0			
130782	BEDROCK SAND & GRAVEL INC	7050 NW GRAND AVE	0.0	0.0			
126319	BELLA BEAMS & ARCHITECTURAL PRODUCTS INC	825 N 73RD AVE	0.0	0.0			
607	BEST FUNERAL SERVICES, INC.	9380 W PEORIA AVE	0.4	0.2	0.7	0.1	
961	BIG SURF WATERPARK	1500 N MCCLINTOCK DR	0.0	0.0	2.6	0.0	
74058	BILTMORE SHUTTERS INC	1138 W WATKINS ST	0.0	0.0			
3305	BIMBO BAKERIES USA, INC	738 W VAN BUREN ST	0.5	0.1	1.8	0.0	
136591	BIOMEDICAL SCIENCES PARTNERSHIP BUILDING	475 N 5TH ST	0.1	0.1	0.7	0.0	
129138	BLUE CROSS BLUE SHIELD OF ARIZONA INC	2480 W LAS PALMARITAS DR	0.0	0.0	0.5	0.0	
130716	BLUE CROSS BLUE SHIELD OF ARIZONA INC	2475 W TOWNLEY AVE	0.1	0.1	1.2	0.0	
47578	BOMAT, INC	4330 N 43RD AVE STE #B-4	0.1	0.0			
133044	BRIDGESTONE AMERICAS TIRE OPERATIONS,LLC	6533 S MOUNTAIN RD	0.1	0.0			
458	BRYANT INDUSTRIES INC	788 W ILLINI ST	0.2	0.1			
133099	BUCKEYE GRAIN U LLC	29700 W LOWER RIVER RD	2.9	0.2	2.2	0.0	
130047	BUESING CORPORATION	11520 E GERMANN RD	0.5	0.1			

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
56105	BURDETTE CABINET CO INC	3941 N HIGLEY RD	0.0	0.0			
135009	C.A.S. CORPORATION	901 W MELINDA LN	0.0	0.0	0.1	0.0	
131634	CAFE VALLEY INC	7000 W BUCKEYE RD	0.2	0.2	2.6	0.0	
3442	CALJET	125 N 53RD AVE	0.0	0.0	0.0	0.0	
131966	CALPORTLAND	4830 S 43RD AVE	0.8	0.3	0.8	0.0	
133365	CALPORTLAND	3410 E VIRGINIA ST	2.3	0.6	0.0	0.0	
898	CAMINO DEL SOL FUNERAL CHAPEL&CREMATION	13738 W CAMINO DEL SOL	0.1	0.1	0.2	0.0	
291	CAPITAL LUMBER COMPANY	11 N 45TH AVE	0.3	0.3			
131767	CAREMARK, L.L.C.	9501 E SHEA BLVD	0.8	0.8	2.8	0.0	
132154	CAREMARK, L.L.C.	4121 E COTTON CENTER BLVD	0.0	0.0	0.9	0.0	
1318	CAVCO INDUSTRIES INC	1366 S LITCHFIELD RD BLDG #6	0.0	0.0			
1316	CAVCO INDUSTRIES LLC/DURANGO PLANT	2502 W DURANGO ST	0.1	0.1			
132126	CB RICHARD ELLIS, INC.	25500 N NORTERRA PKWY	0.0	0.0	0.0	0.0	
260	CEMEX - 19TH AVE PLANT	3640 S 19TH AVE	15.2	2.6	0.1	0.0	
98591	CEMEX - 7TH STREET PLANT	23210 N 7TH ST	2.5	1.4	0.1	0.0	
98492	CEMEX - BUCKEYE PLANT	22625 W BELOAT RD	0.4	0.2	0.0	0.0	
63	CEMEX - EL MIRAGE PLANT	8635 N EL MIRAGE RD	1.7	0.8	0.0	0.0	
213	CEMEX - GLENDALE PLANT	11920 W GLENDALE AVE	0.9	0.1			
106410	CEMEX - SUN CITY EAST PLANTS 4106 & 4118	24004 N 107TH AVE	1.2	0.2			
129625	CEMEX - TABLE MESA SITE	TABLE MESA RD	0.7	0.1			
1266	CEMEX - WEST PLANT	11701 W INDIAN SCHOOL RD	0.9	0.1			
579	CEMEX - WEST VALLEY PLANT	11550 W NORTHERN AVE	4.8	0.4	0.0	0.0	
1262	CEMEX CONSTRUCTION MATERIALS	1510 W LINCOLN ST	0.1	0.1			
53259	CEMEX CONSTRUCTION MATERIALS SOUTH LLC	2600 E LEHI RD	0.2	0.0			
129574	CEMEX CONSTRUCTION MATERIALS SOUTH LLC	4815 S 67TH AVE	0.1	0.0			
1264	CEMEX CONSTRUCTION MATERIALS SOUTH, LLC	290 S NEVADA ST	0.0	0.0			
1310	CENTURY GRAPHICS LLC	2960 GRAND AVE	0.0	0.0	0.2	0.0	
82244	CHANDLER-GILBERT COMM COLLEGE	7440 E TAHOE AVE	0.0	0.0	0.0	0.0	
128869	CHARLES SCHWAB & CO INC	2423 E LINCOLN DR	0.0	0.0	1.0	0.0	
823	CHEMRESEARCH CO INC	1130 W HILTON AVE	0.0	0.0	0.3	0.0	
131471	CHUBB GROUP OF INSURANCE CO.'S	2155 W PINNACLE PEAK RD #400	0.0	0.0	1.1	0.0	
36258	CINTAS CORPORATION	4804 W ROOSEVELT ST	70.5	70.5	928.2	5.6	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
134721	CIRCLE H WEST LLC	8050 S JACKRABBIT TRL	0.0	0.0			
3441	CIRCLE K TERMINAL LLC	5333 W VAN BUREN ST	1.0	0.6			
130851	CITY OF CHANDLER - REVERSE OSMOSIS	3737 S OLD PRICE RD	0.1	0.1	0.9	0.0	
127616	CITY OF CHANDLER AIRPORT WATER REC FAC	905 E QUEEN CREEK RD	0.0	0.0	0.4	0.0	
125351	CITY OF GLENDALE - OASIS WATER CAMPUS	7070 W NORTHERN AVE	0.1	0.1	1.4	0.0	
131042	CITY OF MESA - MESA ARTS CENTER	1 E MAIN ST	0.2	0.2	2.9	0.0	
111469	CITY OF MESA SIGNAL BUTTE WTP	10950 E ELLIOT RD	0.0	0.0	0.3	0.0	
130711	CITY OF MESA WATER RESOURCES (WGFPS)	5457 S SOSSAMAN RD	0.0	0.0	0.6	0.1	
121082	CITY OF PEORIA	8900 N 79TH AVE	0.0	0.0	0.6	0.0	
127947	CITY OF PEORIA - BUTLER WATER REC. FAC.	8660 N 78TH AVE	0.0	0.0	0.8	0.0	
85000	CITY OF PHOENIX 24TH ST WTP	6202 N 24TH ST	0.3	0.2	0.2	0.0	
130308	CITY OF PHX AVIATION DEPT SM OPER SITE	1712 E RENTAL CAR WY	0.0	0.0	0.3	0.0	
64017	CITY OF SCOTTSDALE	16638 N PIMA RD NPB #40	0.1	0.1	2.2	0.0	
123979	CITY OF SCOTTSDALE	9065 E VIA LINDA	0.0	0.0	0.4	0.0	
127820	CITY OF SCOTTSDALE	7601 E MCKELLIPS RD	0.0	0.0	1.1	0.0	
86375	CITY OF SCOTTSDALE CHAPARRAL WTP	8111 E MCDONALD DR	0.0	0.0	0.8	0.0	
38161	CITY OF SCOTTSDALE WATER CAMPUS	8787 E HUALAPAI DR WC101	0.1	0.1	1.9	0.0	
131410	CITY OF SURPRISE MUNICIPAL PROPERTY CORP	14355 W PARADISE LN	0.0	0.0	0.2	0.0	
126636	CITY OF SURPRISE SPA 2 REG WATER REC	15667 W PLANADA LN	0.0	0.0	0.1	0.0	
4403	CLARIANT PLASTICS & COATINGS USA INC-PHX	4425 E ELWOOD ST #104	0.0	0.0			
1075	CO PHX 91ST AVE WWTP	5615 S 91ST AVE #1	6.5	4.5	18.2	64.5	
49636	COFFMAN SPECIALTIES INC	PORTABLE 1	10.7	1.7	0.6	0.0	
106477	COLLABORATIVE RESEARCH BLDG	13208 E SHEA BLVD	0.1	0.1	0.9	0.0	
132496	CONCEPT CABINETRY	700 N MONTEREY ST	0.0	0.0			
113723	CONTRACTORS LANDFILL & RECYCLING	2425 N CENTER ST	1.5	0.3	0.1	0.0	
135833	CORE READY MIX, LLC	PORTABLE #1	0.7	0.2			
399	CORESLAB STRUCTURES (ARIZ) INC	5026 S 43RD AVE	2.3	0.4			
227	CORROSION ENGINEERING INC	145 S NINA CIR	0.2	0.2	0.4	0.0	
1198	COURIER GRAPHICS CORP	2621 S 37TH ST	0.0	0.0	0.4	0.0	
289	COURTHOUSE AG HOLDINGS LLC	51040 W VALLEY RD	0.1	0.0	0.0	0.0	
131081	COX COMMUNICATIONS AZ DEER VALLEY CAMPUS	1550 W DEER VALLEY RD	0.1	0.1	0.3	0.0	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
4368	CRAFTSMEN IN WOOD MFG	5441 W HADLEY ST	0.5	0.4	0.0	0.0	
134012	CROWN CUSTOM MILLWORK, LLC	2740 W DEER VALLEY RD	0.0	0.0			
131179	CSE OPERATING I, LLC	29115 W BROADWAY RD	0.0	0.0	8.8	5.3	
130790	CUSTOM FAB INC	3065 S 43RD AVE	0.3	0.3	0.6	0.0	
131444	CUSTOM LANDSCAPE MATERIALS "BELMONT"	25376 W TONOPAH-SALOME HWY	0.2	0.1	0.7	0.0	
131392	CUSTOM LANDSCAPE MATERIALS "BIG HORN"	AGUILA RD MILE POST 12	0.8	0.3	3.9	0.3	
132691	CUSTOM LANDSCAPE MATERIALS, LLC		0.7	0.5	6.8	0.4	
73115	DANIEL ENTERPRISES INC	1707 E WEBER DR	0.0	0.0			
137795	DECA CREMATION SERVICES, INC.	2139 S 15TH ST	0.1	0.0	0.8	0.1	
47179	DESERT MILLWORK INC	1702 W ROOSEVELT ST	0.0	0.0			
40629	DESERT READY MIX	1800 N ALMA SCHOOL RD	2.2	1.0			
133854	DIAMONDBACK MATERIALS, LLC	6400 S EL MIRAGE RD	0.8	0.4			
61573	DIAMONDBACK SAND & ROCK LLC	6400 S EL MIRAGE RD	0.3	0.0			
130953	DIFFERENT BY DESIGN	203 W LONE CACTUS DR	0.0	0.0			
128167	DIGITAL REALTY TRUST	120 E VAN BUREN ST #120	0.0	0.0	3.0	0.0	
51073	DIGITAL REALTY TRUST CHANDLER, LLC	2121 S PRICE RD	0.1	0.1	6.4	0.0	
128029	DIGITAL REALTY TRUST -TEMPE DATA CENTER	2055 E TECHNOLOGY CIR	0.0	0.0	0.5	0.0	
474	DOMRES GRADING INC	7002 E PINNACLE PEAK RD	0.1	0.0			
127094	DOUBLETREE PAPER MILL LLC	31201 W THAYER RD	12.7	4.9	10.4	0.5	
130879	DRAWER CONNECTION INC	1936 N HIGLEY RD	0.1	0.0			
48771	EAGLE ROOFING PRODUCTS	4602 W ELWOOD ST	2.3	1.5	0.4	0.0	
132103	EDWARD JONES	8640 S RIVER PKWY	0.0	0.0	1.3	0.0	
26	EMPIRE MACHINERY CO	1725 S COUNTRY CLUB DR	0.7	0.7	7.1	0.1	
56	ENCON ARIZONA, LLC DBA TPAC	3052 S 19TH AVE	1.8	0.3			
130260	ENTRUSTED PETS, INC.	2237 S 15TH ST	0.1	0.1	0.2	0.0	
35342	EWING HARDSCAPE SUPPLY, LLC	7243 N EL MIRAGE RD	0.3	0.0			
54414	EWING HARDSCAPE SUPPLY, LLC	PORTABLE	0.5	0.2	1.8	0.1	
1505	EXECUTIVE DOOR COMPANY	3939 W CLARENDON AVE	0.0	0.0			
1488	FARMER'S GIN INC	8400 S TURNER RD	11.0	1.7	0.2	0.0	
224	FERTIZONA	17102 W OLIVE AVE	0.5	0.2			
925	FERTIZONA BUCKEYE LLC	26705 W BASELINE RD	0.8	0.5			
47516	FINE LINE MFG INC	4506 E KERBY AVE	0.0	0.0			

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
132690	FINE WOODS MFG INC	2143 E JONES AVE	0.0	0.0			
132911	FINECRAFT CUSTOM WOODWORKS LLC	5775 N 51ST AVE	0.0	0.0			
132381	FINISHING TOUCH LLC	5411 W ORANGE DR #15	0.0	0.0			
130952	FIRST DATA RESOURCES INC	240 N ROOSEVELT AVE	0.1	0.1	4.8	0.0	
128991	FISHER SAND & GRAVEL	PORTABLE #3	2.7	1.1	8.1	0.0	
130231	FISHER SAND & GRAVEL CO	4001 S 15TH AVE	6.5	1.0			
27728	FLIPCHIP INTERNATIONAL	3701 E UNIVERSITY DR	0.0	0.0	0.3	0.0	0.1
131419	FOOTHILLS GRANITE, LLC	6774 E VIOLA LN	0.2	0.0			
1375	FOREST DESIGNS	3230 E ROESER RD #10	0.1	0.1			
67317	FORTERRA PIPE & PRECAST, LLC	12600 W NORTHERN AVE	0.2	0.1	0.4	0.0	
134227	FUEL PROCESSING OPERATORS LLC	12126 W OLIVE AVE	0.3	0.3	4.0	0.0	
3406	GILA BEND AIR FORCE AUX FIELD	HWY 85	0.1	0.0	0.5	0.0	
1421	GLENN WEINBERGER TOPSOIL INC	3425 S 43RD AVE	0.3	0.1			
561	GLENWOOD CUSTOM CABINETS, LLC	44 E PIONEER ST	0.0	0.0			
1418	GOODRICH CORPORATION	3414 S 5TH ST	0.0	0.0	0.0	0.0	
131046	GOODYEAR BALLPARK	1933 S BALLPARK WAY	0.3	0.3	3.6	0.0	
131841	GRANITE EXPRESS PIONEER		1.2	0.8	10.3	0.7	
10	GREEN ACRES MORTUARIES & CEMETERIES INC	401 N HAYDEN RD	0.0	0.0	0.0	0.0	
1182	GREENWOOD MEMORY LAWN MORTUARY	2300 W VAN BUREN ST	0.9	0.6	1.7	0.2	
141	GRO-WELL BRANDS INC	2807 S 27TH AVE	1.8	1.2			
4498	HANSON AGGREGATES LLC	33500 W INDIAN SCHOOL RD	0.2	0.0	0.0	0.0	
135004	HANSON AGGREGATES OF ARIZONA INC	11401 W GLENDALE AVE	0.5	0.3	0.0	0.0	
699	HANSON AGGREGATES, LLC	4002 S 51ST AVE	6.2	2.5	4.8	3.8	
113855	HANSON AGGREGATES, LLC	6204 W SOUTHERN AVE	0.2	0.2			
131334	HELIAE DEVELOPMENT LLC	614 E GERMANN RD	0.0	0.0	0.0	0.0	
31565	HENRY PRODUCTS INC	302 S 23RD AVE	0.0	0.0	0.6	0.0	
129711	HERITAGE CREMATORY	12525 NW GRAND AVE	0.2	0.1	0.4	0.0	
95050	HICKMANS EGG RANCH	32425 W SALOME HWY	0.1	1.6	1.2	0.9	
134532	HICKMAN'S EGG RANCH, INC.	41625 W INDIAN SCHOOL RD	0.0	0.0	0.6	0.1	
590	HOLLYFRONTIER ASPHALT COMPANY LLC	7110 W NORTHERN AVE	1.0	0.6	6.9	0.0	
3536	HOLSUM BAKERY INC	2322 W LINCOLN ST	0.3	0.3	3.6	0.0	
39213	HOLSUM OF TOLLESON LLC	9600 W BUCKEYE RD	0.2	0.2	3.1	0.0	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
1059	HONEYWELL ENGINES SYS & SERVICE PHX R&O	1944 E SKY HARBOR CIR	0.2	0.1	1.7	0.1	
247	HONEYWELL INTERNATIONAL INC (TEMPE, AZ)	1300 W WARNER RD	1.5	1.0	3.8	0.1	
134844	HUNTER DOUGLAS FABRICATION COMPANY	601 S 65TH AVE STES #4 & #6	0.1	0.1			
168	HYDRO CONDUIT CORP	1011 S 43RD AVE	0.0	0.0	0.0	0.0	
403	HYDRO EXTRUSION NORTH AMERICA, LLC	249 S 51ST AVE	1.8	1.6	12.1	0.7	0.0
354	IMSAMET OF ARIZONA	3829 S ESTRELLA PKWY	3.4	2.3	6.6	0.0	
777	INSULFOAM	3401 W COCOPAH ST	0.1	0.1	2.4	0.0	
31617	INTEL CORP CHANDLER CAMPUS (FAB 6)	5000 W CHANDLER BLVD	0.9	1.3		11.3	0.1
130597	INTERNATIONAL FLORA TECHNOLOGIES	28633 W PATTERSON RD	0.0	0.0	0.1	0.0	
43832	INTERNATIONAL PAPER	660 S 83RD AVE	5.3	4.1	0.8	0.0	0.9
130265	IO PHOENIX ONE, LLC	615 N 48TH ST	0.0	0.0	6.5	0.2	
983	ISOLA GROUP S A R L	165 S PRICE RD	0.3	0.3	9.4	0.0	
121873	JAMES EDWARD FURNITURE	1555 E JACKSON ST	0.1	0.1			
101	JBS TOLLESON INC	651 S 91ST AVE	12.9	4.8	14.6	0.1	
1213	JENSEN PRECAST	2410 W BROADWAY RD	0.2	0.1			
1027	JPCI SERVICES	PORTABLE	0.2	0.2	2.6	0.2	
49780	JW MARRIOTT DESERT RIDGE HOTEL	5350 E MARRIOTT DR	0.5	0.5	6.8	0.0	
641	KILAUEA CRUSHERS INC	21940 N 75TH AVE	0.6	0.1			
725	KILAUEA CRUSHERS INC	HWY 74	4.7	0.7			
114904	KILAUEA CRUSHERS INC	16402 S TUTHILL RD	2.3	0.3			
128509	KILAUEA CRUSHERS INC	SR 85 & BUCKEYE HILLS DR	0.6	0.1			
857	L3 TECHNOLOGIES	1215 S 52ND ST	0.0	0.0	0.3	0.0	
96886	LEGENDS FURNITURE	10300 W BUCKEYE RD	0.0	0.0			
130111	LIFEPLAN CREMATORIUM INC	1216 N 17TH AVE	0.4	0.2	0.7	0.1	
129796	LITCHFIELD PARK SERVICE CO LIBERTY WATER	6302 N EL MIRAGE RD	0.0	0.0	0.5	0.0	
744	M E GLOBAL INC	5857 S KYRENE RD	14.9	9.2	29.0	11.8	
106053	M R TANNER MINING	6515 N EL MIRAGE RD	1.1	0.3			
1248	MAAX SPAS INDUSTRIES CORP	25605 S ARIZONA AVE	0.3	0.2			
31261	MADISON GRANITE SUPPLIES	29925 N NORTH VALLEY PKWY	8.6	1.3	15.7	0.9	
148	MAGELLAN AEROSPACE, GLENDALE INC	5440 W MISSOURI AVE	0.5	0.4	1.1	0.1	
1507	MAPEI CORP	401 S SMITH RD	0.2	0.0			
133636	MARATHON EQUIPMENT COMPANY	402 N 44TH AVE	1.7	1.2	1.9	0.0	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
353	MARLAM INDUSTRIES INC	834 E HAMMOND LN	0.0	0.0	0.0	0.0	
61268	MASTER BLOCK	12620 W BUTLER DR	0.4	0.2	0.4	0.0	
130226	MASTER READY MIX INC	2544 W BROADWAY RD	0.1	0.1			
131905	MATERIAL DISTRIBUTOR COMPANY OF ARIZONA	1133 S SIRRINE ST	0.3	0.2			
135887	MCLANE FOODSERVICE	7600 W ROOSEVELT ST	0.0	0.0	0.1	0.0	
1200	MEDTRONIC - TEMPE	2343 W MEDTRONIC WAY	1.2	0.8	0.6	0.0	0.1
244	MELCHER MISSION CHAPEL AND CREMATORY	6625 E MAIN ST	0.4	0.2	0.7	0.1	
3326	MESA FULLY FORMED LLC	1111 S SIRRINE ST	0.2	0.2			
64504	MESA FULLY FORMED, LLC	7335 N 108TH AVE	0.0	0.0			
4105	MESA INDUSTRIES INC	230 N 48TH AVE	0.5	0.4			
128610	MESA UNIFIED SCHOOL DISTRICT, #4	549 N STAPLEY DR BLDG #14	0.0	0.0	0.1	0.0	
446	METRO MATERIALS LLC	5455 W MONTEBELLO AVE	0.0	0.0			
130810	MICKELSON & RAY, INC.	2402 S 55TH AVE	0.5	0.2			
30307	MILLER WHOLESALE LUMBER CO	1700 S KACHINA DR	0.0	0.0			
3724	MISSION FOODS-TEMPE	5860 S ASH AVE	0.2	0.2	2.9	0.0	
963	MORAN & SONS LUMBER CO INC	1551 S 59TH AVE	0.1	0.1			
882	MORTON SALT, INC.	13000 W GLENDALE AVE	3.4	2.0	8.6	0.4	
13650	MOUNTAIN RIDGE HIGH SCHOOL	22800 N 67TH AVE	0.0	0.0	0.1	0.0	
132523	MOUNTAIN VIEW CUSTOM CABINETS, INC.	23306 N 15TH AVE	0.1	0.0			
264	MOUNTAIN VIEW FUNERAL HOME AND CEMETERY	7900 E MAIN ST	0.1	0.1	0.1	0.0	
146	MWM CORPORATION	5650 W BUCKEYE RD	0.0	0.0			
34197	NATIONAL GYPSUM COMPANY	1414 E HADLEY ST	6.1	3.6	4.1	0.1	
114015	NATIONAL SPECIALTY AGGREGATES LLC	4310 S 80TH ST	0.8	0.1	0.0	0.0	
910	NELTEC INC	1420 W 12TH PL	0.1	0.1	2.7	0.0	
129677	NO WASTE GRINDINGS	PORTABLE #1	0.6	0.6	8.0	0.5	
132318	NORTHERN CONTOURS INC	305 S BROOKS CIR	0.4	0.3			
881	NXP SEMICONDUCTORS	1300 N ALMA SCHOOL RD	6.8	5.1	15.8	0.1	3.6
3953	OAKCRAFT INC	7733 W OLIVE AVE	0.1	0.1	0.1	0.0	
31637	OLAM COTTON	25500 W SOUTHERN AVE	4.8	0.7	0.1	0.0	
53	OLDCASTLE PRECAST INC	411 E FRYE RD	0.9	0.4	4.0	0.3	
132335	OLDCASTLE PRECAST, INC	2900 S 35TH AVE	0.1	0.0			
302	OLSON PRECAST OF ARIZONA INC	3045 S 35TH AVE	2.1	0.6			

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
131719	OPTIMA CAMELVIEW VILLAGE	7141 E RANCHO VISTA DR	0.0	0.0	0.5	0.0	
98	PALO VERDE NUCLEAR GENERATING STATION	5801 S WINTERSBURG RD	32.6	20.1	43.1	0.0	3.2
428	PALOMA GIN PROPERTIES LLC	57525 S POTATOE RD	9.0	1.4	0.0	0.0	
130656	PALOMA READY MIX & MATERIALS LLC	PORTABLE #1	0.1	0.0	0.4	0.0	
733	PAN GLO SERVICES LLC	2401 W SHERMAN ST	0.0	0.0	0.5	0.0	
49047	PARADISE MEMORIAL CREMATORY	9300 E SHEA BLVD BLDG C	0.9	0.6	1.7	0.2	
420	PARAGON-AGGREGATE PRODUCTS CORP	5420 W BETHANY HOME RD	0.0	0.0			
57973	PAVESTONE COMPANY	1015 S 43RD AVE	0.5	0.1			
109938	PAYPAL INC.	4010 N 3RD ST	0.1	0.1	17.4	0.5	
4241	PEPSICO	409 S 104TH AVE	1.1	1.1	6.2	0.1	
29244	PET & ANIMAL LOVERS SERVICE (PALS)	3629 N 40TH AVE	1.9	1.1	3.6	0.5	
128625	PHOENIX BAPTIST HOSPITAL (NEW AIR)	2000 W BETHANY HOME RD	0.0	0.0	0.2	0.0	
253	PHOENIX CEMENT CO	1941 W LOWER BUCKEYE RD	0.2	0.0			
34873	PHOENIX CEMENT CO	1325 N 21ST AVE	0.1	0.0			
91190	PHOENIX CEMENT CO, 54TH AVE TERMINAL	5402 W BUCHANAN ST	0.0	0.0			
143	PHOENIX CEMENT COMPANY	1802 W LOWER BUCKEYE RD	0.9	0.0			
69	PHOENIX HEAT TREATING INC	2405 W MOHAVE RD	0.3	0.3	1.7	0.0	0.3
562	PHOENIX NEWSPAPERS INC	22600 N 19TH AVE	0.0	0.0	0.5	0.0	
126445	PHOENIX PAVER MANUFACTURING LLC	515 W ELWOOD ST	0.9	0.2			
1154	PING INC	2201 W DESERT COVE AVE	0.0	0.0	0.1	0.0	
719	PIONEER LANDSCAPING MATERIALS INC	609 W GUADALUPE RD	0.6	0.1			
38825	PIONEER LANDSCAPING MATERIALS INC	11550 W NORTHERN AVE	0.2	0.0			
54467	PIONEER LANDSCAPING MATERIALS INC	1638 E DEER VALLEY RD	0.3	0.0			
57639	PIONEER LANDSCAPING MATERIALS INC	31906 W CAMELBACK RD	1.7	0.2			
113152	PIONEER LANDSCAPING MATERIALS INC	18335 W MCDOWELL RD	0.2	0.0			
52779	PIONEER LANDSCAPING MATERIALS, INC	13460 W WESTGATE DR	0.4	0.1			
129122	PIONEER LANDSCAPING MATERIALS, INC	25507 S POWER RD	0.3	0.0			
63251	PIONEER SAND COMPANY	11243 E WILLIS RD	0.4	0.1			
131066	PIONEER SAND COMPANY	2305 S HIGLEY RD	0.8	0.1			
133798	PLATYPUS DEVELOPMENT LLC	3740 S SIGNAL BUTTE RD	5.5	0.0	1.7	0.0	
56250	POLY ONE PCC	7601 N GLEN HARBOR BLVD	0.2	0.2	0.0		
108860	PRISMA GRAPHIC CORPORATION	2937 E BROADWAY RD	0.0	0.0	0.2	0.0	0.0

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
60889	PURCELLS WESTERN STATES TIRE	420 S 35TH AVE	0.0	0.0	0.1	0.0	
1335	QUALITY BLOCK INC	3035 S 35TH AVE	0.6	0.4	0.8	0.0	
3307	QUIKJET LLC	5119 W MONROE ST	0.0	0.0	0.1	0.0	
437	QUIKRETE COMPANIES-ARIZONA	26807 W BASELINE RD	0.4	0.3	2.6	0.0	
131898	QUIKTRIP DISTRIBUTION - PHOENIX	8501 W LATHAM ST	0.1	0.1	1.0	0.0	
127827	QUINTERO WASTEWATER TREATMENT FACILITY	16752 W STATE ROUTE 74	0.0	0.0	0.6	0.0	
98541	QWEST	215 E INDIAN SCHOOL RD	0.0	0.0	0.5	0.0	
132499	R & G CUSTOM CRAFTING LLC	2343 W CYPRESS ST	0.0	0.0			
2206	RED EAGLE ENTERPRISES INC	12946 W SANTA FE DR	0.0	0.0	0.1	0.0	
537	RED MOUNTAIN MINING INC	4520 N POWER RD	4.6	1.1	7.7	0.5	
128324	REGENCY MORTUARY SERVICES INC	9850 W THUNDERBIRD RD	0.2	0.1	0.3	0.0	
131605	REGIONAL PUBLIC TRANSPORTATION AUTHORITY	3320 N GREENFIELD RD	0.0	0.0	0.2	0.0	
126322	RELIANCE CUSTOM CABINETS, INC.	825 N 73RD AVE #144	0.0	0.0			
131816	RENAISSANCE GLENDALE HOTEL & SPA	9495 W COYOTES BLVD	0.0	0.0	0.4	0.0	
134572	RESOURCE RECYCLING OF ARIZONA LLC	300 E PINNACLE PEAK RD	0.1	0.0			
109168	RIO GRANDE MATERIAL	5026 S 51ST AVE	0.2	0.0			
44356	RITCHIE BROS AUCTIONEERS (AMERICA) INC	5410 W LOWER BUCKEYE RD	0.1	0.1	0.0	0.0	0.0
4318	RIVER RANCH PLANT #40	5159 N EL MIRAGE RD	1.7	0.3	0.0	0.0	
133058	ROCK SOLID INC	11500 W BEARDSLEY RD	1.1	0.7	0.1	0.0	
133589	ROCK SOLID INC	6204 W SOUTHERN AVE	0.7	0.4	0.0	0.0	
1240	RYSSO PETERS	2525 W CORONADO RD	0.1	0.0			
1371	SAGUARO MOULDING INC	321 S 54TH PL	0.1	0.1			
132005	SALT RIVER MATERIALS GROUP	6204 W SOUTHERN AVE	2.2	0.3			
132784	SAM'S CLUB #6605	1225 N GILBERT RD	0.0	0.0	0.1	0.0	
35385	SAWMILL CABINETS, LLC	4712 E VIRGINIA ST	46.1	36.8			
132227	SCHAUMAPLAST PRECISION FOAM MOLDING LP	21 N 39TH AVE	0.0	0.0	0.6	0.0	
4072	SCHREIBER FOODS INC	2122 S HARDY DR	1.1	2.2	3.9	0.1	
266	SCHUFF STEEL CO	420 S 19TH AVE	0.0	0.0			
246	SCHULT HOMES	231 N APACHE RD	0.6	0.3			
132688	SCOTTSDALE ART FACTORY	7407 E GREENWAY RD	0.1	0.0			
1351	SERENITY MORTUARY SERV INC	2514 S 6TH AVE	1.0	0.6	1.8	0.2	
134841	SFSR MARINA HEIGHTS	500 E RIO SALADO PKWY	0.1	0.1	5.3	0.0	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
1169	SHAMROCK FOODS CO	2228 N BLACK CANYON HWY	0.9	0.9	11.3	0.1	
130996	SHUTTERZ INC	6655 W FRYE RD	0.0	0.0			
18810	SILGAN PLASTIC CLOSURE SOLUTIONS	4 S 84TH AVE STE A	0.0	0.0			
27933	SKUNK CREEK LANDFILL	3165 W HAPPY VALLEY RD	14.8	8.9	1.7	2.8	
39980	S-L SNACKS AZ, LLC	1200 N BULLARD AVE	1.5	1.5	19.8	0.1	
131686	SOLAR & RENEWABLES MANAGEMENT, LLC	29505 W SOUTHERN AVE	0.0	0.0	8.6	5.5	
130141	SOUTHWEST ASPHALT	7TH AVE PORTABLE	7.1	1.3	4.8	0.0	
52776	SOUTHWEST BAKING COMPANY	9604 W BUCKEYE RD	0.0	0.0	0.0	0.0	
308	SOUTHWEST DISTRIBUTING CO	539 S DREW ST	2.6	1.4	0.1	0.0	
46277	SOUTHWEST FOREST PRODUCTS INC	2828 S 35TH AVE #1	7.1	5.8	0.9	0.0	
31643	SOUTHWEST REGIONAL LANDFILL	24427 S HWY 85	13.9	3.5	4.0	0.6	
36910	SPA-1 WATER RECLAMATION FACILITY	11401 N 136TH AVE	0.0	0.0	0.6	0.0	
2110	SPECIAL DEVICES INC	3431 N RESEDA CIR	0.0	0.0			
122	SPELLMAN HARDWOODS INC	4645 N 43RD AVE	1.2	0.7			
80437	SR 85 LANDFILL	28633 W PATTERSON RD	44.7	16.7	2.8	3.2	
4400	SUMCO SOUTHWEST CORPORATION	19801 N TATUM BLVD	0.7	0.4	13.1	0.6	0.1
378	SUN LAND MATERIALS	6950 W SOUTHERN AVE	0.5	0.2	1.6	0.1	
158	SUNSHINE REDI-MIX	5725 N 55TH AVE	0.2	0.1			
165	SUPERLITE BLOCK	301 E BASELINE RD	0.7	0.5	0.5	0.0	
1475	SUPERLITE BLOCK	4021 S 19TH AVE	0.4	0.2	0.5	0.0	
37546	SUPERLITE BLOCK	4626 N 42ND AVE	2.3	1.6	1.2	0.0	
126128	THATCHER COMPANY OF ARIZONA	6321 S RAINBOW RD	0.0	0.0	0.0	0.0	
249	THE BOEING COMPANY	5000 E MCDOWELL RD	1.4	0.8	2.0	0.0	
129078	THE DIAL CORPORATION A HENKEL COMPANY	7201 E HENKEL LN	0.0	0.0	0.6	0.0	
35936	THE INVENTURE GROUP INC	3500 S LA COMETA	17.4	5.3	6.1	0.0	
131502	THE PLAZA LOFTS AT KIERLAND COMMONS	15215 N KIERLAND BLVD	0.0	0.0	0.4	0.0	
118720	TOWN OF GILBERT - WELL SITE #24	2710 E WILLIAMS FIELD RD	0.0	0.0	1.1	0.0	
4009	ULTRAKOTE PRODUCTS LLC	327 S 27TH AVE	0.0	0.0			
234	UNITED DAIRYMEN OF ARIZONA	2008 S HARDY DR	27.8	3.7	30.8	0.3	
124601	UNIVERSITY OF PHOENIX	4025 S RIVERPOINT PKWY	0.0	0.0	0.2	0.0	
63962	UPPER CRUST BAKERY	3655 W WASHINGTON ST	0.1	0.1	1.9	0.0	
131506	USAA (UNITED SERVICES AUTOMOBILE ASSOC)	1 N NORTERRA DR	0.0	0.0	0.8	0.1	

ID	Business Name	Address	PM-10	PM-2.5	NOX	SOX	NHX
130359	VANGUARD	14321 N NORTHSIGHT BLVD	0.0	0.0	0.6	0.0	
127833	VERIZON BUSINESS	27826 N 193RD AVE	0.0	0.0	1.0	0.1	
64786	VERIZON WIRELESS	1250 W GUADALUPE RD	0.7	0.0	0.1	0.0	
64787	VERIZON WIRELESS	429 N 30TH ST	0.6	0.0		0.0	
102982	VERIZON WIRELESS (VAW) LLC	126 W GEMINI DR	0.0	0.0	1.2	0.1	
131704	VI AT SILVERSTONE	23005 N 74TH ST	0.0	0.0	0.5	0.0	
135061	VULCAN ASPHALT LLC	3640 S 19TH AVE	1.0	0.7	1.5	0.3	
135062	VULCAN ASPHALT LLC	5150 S 27TH AVE	2.8	0.1	4.9	2.9	
344	VULCAN MATERIALS CO	11923 W INDIAN SCHOOL RD	1.0	0.1			
1415	VULCAN MATERIALS CO	7845 W BROADWAY RD	11.9	1.0	7.7	7.7	
132528	VULCAN MATERIALS COMPANY	3410 E VIRGINIA ST	11.8	1.2	9.1	9.1	
130787	VULCAN MATERIALS COMPANY AVONDALE PLANT	5301 S DYSART RD	0.3	0.0			
2	VULCAN MATERIALS CO-WESTERN DIVISION	14521 N 115TH AVE	7.9	2.2	8.6	8.6	
90	VULCAN MATERIALS CO-WESTERN DIVISION	4830 S 43RD AVE	7.6	0.6	8.0	0.1	
134056	VULTURE PEAK HOLDINGS, LLC	36610 N 355TH AVE	0.4	0.1			
1149	WEAVER QUALITY SHUTTERS INC	218 S 15TH ST	0.0	0.0			
131585	WEST COAST SAND AND GRAVEL	13333 W SOUTHERN AVE	0.9	0.1			
71340	WEST VALLEY ROCK	25376 W TONOPAH-SALOME HWY	0.3	0.0			
125450	WESTERN AGGREGATES PLANT #41	31805 W SOUTHERN AVE	2.5	0.2			
130153	WESTERN REGIONAL MEDICAL CENTER	14200 W CELEBRATE LIFE WAY	0.0	0.0	0.3	0.0	
269	WESTERN STUCCO PRODUCTS CO INC	6101 N 53RD DR	0.4	0.1			
330	WESTROCK CP, LLC	6902 W NORTHERN AVE	2.9	1.0	2.1	0.0	0.0
398	WICKENBURG FACILITY	44605 GRAND AVE	0.3	0.0	0.1	0.0	
121588	WICKENBURG FUNERAL HOMES INC	187 N ADAMS ST	0.1	0.1	0.2	0.0	
691	WILBUR-ELLIS CO	6415 S RAINBOW RD	1.9	1.9			
128707	WOOD UNLIMITED INC (AIR)	9801 N LITCHFIELD RD	1.9	1.8	23.0	1.5	
3976	WOODCASE FINE CABINETRY, INC.	1727 E DEER VALLEY DR BLDG 1 STE 1	0.1	0.1	0.0	0.0	
35359	WOODESIGN A CORPORATION	3234 E CORONA AVE	0.0	0.0			

Appendix E. Responsiveness Summary

RESPONSIVENESS SUMMARY

2017 PM₁₀ PERIODIC EMISSIONS INVENTORY

The 2017 PM₁₀ Periodic Emissions Inventory was made available for public review on September 19, 2019. No requests for a public hearing or comments were received during the public comment period.

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SEP 24 2019
MARICOPA COUNTY
AIR QUALITY DEPARTMENT

PNI-Arizona Business Gazette

AFFIDAVIT OF PUBLICATION

MC AIR QUALITY DIV
3800 N CENTRAL AVE SUITE 1400
PHOENIX, AZ 85012

NOTICE OF 30-DAY COMMENT PERIOD FOR 2017 PERIODIC PM10 EMISSION INVENTORY (PEI)

The draft periodic PM10 emission inventory includes emission estimates for coarse particulate matter <10 µm in diameter (PM10), fine particulate matter <2.5 µm (PM2.5), nitrogen oxides (NOx), sulfur oxides (SOx), and ammonia (NH3). Emissions are calculated for both Maricopa County and the PM10 nonattainment area. The department invites you to review this emission inventory at <http://www.maricopa.gov/2652> and to submit your comments to Maricopa County Air Quality Department, Emissions Inventory Unit, 3800 N Central Ave, Suite 1400, Phoenix, AZ 85012, or emailed to emisinv@maricopa.gov. Comments must be received no later than October 17, 2019. Questions may be addressed the emission inventory unit at emisinv@maricopa.gov. Interested persons may request in writing a public hearing; requests must be received prior to October 17, 2019.
Pub: Sept 19, 26, 2019

Order # 0003787426 # of Affidavits 1

P.O #

Published Date(s):

09/19/19, 09/26/19

STATE OF WISCONSIN }
COUNTY OF BROWN } SS.

I, being first duly sworn, upon oath deposes and says: That I am the legal clerk of the Arizona Republic, a newspaper of general circulation in the counties of Maricopa, Coconino, Pima and Pinal, in the State of Arizona, published weekly at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

Sworn to before me this

26 TH day of
SEPTEMBER 2019

Vicky Felty
Notary Public
91921

My Commission expires: _____

