

3. Area Sources

3.1 Scope and methodology

This chapter considers all stationary sources which are too small or too numerous to be treated as point sources. EPA guidance documents, including “Introduction to Area Source Inventory Development” as well as permit and emissions data in the MCAQD’s Environmental Management System (EMS) database, and previous SIP inventories, were evaluated to develop the list of area source categories for inclusion. Some source categories were deemed “insignificant” because there are no large production facilities and/or very few small sources, and therefore emissions were not quantified. MCAQD prepared the area source emission estimates for all area sources and provided quality assurance checks on all data. Table 3.1–1 contains a list of all area source categories addressed in this chapter.

Table 3.1–1. List of area source categories.

Area source description	Section
Fuel combustion:	
Industrial natural gas	3.2.1
Industrial fuel oil	3.2.2
Commercial/institutional natural gas	3.2.3
Commercial/institutional fuel oil	3.2.4
Residential natural gas	3.2.5
Residential wood	3.2.6
Residential fuel oil	3.2.7
Industrial processes:	
Secondary metal production	3.3.1
Commercial cooking	3.3.2
State-permitted portable sources	3.3.3
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Electrical equipment manufacturing	3.3.5
Waste treatment and disposal:	
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Open burning	3.4.2
Landfills	3.4.3
Other industrial waste disposal	3.4.4
Miscellaneous area sources:	
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Prescribed Fires	3.5.1.2
Structure fires	3.5.1.3
Vehicle fires	3.5.1.4
Engine testing	3.5.1.5
Health services (crematories)	3.5.2

For nearly all categories, emissions were calculated in one of the following ways:

- emissions estimates for some categories were developed by conducting surveys on local usage (e.g., natural gas consumption) or derived from state-wide data (e.g., fuel oil use).
- for some widespread or diverse categories (e.g., consumer solvent use), emissions were calculated using published per-capita or per-employee emission factors.
- for source categories with some information available from annual emissions reports (e.g., bakeries), these data were combined with employment data to “scale up” reported emissions to reflect the entire source category.
- for those source categories with detailed emissions data available from most or all significant sources in the category, emissions were calculated based on detailed process and operational data provided by these sources.

The specific emissions estimation methodologies used for each source category (including any application of rule effectiveness) are described in greater detail in the respective sections.

3.2 Fuel combustion

Area source emissions for the following seven categories of fuel consumption were calculated: Industrial natural gas, industrial fuel oil, commercial/institutional natural gas, commercial institutional fuel oil, residential natural gas, residential wood, and residential fuel oil. Data for emissions calculations from natural gas combustion came from a survey of the three natural gas suppliers in Maricopa County. The following table summarizes the natural gas sales data received from Maricopa County natural gas suppliers.

Table 3.2–1. Annual natural gas sales in Maricopa County, by supply company and end-user category.
Sales by end user category (in MMCF/yr)

Natural gas supplier	Sales by end user category (in MMCF/yr)					
	Electric Utilities	Industrial	Commercial/Institutional	Residential	Transport*	Other*
Southwest Gas	17.07	1,543.27	15,643.15	14,911.67	6,487.35	n/a
City of Mesa	6.52	93.02	1,609.12	1,339.62	n/a	244.97
El Paso	227,608.92	201.90	n/a	n/a	n/a	6.07

* For emissions calculations, sales from these two categories were grouped with industrial sales.

Area source emissions for wood and fuel oil combustion were calculated from Arizona state-level sales and consumption data as described in the following subsections. Area source emissions from coal and liquid petroleum gas were not calculated as emissions from these categories were determined to be insignificant.

3.2.1 Industrial natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas distributed, by user category, within the county in 2008. Area source industrial natural gas usage for the county is based on the reported total volume of natural gas sold to industrial sources, minus natural gas used by industrial point sources.

Natural gas is used for both external combustion (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source natural gas usage derived must be apportioned between these two categories. This apportionment was based

on the percentages of external and internal natural gas combustion reported by all industrial area sources in 2008.

Annual emissions for the county are calculated by multiplying natural gas usage by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–2. Emission factors and annual CO emissions from area-source industrial natural gas combustion, by combustion type.

Combustion type	% of total	Annual natural gas usage (MMCF)	CO emission factor (lbs/MMCF)	Annual CO emissions (tons/yr)
External	98.44	7,934.68	84	333.26
Internal	1.56	125.74	399	25.09
Totals:	100.00	8,060.43		358.34

Season-day emissions for the county are calculated by first multiplying annual emissions by the percentage of industrial natural gas sold used during the CO season. (Figures reported by natural gas suppliers for the December–February time period are assumed to be representative for the November–January CO season.) CO season emission totals are then divided by the number of days that activity occurs during the CO season. Annual and season-day emissions within the CO maintenance area are calculated by applying the ratio of industrial employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–3. Annual and season-day CO emissions from area-source industrial natural gas combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	358.34	2,513.9
CO Maintenance Area	352.68	2,474.1

3.2.2 Industrial fuel oil

Area source emissions from industrial fuel oil combustion are calculated by a multi-step process which allocates Arizona state-level industrial fuel oil sales data from the US Department of Energy, Energy Information Administration (US DOE, 2010a) to Maricopa County.

To derive industrial fuel oil usage in Maricopa County, reported Arizona sales of high-sulfur diesel for 2008 are first subtracted from Arizona state-level total industrial fuel oil sales, as it is presumed that no high-sulfur diesel fuel is used in Maricopa County due to local air quality regulations and market conditions.

Arizona state industrial fuel oil sales (less high-sulfur diesel fuel) are then multiplied by the ratio of industrial employment in Maricopa County to Arizona State (0.70), as determined by data from the US Census Bureau (2010) to estimate annual Maricopa County industrial fuel oil sales. To avoid double-counting, industrial fuel oil use attributable to stationary point sources (addressed in Chapter 2) and nonroad mobile sources (addressed in Chapter 4) are subtracted from County industrial fuel oil sales to estimate county fuel oil usage by area sources.

Industrial fuel oil is used for both external combustions (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area-source industrial fuel oil sales derived above must be apportioned between these two categories. This apportion-

ment was based on the percentages of external and internal fuel oil combustion reported by all industrial area sources surveyed in 2008 shown in Table 3.2–4.

County-level annual emissions from this area source category were calculated by multiplying industrial fuel oil sales by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–4. Emission factors and annual CO emissions from area-source industrial fuel oil combustion, by combustion type.

Combustion type	% of total	Annual fuel oil sales (Mgals)	CO emission factor (lbs/Mgals)	Annual CO emissions (tons/yr)
External	78.01	65,634.56	5	164.09
Internal	21.99	18,501.53	130	1,202.60
Totals:	100.00	84,136.09		1,366.69

Season-day emissions for the county are calculated by first multiplying annual emissions by 25.07% to estimate CO season emission totals. CO season emission totals are then divided by the number of days that activity occurs during the CO season (78), as recommended by EIIIP guidance (US EPA, 2001a).

Annual and season-day emissions in the CO maintenance area are calculated by applying the ratio of industrial employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–5. Annual and season-day CO emissions from area-source industrial fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	1,366.69	8,784.8
CO Maintenance Area	1,345.09	8,646.0

3.2.3 Commercial/institutional natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas distributed, by user category, within the county in 2008. Area source commercial and institutional (C&I) natural gas usage for the county is based on the reported total volume of natural gas sold to C&I sources, minus natural gas used by C&I point sources.

Natural gas is used for both external combustions (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source natural gas usage derived above must be apportioned between these two categories. This apportionment was based on the percentages of external and internal natural gas combustion reported by all C&I area sources in 2008.

Annual emissions for the county and the CO maintenance area are calculated by multiplying natural gas usage by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–6. Emission factors and annual CO emissions from area-source commercial/institutional natural gas combustion, by combustion type.

Combustion type	% of total	Annual natural gas usage (MMCF)	CO emission factor (lbs/MMCF)	Annual CO emissions (tons/yr)
External	98.34	17,130.07	84	719.46
Internal	1.66	289.16	399	57.69
Totals:	100.00	17,419.23		777.15

Season-day emissions for the county are calculated by first multiplying annual emissions by the percentage of C&I natural gas sold used during the CO season. (Figures reported by natural gas suppliers for the December–February time period are assumed to be representative for the November–January CO season.) CO season emission totals are then divided by the number of days that activity occurs during the CO season.

Annual and season-day emissions in the CO maintenance area are calculated by applying the combined ratio of retail, office, public and other employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–7. Annual and season-day CO emissions from area-source commercial/institutional natural gas combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	777.15	7,248.7
CO Maintenance Area	760.67	7,095.1

3.2.4 Commercial/institutional fuel oil

Area source emissions from commercial and institutional (C&I) fuel oil combustion are calculated by a multi-step process of allocating Arizona state-level C&I fuel oil sales as reported by the US Department of Energy, Energy Information Administration (US DOE, 2010b) to Maricopa County.

To derive commercial/institutional fuel oil usage in Maricopa County, reported Arizona state-level sales of high-sulfur diesel for 2008 are first subtracted from Arizona state-level total commercial/institutional fuel oil sales, as it is presumed that no high-sulfur diesel fuel is used in Maricopa County due to local clean air act requirements and market conditions. Arizona state commercial/institutional fuel oil sales (less high-sulfur diesel fuel) are then multiplied by the ratio of C&I employment in Maricopa County to Arizona state (0.80), as determined by data from the US Census Bureau (2010) to estimate Maricopa County-level C&I fuel oil sales.

To avoid double-counting, commercial/institutional fuel oil use attributable to stationary point sources (addressed in Chapter 2) and nonroad mobile sources (addressed in Chapter 4) are subtracted from County C&I fuel oil sales to estimate county fuel oil usage used by C&I area sources.

Fuel oil is used for both external combustion (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source C&I fuel oil sales derived above must be apportioned between these two categories. This apportionment was based on the percentages of external and internal fuel oil combustion reported by all

commercial/institutional area sources surveyed by MCAQD in 2008 (shown in Table 3.2–8 below).

Annual emissions for the county are calculated by multiplying C&I fuel oil sales by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–8. Emission factors and annual CO emissions from area-source commercial/institutional fuel oil combustion, by combustion type.

Combustion type	% of total	Annual fuel oil sales (Mgals)	CO emission factor (lbs/Mgals)	Annual CO emissions (tons/yr)
External	66.95	20,321.18	5	50.80
Internal	33.05	10,031.59	130	652.05
Totals:	100.00	30,352.78		702.86

Season-day emissions for the county are calculated by first multiplying annual emissions by 26.66% to estimate CO season emission totals. CO season emission totals are then divided by the number of days that activity occurs during the CO season (78) as recommended by EIIP guidance (US EPA, 2001a).

Annual and season-day emissions within the CO maintenance area are calculated by applying the combined ratio of retail, office, public and other employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–9. Annual and season-day CO emissions from area-source commercial/institutional fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	702.86	4,804.7
CO Maintenance Area	687.96	4,702.8

3.2.5 Residential natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas sold, by user category, within the county. Annual emissions from residential natural gas combustion emissions were calculated by multiplying residential natural gas sales by emission factors for residential natural gas combustion listed in AP-42 Tables 1.4-1 and 1.4-2 (US EPA, 1998).

CO season-day emissions are calculated by first multiplying reported natural gas usage during the CO season (8,172.3 MMCF) by the emission factor for CO for residential natural gas combustion (40 lbs CO/MMCF) to produce CO season emissions (natural gas usage reported for the months of December-February are assumed to represent CO season usage). CO season emissions are then divided by the number of days during the CO season that residential natural gas combustion occurs (91) (US EPA, 2001a).

Annual and season-day residential natural gas emissions in the CO maintenance area are calculated by multiplying county-level emissions by the percentage of total resident population (96.85%) in the CO maintenance area.

Table 3.2–10. Annual and season-day CO emissions from residential natural gas combustion.

Geographic area	Annual CO emissions (tons/year)	Season-day CO emissions (lbs/day)
Maricopa County	325.03	3,592.2
CO Maintenance Area	314.79	3,479.1

3.2.6 Residential wood combustion

Area-source emissions from residential wood combustion are calculated based on the amount of wood burned in fireplaces and woodstoves in Maricopa County, as recommended by EIIP guidance (US EPA, 2001b). Residential wood combustion in the county is estimated by multiplying data on statewide residential wood combustion usage (651,000 cords/yr) from the US Department of Energy (US DOE, 2010) by the ratio of county to state households that report use of wood for heating (3.2867%) from the US Census Bureau (2010a). The latest available data on residential wood use for household heating from the US Department of Energy is for the calendar year 2007. Since all fireplaces in homes constructed since 1999 are required by Arizona statute to be clean-burning, it is assumed that these new homes have negligible emissions. Thus, year 2007 data is assumed to be representative of 2008 emissions.

To calculate emissions, the amount of wood used is converted to tons by multiplying cords by the number of cubic feet of wood in a cord (79 avg. ft³ wood/cord) and by the density of the wood used (US EPA, 2001b). Wood density is determined by weighted average of types of wood used for residential combustion in Maricopa County (31.57 lbs/ft³), provided by the US Forest Service (USFS, 1993).

Annual emissions from residential wood combustion are calculated by multiplying the tons of wood used by the CO emission factor for residential total woodstoves and fireplaces (252.6 lbs/ton) from EIIP Volume III, Chapter 2, Table 2.4-1 (US EPA, 2001b).

Season-day CO emissions are calculated by apportioning wood burning activity based on heating degree days (i.e., the number of degrees per day that the daily average temperature is below 65°F). Data provided by Arizona Department of Commerce (ADOC, 2010) indicated that there were a total of 885 heating degree days in Phoenix during 2008, with 625 heating degrees days reported during the CO season. Co season-day emissions were derived by applying the ratio of CO season heating degree days to annual heating degree days and are shown in Table 3.2-11.

Annual and season-day emissions within the CO maintenance area are calculated by multiplying county totals by the percentage of residential population within the CO maintenance area of 96.85%. See Section 1.5.1 for a further discussion of the housing data used.

Table 3.2–11. Annual and season-day CO emissions from residential wood combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	3,369.91	52,305.0
CO Maintenance Area	3,263.75	50,657.4

3.2.7 Residential fuel oil

Emissions from residential fuel oil use were calculated using an approach similar to that used for residential wood combustion described in Section 3.2.6. County-level residential fuel oil use was derived from statewide totals (US EIA, 2010) using the ratio of county to state households that report fuel oil use from the US Census Bureau (2010b).

Annual and daily emissions were calculated using AP-42 emission factors and data on heating degree days and residential housing units described in Section 3.2.6. Annual and season-day emissions are shown in Table 3.2–12.

Table 3.2–12. Annual and season-day CO emissions from residential fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.07	1.1
CO Maintenance Area	0.07	1.0

3.3 Industrial processes

3.3.1 Secondary metal production

Annual emissions from secondary metal production facilities were derived from annual emission reports from permitted sources. As this category consists primarily of foundries, it was assumed that there were no significant unpermitted sources within Maricopa County. CO season-day emissions were calculated based on operating schedule information provided in the facilities' annual emission reports. Since all facilities considered in this section are located within the CO maintenance area, total emission values for the county and the CO maintenance area from secondary metal production are equal.

Table 3.3–1. Annual and season-day CO emissions from area-source secondary metal production.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	107.72	703.5
CO Maintenance Area	107.72	703.5

3.3.2 Commercial cooking

Emissions from commercial cooking were estimated for five types of commercial cooking equipment using EPA methodology (US EPA, 2006). The equipment types include: chain-driven charbroilers, underfired charbroilers, deep-fat fryers, flat griddles, and clamshell griddles. EPA's methodology estimates commercial cooking activity for restaurants with each type of cooking equipment (ethnic, family, fast food, seafood, and steak & barbeque) based on an average number of equipment pieces by restaurant type and average pounds of meat cooked on each type of equipment per week (steak, hamburger, poultry, pork, and seafood). The estimated number of restaurants in Maricopa County for the five restaurant types was obtained from a commercial database (www.selectoryonline.com) and is shown in Table 3.3–2.

Table 3.3–2. Number of Maricopa County restaurants, by restaurant type.

Restaurant category	No. of restaurants
Ethnic food	907
Fast food	1,068
Family	253
Seafood	37
Steak & barbecue	75
All restaurants:	2,340

Using the number of restaurants for each restaurant type, along with the default emission factors and equations from US EPA (2006), emissions for each combination of equipment type, restaurant type, and meat type were calculated, and the results were summed to estimate annual emissions for each type of cooking equipment, as shown in Table 3.3–3.

Commercial cooking is assumed to occur uniformly throughout the year, therefore, it was assumed that 25% of annual activity occurs during the CO season, and activity occurs 7 days/week.

Annual and season-day emissions for the CO maintenance area were calculated by multiplying the Maricopa County emission totals by the percentage population within the maintenance area (96.92%). (See Section 1.5.1 for a discussion of the population data used.) Table 3.3–3 summarizes the annual and season-day emissions from commercial cooking for Maricopa County and the CO maintenance area.

Table 3.3–3. Annual and season-day CO emissions from commercial cooking.

Equipment type	Maricopa County		CO Maintenance Area	
	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Chain-driven charbroilers	86.79	476.9	84.12	462.2
Underfired charbroilers	270.94	1,488.7	262.60	1,442.8
Deep fat fryers	–	0.0	0.00	0.0
Flat griddles	22.55	123.9	21.86	120.1
Clamshell griddles	–	0.0	0.00	0.0
Totals:	380.29	2,089.5	368.58	2,025.1

3.3.3 State-permitted portable sources

The Arizona Department of Environmental Quality (ADEQ) retains the authority to permit certain categories of sources within Maricopa County, including portable sources. MCAQD requested information from ADEQ for all ADEQ-permitted sources that reported any activity in Maricopa County during 2008. Annual total emissions for most pollutants were provided, along with information on the facility type, and information on the location of the site(s) during the year. Permits were classified into four major types: asphalt batch, concrete batch, crushing/screening, and other (including soil remediation, generators, etc.). From this information, emissions that occurred within Maricopa County were estimated as in the following example.

Data provided:

Source information: McNeil Brothers - Erie Strayer Portable Plant
Permit type: Concrete batch plant
Operating schedule: Operated from 1/1-5/15 in Mesa at SR202 and McKellips (SE Corner);
operated from 10/16-12/31 in Goodyear at Northside I-10 east of Estrella.

Total annual emissions:	<u>CO</u>
(tons/yr)	<u>6.19</u>

Using this information, calculations were made to determine:

Total operating days in 2008: 136 = 31 (Jan.) + 29 (Feb.) + ...16 (Oct.) + 30 (Nov.) + 31 (Dec.)
Total operating days in Maricopa County: 136 = 31 (Jan.) + 29 (Feb.) + ...16 (Oct.) + 30 (Nov.) + 31 (Dec.)

All emissions were assumed to be equally distributed among all reported days of operation. First, the total emissions attributable to activity in Maricopa County were calculated as follows:

$$\begin{aligned}
 \text{Annual CO emissions in Maricopa County (tons/yr)} &= \text{Total annual emissions} \times \frac{\text{operating days in Maricopa County}}{\text{total operating days in 2008}} \\
 &= 6.19 \times \frac{136}{136} \\
 &= 6.19 \text{ tons CO/yr}
 \end{aligned}$$

Since activity was presumed to be spread equally among all “in-county” days, season-day emissions were thus calculated as follows:

$$\begin{aligned}
 \text{Season-day CO emissions in Maricopa County (lbs/day)} &= \frac{\text{total emissions attributable to activity in Maricopa County}}{\text{number of operating days in Maricopa County}} \times \frac{2,000 \text{ lbs}}{\text{ton}} \\
 &= \frac{6.19 \text{ tons}}{136 \text{ days}} \times \frac{2,000 \text{ lbs}}{\text{ton}} \\
 &= 91.03 \text{ lbs CO /day}
 \end{aligned}$$

Table 3.3–4 summarizes the annual and season-day emissions for all ADEQ-permitted portable sources that operated within Maricopa County at some point during 2008. Since precise location data was not available for all permits, all emissions are conservatively assumed to have originated within the CO maintenance area; thus emission estimates for Maricopa County and the maintenance area are equal.

Table 3.3–4. CO emissions from ADEQ-permitted portable sources.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	145.42	1,212.6
CO Maintenance Area	145.42	1,212.6

3.3.4 Industrial processes, not elsewhere classified (NEC)

Annual area-source emissions from other industrial processes not elsewhere classified (NEC) were derived from annual emissions reports from permitted facilities. Other industrial processes

include a wide array of industrial activities that are often specific to the permitted facility that reported the process. For this reason, it is assumed there are no significant emissions from other industrial processes, other than those reported by permitted facilities on their annual emissions reports. CO season-day emissions are calculated based on operating schedule information provided by the facilities in their annual emissions report.

Table 3.3-5. Annual and season-day CO emissions from other industrial processes.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	18.59	107.3
CO Maintenance Area	3.47	22.7

3.3.5 *Electrical equipment manufacturing*

Annual and season-day emissions from electric equipment manufacturing were derived from annual emission reports submitted by permitted sources. It was assumed that there were no significant unpermitted sources within Maricopa County and all electrical equipment manufacturing permitted sources are reported here as area-sources.

All facilities addressed in this source category are located within the CO maintenance area; thus, emissions for the county and maintenance area are equal. Annual and season-day emissions are shown in Table 3.3-6.

Table 3.3-6. Annual and season-day CO emissions from area-source electric equipment manufacturing.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	3.85	21.3
CO Maintenance Area	3.85	21.3

3.4 Waste treatment and disposal

3.4.1 *On-site incineration*

This section includes emissions from on-site industrial incinerators, primarily burn-off ovens used to reclaim electric wire or other materials. Emissions from human and animal crematories are addressed in Section 3.5.2. There were no incinerators at residential (e.g., apartment complexes) or commercial/institutional facilities (e.g., hospitals, service establishments) in operation during 2008.

Emissions from on-site incineration were determined from annual emissions reports. It is assumed that all incinerator emissions are accounted for, since all permitted incinerators received reports in 2008. Season-day emissions are based on operating schedules as supplied in the annual emissions reports. All surveyed facilities are located within the CO maintenance area; thus, emissions for the county and maintenance area are equal.

Table 3.4-1. Annual and season-day CO emissions from on-site incineration.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.69	5.7
CO Maintenance Area	0.69	5.7

3.4.2 Open burning

Emissions from controlled open burning are regulated by MCAQD Rule 314, 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, air curtain destructor burning of trees, and fire fighting training. Maricopa County's burn permit database was used to identify all burn permits issued during 2008. A total of 55 permits were issued during the year; however, not all permit applications contained the information needed to calculate emissions. Where data were missing, activity data for each permit category was grown from those permits that contained information.

Reported and estimated activity data for each open burning category are summarized in Table 3.4-2. Permits issued for firefighting training are addressed in Section 3.5.1.3, Structure fires.

Table 3.4-2. Summary of 2008 Maricopa County burn permit activity.

Category	Unit of measure	Total reported activity	Number of permits with activity data	Total permits issued	Activity grown to total number of permits issued
Ditchbank/fencerow	Linear ft	541,336	22	32	787,398
Land clearance	Acres	564	5	12	1,354
Air curtain	Material Burned	70*	0	7	70
Tumbleweeds	Piles	14	2	4	28

*Assumed that air curtain destructors burn 10 tons/day of brush/trees/vegetation.

The above activity data were converted to tons material burned using fuel loading factors from AP-42, Table 2.5-5 (US EPA, 1992). The emission and loading factors used are shown in Table 3.4-3.

Table 3.4-3. Emission and fuel loading factors for open burning.

Category	CO emission factors	Fuel loading factors
	(lbs/ton burned)	(tons/acre)
Weeds, unspecified	85	3.2
Russian Thistle (tumbleweeds)	309	0.1
Orchard Crops: Citrus	81	1.0

The following assumptions were made based on previous Maricopa County emission inventory work:

- Ditch banks and fence rows in Maricopa County average 7 feet in width and are burned twice per year (MCESD, 1999).
- A pile of tumbleweeds 15 feet in diameter and 5 feet high weighs 200 lbs (MCESD, 1993). This is equivalent to 0.1 tons/acre, the AP-42 fuel loading factor for tumbleweeds.
- Air curtain destructors burn between 7-10 tons of material per day (MCAQD, 2006).

To calculate the annual amount of material burned on ditch banks and fence rows in Maricopa County, MCAQD estimated the area burned and then applied AP-42 fuel loading factor. Activity data for the other categories were similarly converted to material burned using AP-42 fuel loading factors.

Annual emissions were then calculated by multiplying the amount of material burned by emission factors listed in AP-42 (Table 3.4–3). To account for unpermitted illegal outdoor burning, all calculated emissions estimates were increased 2.87 times based on complaints received in 2008 for open or illegal outside burning (158 complaints received; 158 complaints/55 open burn permits = 2.87). Table 3.4–4 summarizes the annual emissions for Maricopa County from each open burning category.

Table 3.4–4. Annual CO emissions from open burning in Maricopa County (tons/yr).

Category	Ton-equivalents	CO emissions (tons/yr)
Ditchbank/fencerow	809.8	98.87
Land clearance	4,331.5	528.94
Air curtain	70.0	8.14
Tumbleweeds	2.80	1.24
Total:		637.10

Annual emissions for the maintenance area are calculated by multiplying the percentage of agricultural and/or vacant land use located in the CO maintenance area by the Maricopa County emission totals. (See Section 1.5.2 for a discussion of the land-use data used.) Table 3.4–5 summarizes the annual emissions for the CO maintenance area.

Table 3.4–5. Maintenance area:county ratios and annual CO emissions from open burning in the CO maintenance area.

Category	Surrogate land-use category	2009 Maint. area:county land-use ratio	CO emissions (tons/yr)
Ditchbank/fencerow	Agriculture	28.76%	28.43
Land clearance	Vacant	7.71%	152.08
Air curtain	agriculture and vacant	10.17%	2.34
Tumbleweeds	agriculture and vacant	10.17%	0.36
Total:			183.21

Ditch bank/fence row burning is not allowed from November to February, therefore daily emissions during the CO season are zero. For the other burning categories, it was assumed that open burning occurs 5 days per week (most burn permits are issued for weekdays but permits may be issued on weekends depending on circumstances) and open burning occurs evenly during the CO season months (November – January).

Season-day emissions for the maintenance area are calculated by multiplying the percentage of agricultural and/or vacant land use located in the maintenance area (listed in Table 3.4–5) by the County season-day emissions. Table 3.4–6 summarizes the CO season-day emissions from open burning for both Maricopa County and the CO maintenance area.

Table 3.4–6. Season-day CO emissions from open burning (lbs/day).

Category	Maricopa County (lbs/day)	CO maintenance area (lbs/day)
Ditchbank/fencerow	0.0	0.0
Land clearance	16,272.0	1,254.6
Air curtain	250.6	25.5
Tumbleweeds	38.2	3.9
Totals:	16,560.8	1,284.0

3.4.3 Landfills

Emissions from municipal solid waste (MSW) landfills come from uncontrolled landfill gas emissions as well as from cover operations and combustion from control measures, such as a flare. Total emissions were calculated from annual emissions inventory reports from all landfills located within the county; results are shown in Table 3.4–7 below. No landfills were considered point sources; thus all MSW landfills are reported here as an area-source activity.

Table 3.4–7. Annual and season-day CO emissions from landfills.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	40.05	219.9
CO Maintenance Area	20.84	114.7

3.4.4 Other industrial waste disposal

Annual area-source emissions from other industrial waste disposal were derived from annual emissions reports from permitted facilities. Other industrial waste disposal processes include a wide array of industrial activities that are often specific to the permitted facility that reported the process. For this reason, it is assumed there are no significant emissions from this category, other than those reported by permitted facilities on their annual emissions reports. Typical daily emissions were calculated based on operating schedule information provided by the facilities in their annual emissions report. Emission estimates are shown in Table 3.4–8 below.

All facilities that reported area-source emissions from other industrial waste disposal are located inside the CO maintenance area, therefore emissions for Maricopa County and the CO maintenance area are equal.

Table 3.4–8. Annual and typical daily CO emissions from other industrial waste disposal.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	52.86	252.9
CO Maintenance Area	52.86	252.9

3.5 Miscellaneous area sources

3.5.1 Other combustion

3.5.1.1 Wildfires

Data on wildfires in 2008 within Maricopa County were obtained from the Arizona State Land Department (ASLD) Forestry Division (ASLD, 2009), the Arizona Department of Fire, Building, and Life Safety (DFBLS, 2009), and the Federal Fire Occurrence website (FFOW, 2009).

The ASLD Forestry Division provides for the prevention and suppression of wildfires on state and private lands located outside of incorporated municipalities. The wildfire data provided by ASLD includes wildfires that occur outside of local fire districts and municipalities on State, private, and U.S. Bureau of Land Management (BLM) land in 2008. The ASLD reported 25 wildfires in 2008 in Maricopa County which encompassed nearly 750 acres. Wildfire data provided by ASLD were compared to wildfires reported in the Geospatial Multi-Agency

Coordination Group (GeoMAC) Wildland Fire Support database and 2008 Incident Status Summary reports (ICS-209) to identify wildfires that may have occurred outside of ASLD jurisdiction. GeoMAC and ICS-209 reports only include large wildfires, generally fires greater than 100 acres. Three Maricopa County wildfires were reported in GeoMAC and on ICS-209 reports in 2008 (USDA, 2008 and USGS, 2008). Two of these fires were included in the ASLD data. One fire, the Ethan fire, was not captured in the ASLD data because it occurred on tribal lands. The Ethan fire encompassed more than 6,600 acres.

The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire departments. 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 thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included ten “forest, woods or wildland fires”. The ten “forest, woods or wildland fires” were analyzed for inclusion in the wildfire emission estimates. First, the DFBLS fires were culled for duplicates by comparing the incident dates and locations with wildfires reported by ASLD. One DFBLS fire was excluded from the combined dataset because it may have been a duplicate already captured in the ASLD data. Because only four of the ten DFBLS fires included acreage, an average number of acres burned (1.05 acres) were determined from the fires with reported acreage. This average number of acres burned was then applied to the fires with no reported acreage.

The Federal Fire Occurrence Website is an official government website that provides users with the ability to query, research and download wildland fire occurrence data. The data available through this website contains over 548,000 fire records collected by Federal land management agencies for fires that occurred from 1980 through 2008 in the United States. The 2008 data for Maricopa County included eighty-one fires. The federal wildland fire occurrence data were culled for duplicates by comparing the incident names, dates and locations with wildfires reported by ASLD and DFBLS. Thirteen fires were excluded from the combined dataset because they appeared to be duplicates already captured in either the ASLD or DFBLS data and seven fires were excluded because they contained no acreage data. The final 2008 dataset listed 96 fires encompassing over 7,400 acres. Table 3.5-1 summarizes fire data obtained from each data sources.

Table 3.5-1. Fire data sources.

Data Source	Number of Fires	Acreage
Arizona State Land Department (ASLD)	25	747.25
Arizona Department of Fire, Building, and Life Safety (DFBLS)	9	9.45
Federal Fire Occurrence website (FFOW)	61	16.79
ICS-209	1	6,660.00
Totals	96	7,433.49

Fuel loading was assigned using the National Fire Danger Rating System (NFDRS) fuel model codes and a table of fuel loading values for NFDRS fuel model categories (WGA/WRAP, 2005). The department used the NFDRS Fuel Model map in ArcGIS to identify NFDRS fuel types for fires with latitude and longitude data.

Table 3.5–2. NFDRS fuel model categories and fuel loading factors for 2008 Maricopa County wildfires.

Land use type (by NFDRS Model Category)	No. of Fires	Total area (acres)	Fuel loading factor (tons/acre)
Agriculture*	33	744.05	4.5
California chaparral	1	0.01	19.5
Barren*	2	0.4	0.5
Pine-grass savanna	1	0.01	4.7
Intermediate brush	17	2.87	15.0
Sagebrush grass	42	6,686.15	4.5
Totals	96	7,433.49	

* “Agriculture” and “Barren” NFDRS model categories were not included in WGA/WRAP 2002 fuel loading values for NFDRS fuel model categories. Therefore, it was assumed that “Agriculture” is similar to “sagebrush grass” and “Barren” is similar to “western grasses (annual)”, and fuel loadings were assigned accordingly.

Estimates of the material burned were derived by multiplying the number of acres burned by the fuel loading factor. Table 3.5–3 shows the number of wildfires and acres burned for Maricopa County and the CO maintenance area in 2008 and an estimate of material burned. No wildfires occurred during the CO season; therefore season-day emissions from wildfires were zero.

Table 3.5–3. Summary of fires, acres burned and estimate of material burned

Geographic Area	No. of Fires	Acres Burned	Material Burned Annually (tons/yr)	Material Burned in CO Season (tons/season)
Maricopa County	96	7,433	33,479	12.8
CO Maintenance Area	19	28	127	0

The CO emission factor was obtained from the Western Regional Air Partnership's (WRAP) 2002 Fire Emission Inventory (WGA/WRAP, 2005). The CO emission factor for wildfires and prescribed broadcast burning (289 lbs CO/ton) was used.

The majority of fire data included fire locations in latitude and longitude. For those fires without longitude and latitude, the fire location address was used to determine latitude and longitude. This latitude and longitude data was used to determine the number of acres burned inside of the CO maintenance area. Nineteen wildfires occurred within the CO maintenance area, resulting in nearly 28 acres burned.

Annual emissions from wildfires within the CO maintenance area were calculated in the same manner as Maricopa County annual emissions, except that material burned in the CO maintenance area were used rather than material burned in Maricopa County.

Annual and season-day emissions from wildfires for Maricopa County and the maintenance area are shown in Table 3.5–4.

Table 3.5–4. Annual and season-day CO emissions from wildfires

Geographic area	CO-season burn days	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	7	4,837.77	526.4
CO Maintenance Area	0	18.29	0.0

3.5.1.2 Prescribed fires

Prescribed fire data were obtained from the U. S. Forest Service (USFS, 2009). The USFS reported that six prescribed fires occurred in Maricopa County in 2008. Twenty-nine acres of piled fuels were burned. All six prescribed fires occurred outside the maintenance area. Because all 2008 prescribed fires were piled fuels, the total mass of material burned was derived by multiplying the number of acres burned by tons of piles per acre for each fire. Data provided by the USFS and the resulting material burned for each fire are shown below in Table 3.5–5.

Table 3.5–5. Prescribed fire activity in Maricopa County in 2008.

Date of burn	Burn number	Burn location	Acres Burned	Tons of piles/acre	Material Burned (tons)
01/13/2008	TNF0106	T6N,R7E,S28	3	1	3
03/13/2008	TNF0106P	T6N,R7E,S28	3	3	9
04/04/2008	TNF0302	T3N,R7E,S34	2	5	10
04/09/2008	TNF0302	T3N,R8E,S28	5	5	25
09/25/2008	TNF0302	T3N,R8E,S31	10	5	50
11/06/2008	TNF0302	T2N,R7E,S18	6	5	30
Totals:			29	24	127

The prescribed fire CO emission factor (74.3 lbs CO per ton burned) was obtained from the Western Regional Air Partnership’s (WRAP) 2002 Fire Emission Inventory (WGA/WRAP, 2005).

Annual emissions from prescribed fires in Maricopa County were calculated by multiplying the material burned (tons/acre) by the emission factor (lbs CO/ton) and dividing the result by 2,000 lbs/ton.

Two prescribed fires occurred during the CO season. The fires occurred on January 13, 2008 and November 6, 2008, and resulted in 33 tons of material burned. It was assumed the prescribed fires lasted one day each. CO-season day emissions are determined by multiplying the tons material burned by the emission factor (lbs CO/ton) and then dividing the resulting emissions by the number of burn days. In this case, there were only two burn days.

Because all the 2008 prescribed fires burned outside of the maintenance area, the annual and season-day emissions for the maintenance area are zero.

Table 3.5–6. Annual and season-day CO emissions from prescribed fires.

Geographic Area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	4.72	1,226.0
CO Maintenance area	0.00	0.0

3.5.1.3 Structure fires

2008 structure fire data were from the Arizona Department of Fire, Building, and Life Safety (DFBLS). The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire department. 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 thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included nearly 2,150 reported structure fires.

Because the DFBLS data only included data reported by twenty-one of thirty-six 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 population estimates for Maricopa County were used to scale up the number of structure fires (ADOC, 2008). Seven open burn permits were issued in 2008 for fire training; these were included in the total number of estimated structure fires for 2008. It was estimated that 2,422 structure fires occurred in the county during 2008.

Estimates of the 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, which factors in percentage structural loss and content loss (US EPA, 2001c). Annual emissions were then calculated by multiplying the amount of material burned by a 60 lbs of CO per ton of material burned emission factor (from US EPA, 2001c) and dividing the resultant amount by 2,000 lbs/ton.

Annual emissions for the CO maintenance were derived by multiplying Maricopa County annual emissions by the percentage of total population within the maintenance area (96.92%). See Section 1.5.1 for a discussion of the population data used.

It was assumed that structure fires occur 7 days a week; however, structure fires vary seasonally and may increase during cold weather. Because local season-specific data were not available from the NFIRS data, seasonal occurrences of residential and non-residential structure fires reported by the Federal Emergency Management Agency (FEMA) were used to derive a seasonal adjustment factor for the CO season (US EPA, 2001c). FEMA reported that 29.6% of residential structure fires and 24.5% of non-residential structural fires occurred during November, December, and January 1994. Thus, an average occurrence of 27.05% $[(29.6\% + 24.5\%) \div 2]$ was used as a seasonal adjustment factor to estimate CO season-day emissions.

CO season-day emissions for Maricopa County were derived by multiplying the annual emissions by the 27.5% seasonal adjustment factor and then dividing the result by 91 (7 days/wk \times 13 weeks/season).

Table 3.5–7. Annual and season-day CO emissions from structure fires.

Geographic area	Annual CO emissions (tons/yr)	Season day CO emissions (lbs/day)
Maricopa County	83.56	496.8
CO Maintenance area	80.98	481.4

3.5.1.4 Vehicle fires

2008 vehicle fire data were from the Arizona Department of Fire, Building, and Life Safety (DFBLS). The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire department. 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 thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included over 2,100 reported vehicle fires. Because the DFBLS data only included data reported by twenty-one of thirty-six fire departments in Maricopa County, the number of vehicle fires reported were scaled up to the

entire inventory area based on population. The most recent population estimates for Maricopa County were used to scale up the number of vehicle fires (ADOC, 2008). It was estimated that 2,403 vehicle fires occurred in Maricopa County in 2008.

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). The amount of annual material burned in vehicle fires was then multiplied by the emission factor for open burning of automobile components (125 lbs of CO/ton of material burned) from AP-42 as listed in table 3.7–12 (US EPA, 1992). The resultant amount was divided by 2,000 lbs/ton to obtain annual emissions in tons per year.

Annual emissions for the CO maintenance area were derived by multiplying Maricopa County annual emissions by the percentage of total population within the CO maintenance area (96.92%). See Section 1.5.1 for a discussion of the population data used. It is assumed that vehicle fires occur evenly throughout the year. Thus, CO season day emissions were derived by dividing the Maricopa County and maintenance area annual emissions by 366 days/year. The results are shown in Table 3.5–8 below.

Table 3.5–8. Annual and season-day CO emissions from vehicle fires.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	37.55	205.2
CO Maintenance area	36.39	198.8

3.5.1.5 Engine testing

Annual emissions from engine testing facilities were derived from annual emission reports from permitted sources that were not considered point sources in this inventory. It was assumed that there were no significant unpermitted sources within Maricopa County. Season-day emissions were calculated based on operating schedule information provided in the facilities’ annual emission reports. Since all facilities considered in this section are located within the CO maintenance area, total emission values for the county and the CO maintenance are equal. Results are shown in Table 3.5–9.

Table 3.5–9. Annual and season-day CO emissions from engine testing.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	4.06	27.5
CO Maintenance Area	4.06	27.5

3.5.2 Health services: crematories

Emissions from human and animal crematories were calculated from annual emissions inventory reports from all crematories located within the county. It is assumed that there are no unpermitted crematories in Maricopa County. CO season-day emissions were calculated based on operating schedule information provided in the facilities annual emission reports. Location information provided in those annual emission reports indicated whether the facility was inside or outside the CO maintenance area.

Table 3.5–10. Annual and season-day CO emissions from crematories.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.68	5.2
CO Maintenance Area	0.68	5.1

3.6 Summary of area source emissions

Table 3.6–1 summarizes the total annual and CO season-day emissions from all area sources addressed in this chapter for both Maricopa County and the CO maintenance area.

Table 3.6–1. Summary of annual and season-day area source CO emissions, by source category.

Source category	Maricopa County		CO maintenance area	
	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Fuel combustion:				
Industrial natural gas	358.34	2,513.9	352.68	2,474.1
Industrial fuel oil	1,366.69	8,784.8	1,345.09	8,646.0
Commercial/institutional natural gas	777.15	7,248.7	760.67	7,095.1
Commercial/institutional fuel oil	702.86	4,804.7	687.96	4,702.8
Residential natural gas	325.03	3,592.2	314.79	3,479.1
Residential wood	3,369.91	52,305.0	3,263.75	50,657.4
Residential fuel oil	0.07	1.1	0.07	1.0
Total, all fuel combustion:	6,900.04	79,250.4	6,725.01	77,055.5
Industrial processes:				
Commercial cooking	380.29	2,089.5	368.58	2,025.1
Secondary metal production	107.72	703.5	107.72	703.5
State-permitted portable sources	145.42	1,212.6	145.42	1,212.6
Industrial process NEC	18.59	107.3	3.47	22.7
Electric equipment mfg	3.85	21.3	3.85	21.3
Total, all industrial processes:	655.87	4,134.3	629.03	3,985.3
Waste treatment/disposal:				
On-site incineration	0.69	5.7	0.69	5.7
Open burning	637.10	16,560.8	183.21	1,284.0
Landfills	40.05	219.9	20.84	114.7
Other industrial waste disposal	52.86	252.9	52.86	252.9
Total, all waste treatment	730.70	17,039.4	257.60	1,657.3
Miscellaneous Area Sources:				
Wildfires	4,837.77	526.4	18.29	0.0
Prescribed fires	4.72	1,226.0	0.00	0.0
Structure fires	83.56	496.8	80.98	481.4
Vehicle fires	37.55	205.2	36.39	198.8
Engine testing	4.06	27.5	4.06	27.5
Crematories	0.68	5.2	0.68	5.1
Total, all miscellaneous sources:	4,968.33	2,486.9	140.40	712.9
Total, all area sources:	13,254.94	102,911.0	7,752.04	83,411.1

3.7 Quality assurance / quality control procedures

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

Area source categories were selected for inclusion in the inventory based on the latest Emission Inventory Improvement Program (EIIP) guidance available. EPA's guidance for area source categories included in prior National Emission Inventories (NEIs) was also evaluated. The list of area source categories developed based on these guidance documents was modified to fit the characteristics of Maricopa County, with some area source categories determined to be insignificant (e.g., emissions from industrial coal combustion, or oil and natural gas production facilities). Prior Maricopa County periodic inventories for ozone and carbon monoxide, as well as and other similar emission inventories from other locales were also consulted, to cross-check the completeness of the list of area source categories identified for inclusion in the present inventory.

Data for area source emission calculations were gathered from a wide universe of resources. Whenever applicable, local surveyed data (such as annual emissions report) was used as this data best reflects activity in the county and the CO maintenance area. When local data was not available, state data from Arizona State agencies (such as the Arizona Department of Transportation) and regional bodies (such as the Western Regional Air Partnership [WRAP]) were used. National level data (such as the US Census Bureau) was used when no local, state or regional data was available. In addition, the most recent EIIP guidance for area sources was consulted for direction in determining the most relevant data source for use in emissions calculations.

Emissions calculations for area sources were performed by three air quality planners and one unit manager. All area 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 area 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 area source emission estimates had been produced, several quality control checks were performed to substantiate the calculations. Most area source calculations were peer-reviewed by two other planners, with all area 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 area 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 area source chapter. This draft chapter was read through in its entirety by the unit manager and the three air quality planners for final review, with any identified errors corrected by the author of the section.

The draft version of the area source chapter was sent to the Arizona Department of Environmental Quality, the Arizona Department of Transportation, and the Maricopa Association of Governments for a quality assurance review. These agencies provided comments which were addressed and incorporated into the final area source chapter. The QA/QC activities described here have produced high levels of confidence in the area source emissions estimates detailed in this chapter, and represent the best efforts of the inventory preparers.

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