DRAFT
MODELING PROTOCOL

IN SUPPORT OF

THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

JUNE 2012

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ACRONYMS AND ABBREVIATIONS

Acronyms

ADOT	Arizona Department of Transportation
ADEQ	Arizona Department of Environmental Quality
AERR	Annual Emissions Reporting Requirements
APM	Aviation Performance Metrics
APU	Auxiliary Power Unit
ATADS	Air Traffic Activity Data System
AVFT	Alternative Vehicle and Fuel Technologies
CAAA	Clean Air Act Amendments
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CTOC	Cap and Trade Oversight Committee
EDMS	Emissions and Dispersion Modeling System
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FR	Federal Register
GSE	Ground Support Equipment
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
LOS	Level-of-Service
LTO	Landing and Takeoff
LULC	Land Use Land Cover
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Department
MOVES	Motor Vehicle Emission Simulator
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PEI	Periodic Emissions Inventory
PTE	Potential To Emit
TDM	Travel Demand Model
TSD	Technical Support Document
UAM	Urban Airshed Model
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled

Abbreviations

CO	Carbon Monoxide
CO_2	Carbon Dioxide
ppm	parts per million

1 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) redesignated the Phoenix metropolitan area from a serious nonattainment area to attainment for the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO) and approved the Carbon Monoxide Redesignation Request and Maintenance Plan for the Maricopa County Nonattainment Area (MAG 2003) effective April 8, 2005 (70 FR 11553). The MAG 2003 CO Maintenance Plan demonstrated maintenance of the CO standards through 2015.

Section 175A(b) of the Clean Air Act Amendments (CAAA) states that *"8 years after redesignation of any area as an attainment area under section 107(d), the State shall submit to the Administrator an additional revision of the applicable State implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the initial 10-year period".* Thus, a second CO maintenance plan for the years 2016 through 2025 for the Phoenix metropolitan area is required for submittal to EPA by April 8, 2013.

The purpose of this modeling protocol is to describe modeling methodologies and assumptions which will be used to determine whether the CO NAAQS in the Phoenix metropolitan area will continue to be maintained through 2025, and to establish the 2025 conformity budget for onroad mobile source emissions using the latest version of EPA's Motor Vehicle Emission Simulator (MOVES) model, MOVES2010b. The protocol should be viewed as a set of general guidelines that provide focus, consistency, and a basis for consensus for all parties involved in this analysis. This modeling protocol will be reviewed and approved by members of the Air Quality Planning Team prior to commencement of modeling. This team includes staff representatives from the Maricopa Association of Governments (MAG), the Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Transportation (ADOT), and the Maricopa County Air Quality Department (MCAQD).

Background

Carbon monoxide is a colorless, odorless, and poisonous gas emitted from combustion processes. It is highly toxic to humans and animals when encountered in higher concentrations. In the atmosphere, it is short-lived and combines with oxygen to form carbon dioxide (CO_2). Since the principal source of CO in urban areas is motor vehicle exhaust, CO concentrations are closely related to vehicular traffic volume (Seinfeld 1986). CO problems generally occur in localized areas in association with cold, stagnant weather conditions during the winter (CARB 2004).

To protect the public health from this air pollutant, the 1990 CAAA required that all areas of the nation attain and maintain the NAAQS for CO. The federal standards for CO provide two primary standards: 9 parts per million (ppm) averaged over an 8-hour period and 35 ppm averaged over a 1-hour period. Any monitor must not exceed either standard more than once per year during two consecutive years.

In accordance with the 1990 CAAA, EPA designated the Phoenix metropolitan area as a moderate nonattainment area for CO. Since the area had not attained the standard by December 31, 1995, the area was re-designated as a serious nonattainment area in 1996. The attainment date for serious

nonattainment areas is December 31, 2000 under the CAAA.

The MAG 1999 Serious Area Carbon Monoxide Plan (MAG 1999) demonstrated attainment of the CO standards by December 31, 2000 and was submitted to EPA in July 1999. Since the Arizona Legislature repealed the remote sensing program in 2000, the 1999 CO plan was revised to reflect the discontinuation of the remote sensing program. The Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG 2001) confirmed attainment of the standards without the remote sensing program and was submitted to EPA in March 2001.

Since no violation of the CO standards has occurred at any monitor in the area since 1996 and the EPA clean data requirement was satisfied for the re-designation from nonattainment to attainment, the MAG 2003 CO Redesignation Request and Maintenance Plan was submitted to EPA in May 2003. The plan demonstrated maintenance of the standards through 2015. On March 9, 2005, EPA re-designated the area to attainment for the CO standards and approved the MAG 2003 CO Maintenance Plan, effective April 8, 2005.

In accordance with Section 175A(b) of the 1990 CAAA, the second CO maintenance plan for an additional 10-year period for the Phoenix metropolitan area should be prepared and submitted to EPA by April 8, 2013.

Objectives

The protocol document describes the procedures MAG will use for conducting all phases of the modeling study.

Key objectives to be accomplished by this protocol document are to: (1) enhance technical credibility, (2) encourage the participation of all interested parties, (3) lay out responsibilities of all participants, (4) provide for consensus-building among all interested parties concerning modeling assumptions and approaches, and (5) provide documentation for technical decisions to be made in applying the modeling approaches.

2 MODELING MAINTENANCE DEMONSTRATION

The second MAG CO maintenance plan will perform three modeling analyses to demonstrate maintenance of the standards through 2025. The modeling will assume that the committed control measures in the MAG 2003 CO Maintenance Plan will continue to be implemented through 2025.

1) Emissions Inventory Comparison

Two sets of CO emissions inventories (point, area, onroad, and nonroad sources) will be developed for the years 2006, 2008, 2015, and 2025 for the CO modeling domain and maintenance area shown in Figure 2-1. The first set of emissions inventories will be developed for the CO modeling domain defined in the MAG 2003 CO Maintenance Plan for the years 2006, 2008, 2015, and 2025. The second set of emissions inventories will be developed for the CO maintenance area for the years 2008 and 2025. The emissions inventory for the base year 2008 for the CO maintenance area will be obtained from the 2008 Periodic Emissions Inventory (PEI) for CO (MCAQD 2012), currently under development by the Maricopa County Air Quality Department (MCAQD). Both sets of CO emissions inventories will be developed using the latest emissions models (i.e., MOVES2010b, NONROAD2008a, and EDMS version 5.1.3).

Emissions for the modeling domain in the years 2015 and 2025 will be compared to those for 2006 and 2008. A comparison of emission levels and actual CO concentrations in 2006 and 2008, as well as the continued decrease in emission levels in future years should substantiate maintenance of the CO standards through 2025.

2) Scaling UAM/CAL3QHC Maximum Concentrations

The MAG 2003 CO Maintenance Plan conducted Urban Airshed Model (UAM) and CAL3QHC modeling to estimate the combined UAM/CAL3QHC maximum 8-hour concentrations in the CO modeling domain for the years 2006 and 2015. The UAM/CAL3QHC maximum modeled concentrations shown in Table 2-1 were used to demonstrate maintenance of the standards for the interim year 2006 and maintenance year 2015.

Since the UAM/CAL3QHC maximum modeled predictions were based on emissions inventories developed with older versions of models (e.g., MOBILE6 and NONROAD) available at the time of development of the MAG 2003 CO Maintenance Plan, these projections will be adjusted by updated emissions inventories for 2006 and 2015. The ratio of the updated emissions in the new maintenance plan to the emissions in the MAG 2003 CO Maintenance Plan will be applied to the UAM/CAL3QHC maximum projected concentrations for 2006 and 2015. The adjusted maximum modeled concentrations will then be projected to 2025 by applying the ratios of the 2025 emissions to the 2006 emissions and the 2025 emissions to the 2015 emissions. The scaled maximum modeled concentration for 2025 in the CO modeling domain will be used to determine if the 8-hour CO standard is met in 2025.

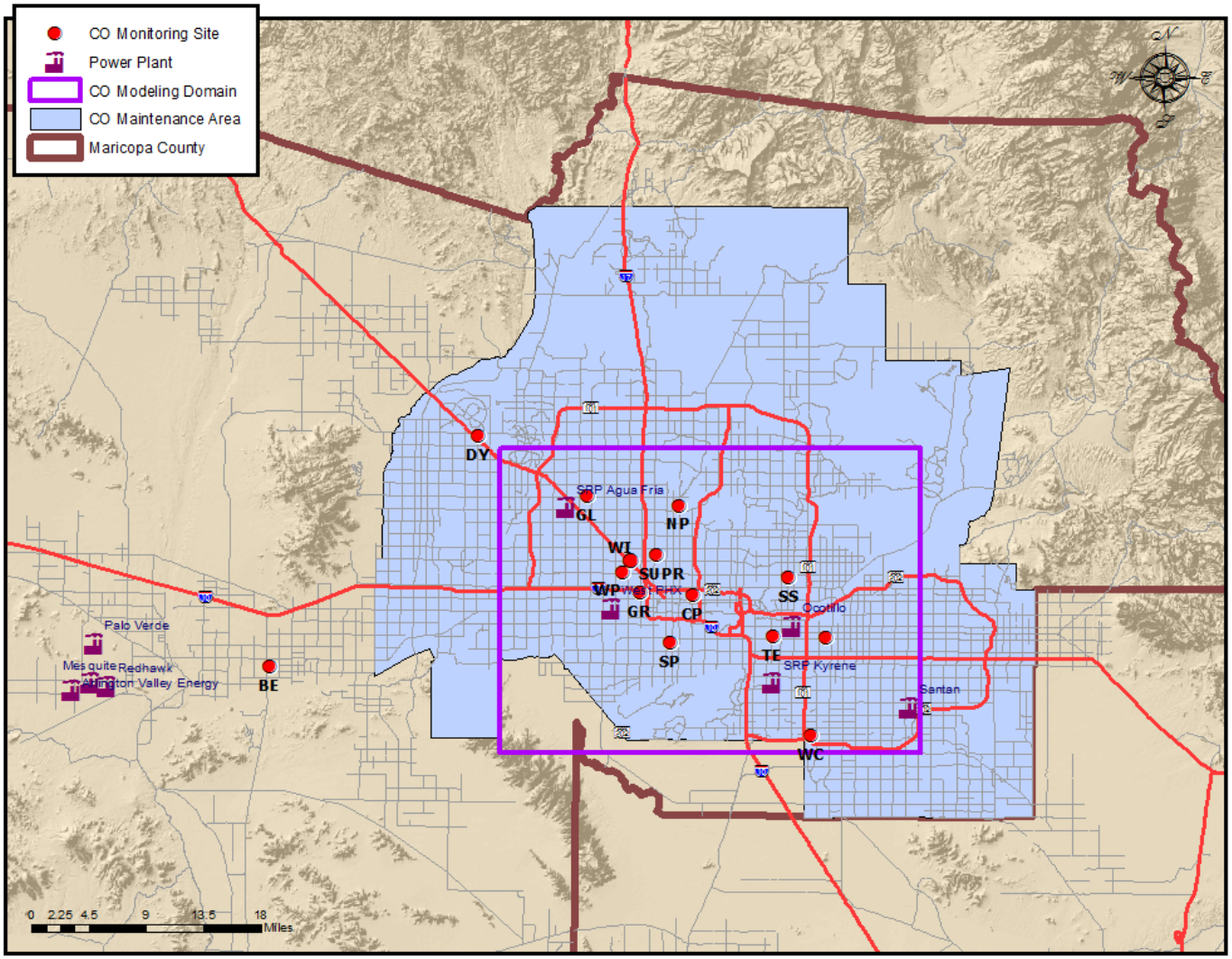

Figure 2-1 Carbon Monoxide Monitoring Sites and Boundaries of Modeling Domain and Maintenance Area

Table 2-1 Combined UAM/CAL3QHC Maximum Eight-hour CO Concentrations for the December 16-17 Episode in the MAG 2003 Carbon Monoxide Maintenance Plan

Location	UAM	CAL3QHC	Total
2006			
WISR Monitor	7.22 ppm	0.06 ppm	7.28 ppm
WISR Receptor #9	7.17 ppm	1.08 ppm	8.25 ppm
WISR Receptor #8	7.17 ppm	0.91 ppm	8.08 ppm
WISR Receptor #20	7.17 ppm	0.68 ppm	7.85 ppm
PHGA Monitor	N/A	N/A	N/A
PHGA Receptor #30	7.74 ppm	0.50 ppm	8.24 ppm
PHGA Receptor #46	7.89 ppm	0.19 ppm	8.08 ppm
PHGA Receptor #29	7.74 ppm	0.29 ppm	8.03 ppm
UAM Maximum	8.92 ppm	-	8.92 ppm
2015			
WISR Monitor	6.56 ppm	0.03 ppm	6.59 ppm
WISR Receptor #9	6.23 ppm	1.81 ppm	8.04 ppm
WISR Receptor #8	6.23 ppm	1.61 ppm	7.84 ppm
WISR Receptor #20	6.56 ppm	0.88 ppm	7.44 ppm
PHGA Monitor	N/A	N/A	N/A
PHGA Receptor #30	7.16 ppm	0.65 ppm	7.81 ppm
PHGA Receptor #46	7.16 ppm	0.29 ppm	7.45 ppm
PHGA Receptor #29	7.19 ppm	0.20 ppm	7.39 ppm
UAM Maximum	8.06 ppm	-	8.06 ppm

WISR = 35th Ave-Grand Ave-West Indian School Road Intersection
PHGA = 27th Ave-Grand Ave-Thomas Road Intersection

3) Intersection Analysis

An intersection analysis will be performed using the CAL3QHC model on potentially high traffic volume and congested intersections identified for the maintenance year 2025. The purpose of the intersection hotspot analysis is to assure that potential high traffic and congested intersections identified in the region for 2025 will not contribute to any exceedance of the standards. In accordance with EPA's intersection selection procedure guidance (EPA 1992), three intersections from those with the six worst Levels-of-Service (LOS) and three intersections from those with the six highest traffic volumes will be selected for the CAL3QHC modeling for the maintenance year of 2025. A traffic assignment produced by the TransCAD TDM for the PM peak period in 2025 will be used to identify intersections with the highest traffic volumes and levels of service in the CO maintenance area.

The CAL3QHC maximum 1-hour CO concentration predicted at receptors surrounding each selected intersection will be multiplied by a persistence factor to derive the maximum predicted 8-hour concentration (EPA 1992). The persistence factor will be based on the ratio of the 8-hour to the maximum1-hour measured CO concentration within the 8-hour period. The maximum 8-hour prediction will be derived by multiplying the CAL3QHC maximum 1-hour concentration by the persistence factor and combining the results with the background concentration. The background concentration for the base year 2008 will be determined by averaging the highest 8-hour CO concentrations at area-wide monitors for the years 2007, 2008, and 2009 (shown in Table 3-3).

The calculation of the background concentration will not include CO measurements at the West Indian School Road and West Phoenix monitors since these are located at sites typically affected by high traffic volumes and congestion. Consequently, the CO measurements at these monitors are not appropriate for representing the background concentration. The background concentration for the base year 2008 will be scaled to a future year background concentration by multiplying the base year background concentration by the ratio of the future year emissions to the base year emissions. The background concentration for the future year will be added to the maximum 8-hour concentration predicted by CAL3QHC.

The total CO concentration produced by combining the maximum CAL3QHC concentration with the background concentration should not exceed the 8-hour CO standard for the year 2025.

<u>MOVES2010b Emission Rates</u>

According to EPA guidance (EPA 1992), evaluation of the air quality impact of an intersection requires use of the CAL3QHC dispersion model and emission rates from the latest version of an EPA-approved onroad mobile source emissions model. MOVES2010b will be used to estimate emission rates for both free-flow and idling traffic for the selected intersections.

The MOVES2010b simulation will be performed for each selected intersection using the PM peak traffic volume, which represents the worst-case condition (EPA 2010).

For a project level analysis, it is required to develop a run specification ("RunSpec") defining the location,

time span, vehicle types, fuel types, road types, pollutants, and processes of the analysis.

Following EPA guidance (EPA 2010), the RunSpecs will be developed as follows:

- Scale: To accept detailed activity input at the link level, MOVES2010b will be executed using the Project domain. Since CAL3QHC requires emission rates in terms of grams/vehicle-mile for free-flow links and grams/hour for queue links, the inventory option will be selected as output.
- Time Spans: To describe the PM peak traffic scenario, a PM peak hour in terms of traffic volume will be set to December 2025. Time aggregation and the day selection will be set to "hour" and "weekday", respectively.
- Geographic Bounds: Maricopa County will be selected at the project level.
- Vehicles/Equipment: The appropriate fuel and vehicle type combinations will be selected to reflect all vehicle types that are expected to operate in the selected intersection.
- Road Type: Based on the Highway Performance Monitoring System (HPMS) functional classification of the road type, a specific road type will be used for the selected intersection.
- Pollutants and Processes: To model an intersection, which requires CO emission rates for both free-flow and queue links, Running Exhaust and Crankcase Running Exhaust will be selected as processes.
- Output: Under General Output panel, "grams" and "miles" will be selected for the output units, and "Distance Traveled" and "Population" will be selected for the activity. For the Output Emissions Detail panel, only "Emission Process" will be selected along with the default selection of emissions by hour and link.

After creating the RunSpec, the project details will be entered using the MOVES Project Data Manager as follows:

- Meteorology: The 8-hour average temperature and humidity corresponding to each of the ten highest non-overlapping 8-hour CO monitoring values for the last three years (2009, 2010, and 2011) will be retrieved from the National Climatic Data Center (NCDC) database for the National Weather Service (NWS) station at the Phoenix Sky Harbor International Airport (KPHX). Then, the ten values will be averaged for use with MOVES2010b.
- Age Distribution: The latest available local age distribution assumptions will be used. A MOVES age distribution table will be derived from EPA's registration distribution converter and the latest vehicle registration data for Maricopa County provided by the Arizona Department of Transportation (ADOT).
- Fuel Supply and Formulation: The MOVES default fuel formulation and fuel supply data will be revised based on local volumetric fuel property information provided by the Arizona Department of Weights and Measures.
- Inspection and Maintenance (I/M) program: The default I/M program in MOVES2010b will be changed to represent characteristics of the actual I/M program in Maricopa County.
- Link Source Type: With an assumption that distribution of a regional fleet for a given road type represents the source type distribution for selected intersections, the source type distribution consistent with the latest transportation conformity regional emissions analysis will be used.

- Links: The number of links and the length of each link for a given intersection will be determined by following EPA guidance (EPA, 2010). Traffic volume and average speed for each link will be assigned based on the information provided by the MAG Transportation Division.

MOVES will generate a grams/vehicle-mile emission rate for each free-flow link and a grams/vehicle-hour emission rate for each queue link. The emission rates will be used in CAL3QHC to perform the intersection analysis.

CAL3QHC Modeling Analysis

For the hotspot analysis, the CAL3QHC model (EPA 1992, 1995, and 2004) will be used as a dispersion model to predict localized "hotspot" impacts. Microscale CO concentrations will be calculated for the selected intersections.

CAL3QHC version 2.0 is a computer-based modeling methodology developed to predict CO or other pollutant concentrations from motor vehicles traveling near a roadway intersection. Based on the assumption that vehicles at an intersection are either in motion or in an idling state, the model is designed to predict air pollution impacts by combining emissions from both idling and moving vehicles with meteorological data. All simulations will be conducted in accordance with the methodologies described in the CAL3QHC User's Guide (EPA 1995) and the CO modeling guidance (EPA 1992).

Two of the major input categories for CAL3QHC are roadway links and receptors. At all locations, receptors will be placed outside the 3 meter (10 feet) wide mixing zone along the roadway and spaced regularly along each leg of the intersection on both sides of the road. While receptors will be identified by their X, Y, and Z coordinates, all receptor heights (Z) will be set to 1.8 meters (6 feet), which is assumed as a breathing height.

Multiple roadway links will be chosen for each selected intersection. Each roadway link is comprised of two nodes (endpoints) which are identified by an east coordinate (X) and a north coordinate (Y). All links will be modeled as at-grade (AG) roadways with zero vertical height. A link can be specified as either a "free flow" or "queue" link. Free flow links represent traffic conditions where vehicles have the green light and do not stop when traveling through an intersection. A queue link represents a situation where traffic has a red light and is stopped at an intersection. Traffic volumes and signal timing information (i.e., signal cycle length, average red time, arrival rate, etc.) will be obtained from the MAG Transportation Division.

3 WEIGHT OF THE EVIDENCE MAINTENANCE DEMONSTRATION

Continued Monitored Attainment

The Phoenix metropolitan area has not had an exceedance of the 1-hour CO standard (35 ppm) since 1986 and the 8-hour CO standard (9 ppm) since 1996.

Monitored data from 1996 through 2011 indicate that CO concentrations in the maintenance area have continued to decline over time to a level substantially below the1-hour and 8-hour standards. The highest and 2nd highest monitored 1-hour and 8-hour CO concentrations for the period of 1996-2011 are shown in Tables 3-1 through 3-4. The declining trend in historical CO concentrations for each monitor provides corroboration that the area will continue to maintain the standards.

As a weight of the evidence demonstration for the continued maintenance of the standards in future years, historical trends in concentrations measured at the CO monitors will be presented and discussed in the second MAG CO maintenance plan.

Meteorological Analysis

The meteorological analysis will support the premise that improvements in CO air quality are due to permanent and enforceable emission reductions, not unusually favorable meteorological conditions.

To demonstrate that the air quality improvements in the CO maintenance area are not due to unusually favorable meteorological conditions, historical conditions for the following meteorological parameters during the CO winter season will be compared with those during the 1994 CO episode (December 17, 1994).

Temperature

Higher CO emissions are typically caused by the incomplete combustion of fuel at lower temperatures. In addition, since the air stability is more stagnant in cold weather, a higher level of CO emissions tend to be trapped under a lower level of the atmosphere during winter. Based on the observations from the NWS station at the Phoenix Sky Harbor International Airport, historical trends and diurnal cycles of mean winter temperatures will be discussed to verify that temperatures during the past decade have not contributed favorably to the improvement in the air quality level for CO.

Wind speed

A lower wind speed (e.g., calm wind) contributes to the accumulation of ground-level CO emissions near emission sources. By using wind speed data from the NWS at the Phoenix Sky Harbor International Airport, historical wind speeds and diurnal patterns of wind speeds during winter will be compared to those during the 1994 CO episode. The comparison will provide evidence that historical wind speeds are not typically favorable to the improvement of air quality.

Table 3-1 Highest 1-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 1st highest 1-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0016	W Indian School Rd	WI	12.6	10.8	9.7	11.8	11.9	8.0	7.7	6.8	6.9	6.8	7.6	6.2	3.9	5.6	3.7	
04-013-0019	West Phoenix	WP	11.7	11.7	10.7	12.3	10.6	8.4	8.6	7.5	7.7	7.2	7.2	6.0	4.7	4.9	4.3	3.8
04-013-1003	Mesa	ME	6.7	7.5	6.5	7.2	6.0	4.6	4.9	3.5	3.0	3.4	4.1	3.9	1.7	2.0	2.0	1.5
04-013-1004	North Phoenix	NP	7.7	8.7	8.0	7.8	6.0	5.2	4.5	4.0	4.1	3.8	3.5	3.4	2.1	5.9	2.9	2.9
04-013-2001	Glendale	GL	8.2	5.4	5.0	5.7	4.6	4.7	4.1	5.7	6.1	3.2	3.8	4.3	2.1	2.0	9.0	1.8
04-013-3002	Central Phoenix	CP	11.1	9.4	9.1	11.3	8.1	6.0	6.0	5.9	5.0	5.2	6.0	4.1	3.6	3.6	3.2	2.5
04-013-3003	South Scottsdale	SS	8.0	6.3	5.5	6.0	5.0	4.5	5.5	4.1	3.4	3.2	5.5	2.7	2.0	2.9	2.1	1.6
04-013-3010	Greenwood	GR		9.7	9.4	10.8	8.1	7.0	7.3	6.8	7.6	5.9	6.3	4.6	3.0	3.5	4.3	2.9
04-013-4003	South Phoenix	SP				7.4	10.0	6.8	6.5	5.8	6.7	5.5	5.2	4.9	3.7	4.1	4.4	2.5
04-013-4004	West Chandler	WC					3.8	3.3	3.5	3.9	2.9	3.5	2.7	2.7	1.8	2.1	2.0	1.6
04-013-4005	Tempe	TE					5.0	4.3	4.9	3.8	3.1	3.2	3.7	3.2	2.4	4.0	3.4	3.6
04-013-4010	Dysart	DY								1.8	2.1	1.7	1.3	1.8	1.5	1.0	2.0	0.8
04-013-4011	Buckeye	BE									0.9	1.1	1.2	3.9	0.7	1.2	1.9	1.8
04-013-9997	Super Site	SUPR				8.5	9.1	7.0	5.7	6.7	4.9	5.6	5.3	4.6	3.1	2.9	2.9	2.3
Maximum			12.6	11.7	10.7	12.3	11.9	8.4	8.6	7.5	7.7	7.2	7.8	6.2	4.7	5.9	9.0	3.8

Table 3-2 Second Highest 1-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 2nd highest 1-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0016	W Indian School Rd	WI	11.8	10.3	9.4	11.7	9.6	7.7	7.3	6.8	6.7	6.5	7.7	5.7	3.6	5.0	3.3	
04-013-0019	West Phoenix	WP	11.2	10.3	9.6	11.9	10.4	8.2	7.9	7.3	7.5	7.0	6.5	6.0	4.5	4.8	4.2	3.7
04-013-1003	Mesa	ME	6.3	7.0	6.1	6.5	5.7	3.8	4.8	3.4	2.6	3.3	3.5	2.5	1.7	1.9	2.0	1.4
04-013-1004	North Phoenix	NP	7.5	7.5	7.3	6.4	5.9	4.7	4.5	4.0	3.7	3.5	3.3	3.0	2.0	2.1	2.4	2.7
04-013-2001	Glendale	GL	6.9	5.2	4.9	5.3	4.6	4.7	3.9	3.5	3.2	3.1	2.9	3.3	2.0	1.9	8.9	1.7
04-013-3002	Central Phoenix	CP	10.3	9.0	8.9	9.3	8.0	5.8	5.8	5.4	4.4	5.1	4.8	4.0	3.5	3.0	3.2	2.5
04-013-3003	South Scottsdale	SS	7.0	6.1	5.2	5.8	4.9	4.4	4.3	4.0	3.1	3.1	3.1	2.6	2.0	1.9	2.0	1.6
04-013-3010	Greenwood	GR		8.9	8.9	9.5	8.1	6.9	6.8	6.8	7.3	5.4	5.2	4.6	3.0	3.2	3.9	2.6
04-013-4003	South Phoenix	SP				7.4	8.4	6.3	6.5	5.5	5.9	5.2	4.7	4.3	3.2	3.4	4.3	2.3
04-013-4004	West Chandler	WC					3.4	3.3	3.2	3.3	2.7	2.7	2.6	2.4	1.7	2.1	2.0	1.5
04-013-4005	Tempe	TE					4.6	4.2	4.7	3.7	2.6	3.0	3.4	2.8	2.3	3.6	2.4	3.4
04-013-4010	Dysart	DY								1.6	1.8	1.7	1.3	1.7	1.4	0.9	1.8	0.8
04-013-4011	Buckeye	BE									0.9	1.1	1.2	1.6	0.7	1.1	1.3	1.2
04-013-9997	Super Site	SUPR				8.2	7.9	6.9	5.4	6.0	4.9	5.1	4.5	4.3	3.1	2.8	2.7	2.2
Maximum			11.8	10.3	9.6	11.9	10.4	8.2	7.9	7.3	7.5	7.0	7.7	6.0	4.5	5.0	8.9	3.7

Table 3-3 Highest 8-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 1st highest Non-overlapping 8-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0016	W Indian School Rd	WI	8.5	8.3	8.2	7.7	6.9	6.6	5.5	5.4	4.7	5.3	5.3	5.0	2.8	4.2	2.3	
04-013-0019	West Phoenix	WP	8.5	7.2	7.8	7.7	7.4	6.7	5.5	6.2	5.2	5.8	5.0	4.6	3.1	4.6	3.3	2.7
04-013-1003	Mesa	ME	4.5	4.7	4.4	4.5	4.4	2.9	3.5	2.5	1.7	2.4	2.8	2.0	1.4	1.5	1.4	1.1
04-013-1004	North Phoenix	NP	3.9	4.0	6.2	3.5	3.2	2.5	3.3	2.3	2.2	2.3	2.0	1.7	1.3	1.3	1.7	1.6
04-013-2001	Glendale	GL	4.2	4.0	3.4	3.9	3.6	3.1	3.2	2.4	2.4	2.4	1.9	1.8	1.6	1.3	3.0	1.2
04-013-3002	Central Phoenix	CP	8.4	7.2	7.2	6.0	5.3	4.3	4.4	4.6	3.4	4.1	3.8	2.9	2.6	2.2	2.4	1.9
04-013-3003	South Scottsdale	SS	4.9	4.3	3.7	4.3	3.3	3.2	3.0	2.3	2.4	2.4	2.1	1.6	1.5	1.4	1.6	1.2
04-013-3010	Greenwood	GR		7.6	7.5	6.7	5.7	4.7	5.4	5.4	4.9	4.2	3.6	4.0	2.7	2.6	3.0	1.8
04-013-4003	South Phoenix	SP				4.6	5.9	3.4	3.8	3.6	3.5	3.8	3.2	3.1	2.2	2.6	3.1	1.6
04-013-4004	West Chandler	WC					2.5	2.3	2.2	2.6	2.1	2.4	2.2	1.6	1.4	1.7	1.9	1.2
04-013-4005	Tempe	TE					3.8	3.3	3.4	2.9	1.9	2.6	2.5	1.9	1.8	2.9	1.9	3.2
04-013-4010	Dysart	DY								1.2	1.1	1.3	0.9	1.3	1.0	0.9	0.9	0.4
04-013-4011	Buckeye	BE									0.5	0.9	0.7	1.0	0.5	0.6	0.6	0.9
04-013-9997	Super Site	SUPR				7.0	6.9	5.7	4.2	4.8	4.2	3.7	3.0	3.1	2.5	2.3	2.1	1.8
Maximum			8.5	8.3	8.2	7.7	7.4	6.7	5.5	6.2	5.2	5.8	5.3	5.0	3.1	4.6	3.3	3.2

Table 3-4 Second Highest 8-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 2nd highest Non-overlapping 8-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0016	W Indian School Rd	WI	8.3	7.2	8.1	7.6	6.8	6.0	5.4	5.3	4.6	4.8	4.5	3.9	2.8	3.3	2.3	
04-013-0019	West Phoenix	WP	8.2	7.0	7.1	7.5	7.2	6.6	5.5	5.5	5.1	4.6	4.6	4.1	3.0	3.3	3.2	2.5
04-013-1003	Mesa	ME	3.8	4.5	3.7	4.0	3.2	2.7	3.5	2.2	1.7	2.4	2.0	2.0	1.3	1.3	1.4	1.0
04-013-1004	North Phoenix	NP	3.7	3.4	5.6	3.5	3.1	2.5	2.7	2.1	2.0	2.2	1.9	1.6	1.3	1.3	1.6	1.5
04-013-2001	Glendale	GL	3.7	3.0	3.4	3.5	3.2	2.8	2.7	2.3	2.1	2.3	1.8	1.6	1.5	1.2	1.5	1.2
04-013-3002	Central Phoenix	CP	7.5	7.2	6.3	6.0	5.2	4.1	4.1	3.8	3.3	3.8	3.2	2.9	2.2	2.1	2.2	1.8
04-013-3003	South Scottsdale	SS	4.9	4.2	3.5	4.1	3.1	3.1	2.8	2.2	2.4	2.4	1.9	1.6	1.4	1.4	1.6	1.2
04-013-3010	Greenwood	GR		6.9	6.8	6.7	5.6	4.6	5.1	5.1	4.3	4.1	3.5	3.0	2.4	2.4	2.3	1.8
04-013-4003	South Phoenix	SP				4.4	4.8	3.4	3.7	3.3	3.3	3.2	2.7	2.3	2.0	2.2	3.1	1.5
04-013-4004	West Chandler	WC					2.2	2.1	2.2	2.6	2.1	2.0	2.0	1.5	1.4	1.5	1.6	1.1
04-013-4005	Tempe	TE					3.2	3.1	3.4	2.4	1.7	2.4	2.4	1.9	1.4	2.1	1.6	2.9
04-013-4010	Dysart	DY								1.1	1.1	1.2	0.8	1.3	1.0	0.8	0.6	0.4
04-013-4011	Buckeye	BE									0.4	0.9	0.6	0.8	0.5	0.5	0.6	0.8
04-013-9997	Super Site	SUPR				6.5	6.5	5.2	4.2	4.2	4.0	3.6	2.9	2.9	2.4	2.3	2.1	1.7
Maximum			8.3	7.2	8.1	7.6	7.2	6.6	5.5	5.5	5.1	4.8	4.6	4.1	3.0	3.3	3.2	2.9

Mixing height and atmospheric stability

Mixing height may play a key role in higher CO concentrations measured at the monitors. Higher mixing height provides a large environmental capacity to dilute CO emissions, while lower mixing height may trap CO emissions in a very shallow layer and lead to higher CO concentrations in the urban area where traffic is heavy. The methodology to calculate the mixing height is discussed in "*Mixing height calculated based on surface and upper air meteorological data*" (See Section 4-4). The stability and turbulence in the atmospheric boundary layer are important factors affecting ground-level CO concentrations. Historical atmospheric stabilities during winter, along with mixing height, cloud cover, and solar radiation, will be discussed in comparison with those for the 1994 CO episode.

4 EMISSIONS INVENTORIES

4-1 Point Sources

According to EPA's Annual Emissions Reporting Requirements Rule (AERR) (EPA 2008), point sources are defined as major stationary sources that emit substantial amounts of pollution into the air and are required to obtain a permit to operate under 40 CFR Part 70. Stationary sources include industrial processes, power plants, and large manufacturing facilities. According to the 2008 Periodic Emissions Inventory (PEI) for CO (MCAQD 2012), twenty-one stationary sources are located in Maricopa County and sixteen, in the CO maintenance area. Fourteen of these stationary sources reside in the CO modeling domain.

Point source emissions from the 2008 PEI for CO will be projected using growth factors. In accordance with EPA guidance (EPA 1999b), the growth factor will be developed by dividing the growth indicator representing a point source in a projection year by the same growth indicator in the base year 2008. The growth indicators for 2015 and 2025 will be obtained from the latest MAG socioeconomic projections for population, housing, and employment, which were approved by the MAG Regional Council in May 2007 (MAG 2007a). These socioeconomic projections reflect the 2005 Census Survey results and the population control totals for Maricopa County developed by the Arizona Department of Economic Security. Table 4-1 presents population and employment growth indicators for 2006, 2008, 2015, and 2025.

Table 4-1 Maricopa County Population and Employment in 2006, 2008, 2015, and 2025

Category	2006 *	2008 *	2015	2025
Total Population	3,793,000	3,988,000	4,732,000	5,697,000
Retail Employment	515,000	513,000	674,000	852,000
Office Employment	425,000	388,000	563,000	740,000
Industrial Employment	395,000	376,000	490,000	576,000
Public Employment	269,000	308,000	334,000	406,000
Other Employment	247,000	246,000	323,000	414,000
Construction Employment	75,000	64,000	94,000	103,000
Total Employment	1,926,000	1,895,000	2,478,000	3,091,000

* Actual population and employment data in 2006 and 2008

For power plants, Potential To Emit (PTE) values will be conservatively assumed for CO emissions in the years 2015 and 2025.

4-2 Area Sources

Area sources are facilities or activities that are not qualified as point sources in terms of the amount of pollution but collectively release significant amounts of pollutants into the air (EPA 2001). For example, small-scale industries, residential wood burning, commercial cooking, waste incineration, residential sources, and wildfires are defined as area sources. According to the 2008 PEI for CO (MCAQD 2012), there are twenty three area source categories in Maricopa County.

Following EPA guidance (EPA 1999b), growth factors derived from the population and employment indicators shown in Table 4-1 will be applied to the base year area source emissions from the 2008 PEI for CO to project future emissions.

Area source emissions for the CO modeling domain will be developed by applying surrogate factors to the county-level area source emissions. The surrogate factors are the ratios of land use acreage, population, and employment in the CO modeling domain versus Maricopa County. The selection of an appropriate surrogate factor will be made based on how well the surrogate represents the emissions levels for each area source category.

4-3 Onroad Sources

Network and off-network mobile source emissions for CO will be calculated by using the latest version of the Motor Vehicle Emission Simulator (MOVES2010b) and MAG MOVESLink software. MOVESLink is a tool designed to process network and off-network emissions factors from MOVES2010b and link data from the TransCAD TDM to develop an onroad emissions inventory for regional transportation conformity and photochemical air quality modeling analyses. This tool was developed by MAG based on the Python programming language and state-of-the-art GIS technology. MOVESLink is used to 1) read link-level activity data from the MAG TransCAD traffic assignment, 2) prepare MOVES2010b input data, 3) execute MOVES2010b, and 4) post-process MOVES2010b results.

To calculate the CO season-day vehicle emissions for the selected years, MOVES2010b will be executed using local input data for each month of the peak CO season and each geographical area (the CO maintenance area and the CO modeling domain). The CO season-day emissions will be calculated by dividing the three-month peak CO season emissions from November through January by 92 days. Each scenario will be created using the County Domain/Scale and the Inventory Calculation Type for all road types including off-network.

MOVES2010b requires a detailed level of local data, including fuel data, Inspection and Maintenance (I/M) program, meteorological data, vehicle population, source type age distribution, annual vehicle miles traveled (VMT), monthly/daily/hourly fractions, road type distribution, average speed distribution, ramp fraction, and Alternative Vehicle and Fuel Technologies (AVFT). Following EPA's guidance (EPA 2012), local input data will be prepared as follows:

- Fuel data: The fuel data for each month will be derived from the fuel inspection results in

Maricopa County provided by the Arizona Department of Weights and Measures. The fuel data for Maricopa County will be applied to both the CO maintenance area and the CO modeling domain. For future year modeling, 2011 fuel data will be used.

- I/M programs: The I/M program data will be converted from the MOBILE6.2 inputs used for the latest transportation conformity regional emissions analysis.
- Meteorological data: As a representative of local meteorological conditions, meteorological data for the Phoenix Sky Harbor International Airport will be obtained from the National Climatic Data Center (NCDC) for the selected peak CO seasons. The average data over the most recent three years, 2009 to 2011, will be applied to the future year modeling.
- Vehicle population: The vehicle population in Maricopa County for the past years will be obtained from the vehicle registration data provided by the Arizona Department of Transportation (ADOT). Following EPA's guidance (EPA 2012), the vehicle population data will be assigned to the 13 MOVES source types. Then, the vehicle population in the CO maintenance area and the CO modeling domain will be estimated by multiplying the vehicle population in Maricopa County by the population ratios of these two areas to Maricopa County. For future year modeling, the vehicle population data will be adjusted by applying the ratio of the projected future year population to the current population.
- Source type age distribution: EPA's data converter will be used to generate the appropriate MOVES age distribution input from the registration distribution input file created for MOBILE6.2. The source type age distribution for Maricopa County will be applied for both the CO maintenance area and the CO modeling domain.
- Annual VMT: The annual VMTs by Highway Performance Monitoring System (HPMS) vehicle type will be derived from the traffic assignment data provided by the MAG Transportation Division and the MOVES default VMT fraction.
- Road type distribution: The road type distribution by HPMS vehicle type will be derived from the traffic assignment data provided by the MAG Transportation Division and the MOVES default VMT fraction.
- VMT fraction: The month/day/hour VMT fractions will be developed from data recorded by continuous traffic counters on freeways (ADOT Freeway Management System) and arterials (Phoenix Automatic Traffic Recorders) during the year 2007.
- Average speed distribution: Estimates of local average speeds will be derived from a post-process of the output from the traffic assignment data provided by the MAG Transportation Division.
- Ramp fraction: The ramp fraction represents the percent of vehicle hours traveled (VHT) on ramps on both rural restricted roads (road type 2) and urban restricted roads (road type 4). The VHTs for both the CO maintenance area and the CO modeling domain will be obtained from the traffic assignment data provided by the MAG Transportation Division.
- AVFT strategy: The fleet information for transit buses provided by Valley Metro will be used to prepare the AVFT input file. For the unavailable fleet data, MOVES2010b default values will be obtained from the [fuelEngFraction] table in the MOVES default database.

MOVES2010b will generate monthly emissions including weekday and weekend emissions for a given month by specifying the output time aggregate level as month. Then, the CO season-day emissions will be calculated from the three-month peak CO season emissions.

4-4 Nonroad Sources

Nonroad mobile sources are defined as engines, equipments, and vehicles that are not certified as highway vehicles. Nonroad mobile sources consist of agricultural equipment, aircraft, construction equipment, industrial equipment, residential and commercial lawn and garden equipment, recreational vehicles, pleasure craft, and locomotive equipment.

The EPA NONROAD2008a model will be executed to estimate emissions for nonroad equipment categories in the CO season months of November through January for weekdays and weekends. Weekday emissions will be used for all nonroad equipment categories except residential lawn and garden equipment, pleasure craft, and recreational equipment. Since these activities are typically higher during weekends, weekend emissions will be used for these categories. Weekday or weekend emissions for the three months will then be averaged to derive the average season day emissions.

Monthly local fuel parameters (i.e., RVP, gasoline and diesel sulfur, and ethanol content) for use in NONROAD2008a runs will be provided by the Arizona Department of Weights and Measures. Temperatures will be consistent with those for the 2008 PEI for CO (MCAQD 2012).

Equipment population and activity levels for commercial lawn and garden equipment will be based on the results of a survey performed by ENVIRON as a part of the Cap and Trade Oversight Committee (CTOC) work (ENVIRON, 2003). The survey results indicate that the population of most of the commercial lawn and garden equipment in Maricopa County is significantly lower than the default values in NONROAD2008a, while average annual operating hours for these equipment are slightly higher than the default values.

The county total nonroad emissions derived using NONROAD2008a will be scaled to the CO maintenance area and the CO modeling domain based on the surrogate factors for land use, population and employment.

Locomotive Sources

Locomotive emissions for 2006 will be interpolated using the 2005 and 2008 locomotive emissions which will be extracted from the 2005 and 2008 PEIs for CO, respectively. Based on a recommendation by the Maricopa County Air Quality Department, future locomotive emissions will be assumed at the same level as 2008.

Aviation Sources

Airport emissions will be developed by using the Emissions and Dispersion Modeling System (EDMS). This model is specifically designed to assess the air quality impacts of airport emission sources, particularly aviation sources, which consist of aircraft, auxiliary power units (APUs), and ground support equipment (GSE). The latest EDMS 5.1.3 version was released on November 15, 2010. It features up-to-date aircraft engine emission factors. The EDMS model computes emissions for oxides of nitrogen (NOx),

CO, volatile organic compounds (VOCs), and other gaseous pollutants and particulate matter.

Airport emissions for the CO maintenance area will be developed for the 12 medium and large airports identified in Table 4-2. Four of these airports are located within the CO modeling domain, as indicated in the table below.

Table 4-2 Airports in the CO Maintenance Area and the CO Modeling Domain

No.	Airport	Abbreviation	Longitude	Latitude	Within the CO modeling domain?
1	Chandler Municipal	CHD	-111.811	33.269	NO
2	Phoenix Deer Valley	DVT	-112.083	33.688	NO
3	Falcon Field	FFZ	-111.728	33.461	NO
4	Glendale Municipal	GEU	-112.295	33.527	YES
5	Phoenix Goodyear	GYR	-112.376	33.423	NO
6	Williams Gateway	IWA	-111.655	33.308	NO
7	Phoenix Sky Harbor Intl	PHX	-112.008	33.434	YES
8	Scottsdale	SDL	-111.911	33.623	YES
9	Luke Air Force Base	LUF	-112.383	33.535	NO
10	Stellar Airpark	P19	-111.916	33.299	YES
11	Pleasant Valley	P48	-112.251	33.801	NO
12	Sky Ranch At Carefree	18AZ	-111.898	33.818	NO

The four inputs to the EDMS model are described below:

Landing-takeoff cycles (LTOs)

The aircraft categories are classified as air commercial (AC), air taxi (AT), general aviation (GA), and military (ML). The historical (2006 and 2008) annual LTOs for each aircraft category will be retrieved from the MAG 2009 survey data and the Airport Operations database in the Federal Aviation Administration (FAA)'s Air Traffic Activity Data System (ATADS). The forecasted (2015 and 2025) annual LTOs data will be obtained from the FAA's latest 2011 Terminal Area Forecast system. To compute the CO seasonal LTOs, a monthly profile obtained from the FAA's Airport Operations database will be applied.

Aircraft fleet mix and LTOs for each aircraft type

The methodology described in the 2008 PM-10 PEI (MCAQD 2011) will be used to calculate the aircraft fleet mix. For each aircraft category, the top 10 aircraft types and their individual LTO weighting factors will be derived from the FAA's Enhanced Traffic Management System Counts database for each airport. The CO seasonal LTOs by aircraft category will be apportioned to the top 10 individual aircraft types by using weighting factors.

Monthly, weekly, and hourly operational profiles for each aircraft type

The CO seasonal LTOs for each aircraft type need to be broken down into hourly LTOs by using monthly, weekly, and hourly operational profiles. Monthly and weekly operational profiles by aircraft type for airports will be obtained from the FAA's ATADS database. Hourly operational profiles for each month will be obtained from the MAG 2009 airport survey data and FAA's Aviation Performance Metrics (APM) database. The monthly, weekly, and hourly operational profiles for 2008 are assumed to be the same as those for 2006, 2015, and 2025 for each aircraft category and airport.

Mixing height calculated based on surface and upper air meteorological data

EPA's latest version of AERMET (version 11059) will be used to calculate time-variant mixing heights for the EDMS runs. The three essential AERMET inputs are surface meteorological data, upper air meteorological data, and surface characteristics data including albedo, Bowen ratio, and surface roughness.

- The base year 2008 surface meteorological data will be retrieved from NCDC's Automated Surface Observing System and Integrated Surface Database for the NWS station at the Phoenix Sky Harbor International Airport.

- The upper air data will be obtained from the National Oceanic and Atmospheric Administration (NOAA) and Earth System Research Laboratory (ESRL) Radiosonde Database. While two upper air monitors located in Tucson and Flagstaff are in operation during the winter, upper air data monitored at the Tucson station (station number 23160) will be used since Tucson station represents similar meteorological and terrain features to Phoenix.

- Surface characteristics will be determined by using EPA's AERSURFACE (version 08009) processor with the Land Use and Land Cover (LULC) data for the Maricopa County area.

Luke Air Force Base emissions calculation

The 2008 PM-10 PEI (MCAQD 2011) reported three distinct aircraft activities for Luke Air Force Base (AFB): (1) the operation of aircraft stationed at the base, (2) a much smaller level of "transient" aircraft traffic within Luke AFB's airspace, and (3) emissions produced during on-wing engine testing. Luke AFB also reported two additional types of military aircraft operations: aircraft low fly bys (LFB), and aircraft low fly patterns (LFP). Each of these types of operations can be characterized by a distinctive combination of the time-in-mode (e.g., approach, taxi in/out, takeoff, and climb out).

The 2008 aircraft and other source emissions for Luke AFB will be obtained from the 2008 PEI for CO (MCAQD 2012). These emissions in 2025 will be derived from the Final F-35A Basing Environmental Impact Statement (LAFB 2012).

5 TRANSPORTATION CONFORMITY BUDGET

The MAG 2003 CO Maintenance Plan established two transportation conformity budgets: a 2006 emissions budget of 699.7 metric tons per day and a 2015 budget of 662.9 metric tons per day. EPA found the 2006 and 2015 budgets to be adequate for conformity purposes, effective October 14, 2003. In addition, these budgets were approved by EPA as part of the MAG 2003 CO Maintenance Plan, effective April 8, 2005.

The second MAG CO maintenance plan will establish a new budget for the maintenance year of 2025 for the CO maintenance area. Currently, the approved 2006 budget applies to conformity horizon years from 2006 through 2014 and the 2015 budget applies to horizon years after 2014. Once EPA finds the new 2025 budget to be adequate (or approves the 2025 budget as part of the MAG 2013 CO Maintenance Plan), the 2015 budget will apply to horizon years from 2015 through 2024 and the new 2025 budget will apply to horizon years after 2024. A safety margin will not be applied in establishing the 2025 budget.

6 MANAGEMENT STRUCTURE AND COMMITTEES

MAG has responsibilities for regional involvement in a number of planning issues, and has established an extensive mechanism for ensuring coordinated policy direction from elected officials, coordinated management and technical input, and advice from the appropriate agency staff, as well as direct citizen input. Figure 6-1 displays the MAG Policy Structure and Figure 6-2 presents the MAG Committee Structure. All policy committees and formal technical committees follow the Arizona open meeting law which requires, among other requirements, the posting of meeting notices and agendas at least 24 hours prior to any meeting.

The MAG Regional Council is the governing body of MAG. It is comprised of elected officials from each member agency, two ex-officio members representing the Arizona State Transportation Board, and a representative from the Citizens Transportation Oversight Committee. This composition of elected officials is a reflection of citizen input at the local government level. The MAG Regional Council agenda includes a call to the audience, providing the opportunity for public comments at each monthly meeting. MAG holds at least one formal public meeting prior to the adoption of any new or updated nonattainment area plan. Formal public meetings are advertised locally at least 30 days prior to the meeting date and documentation is available for public review during this 30-day period. Draft documents are distributed to appropriate federal, state, and local agencies for review and comment during this period. Comments received are analyzed with a staff response for consideration by the MAG Air Quality Technical Advisory Committee and MAG Regional Council before taking approval action. Documentation of the comments and responses are incorporated into the plan document.

Due to the technical complexity of many MAG programs, committees consisting of professional experts are often needed to assist in program development. The Air Quality Technical Advisory Committee is composed of representatives from eight MAG member agencies, citizens, environmental interests, health interests, automobile industry, fuel industry, utilities, public transit, trucking industry, rock products industry, construction firms, housing industry, architecture, agriculture, industry, business, parties to the Air Quality Memorandum of Agreement, and various State and Federal agencies. The role of the Technical Advisory Committee is to review and comment on technical information generated during the planning process and make recommendations to the MAG Management Committee.

MAG POLICY STRUCTURE

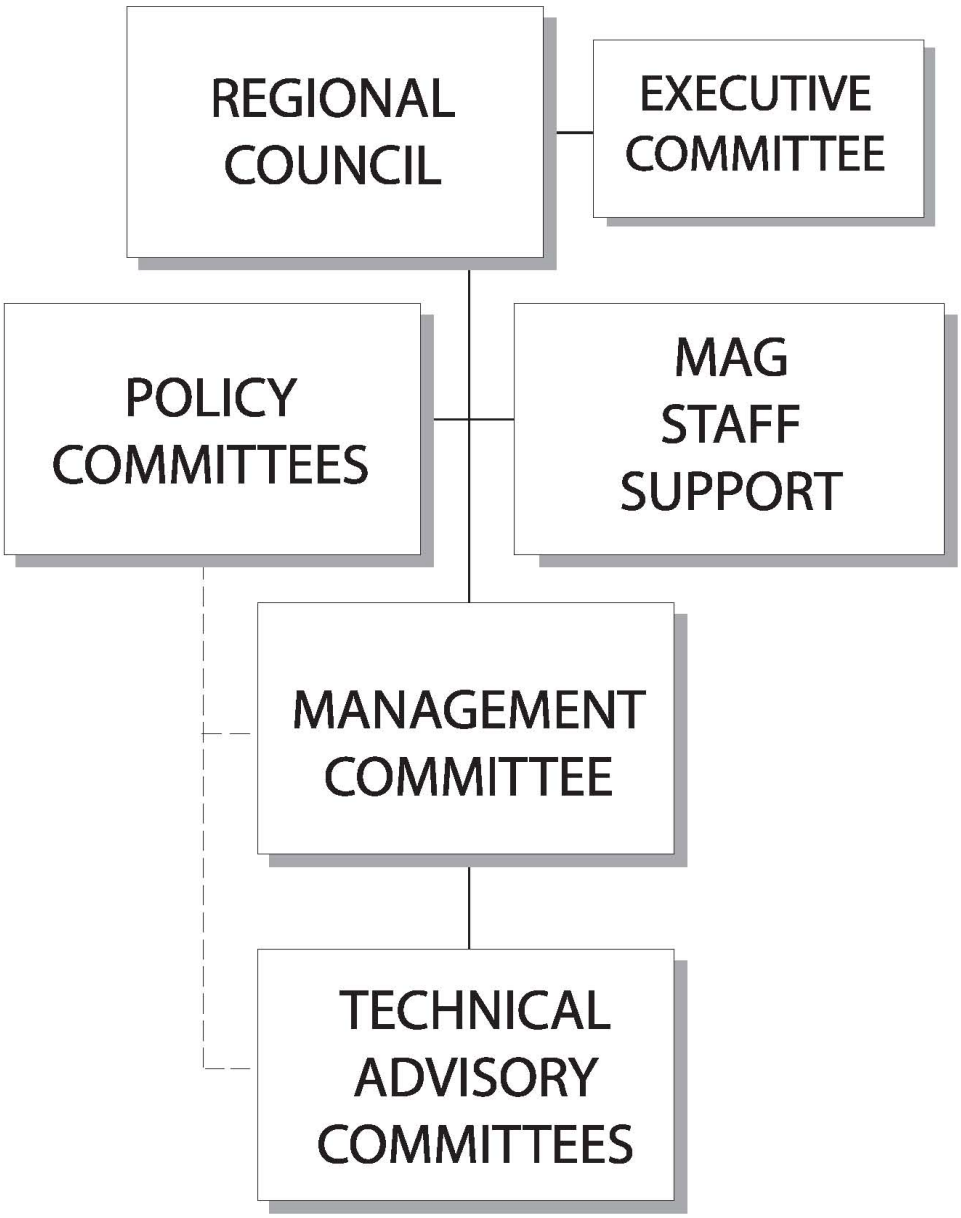

Figure 6-1 MAG Policy Structure

MAG COMMITTEE STRUCTURE

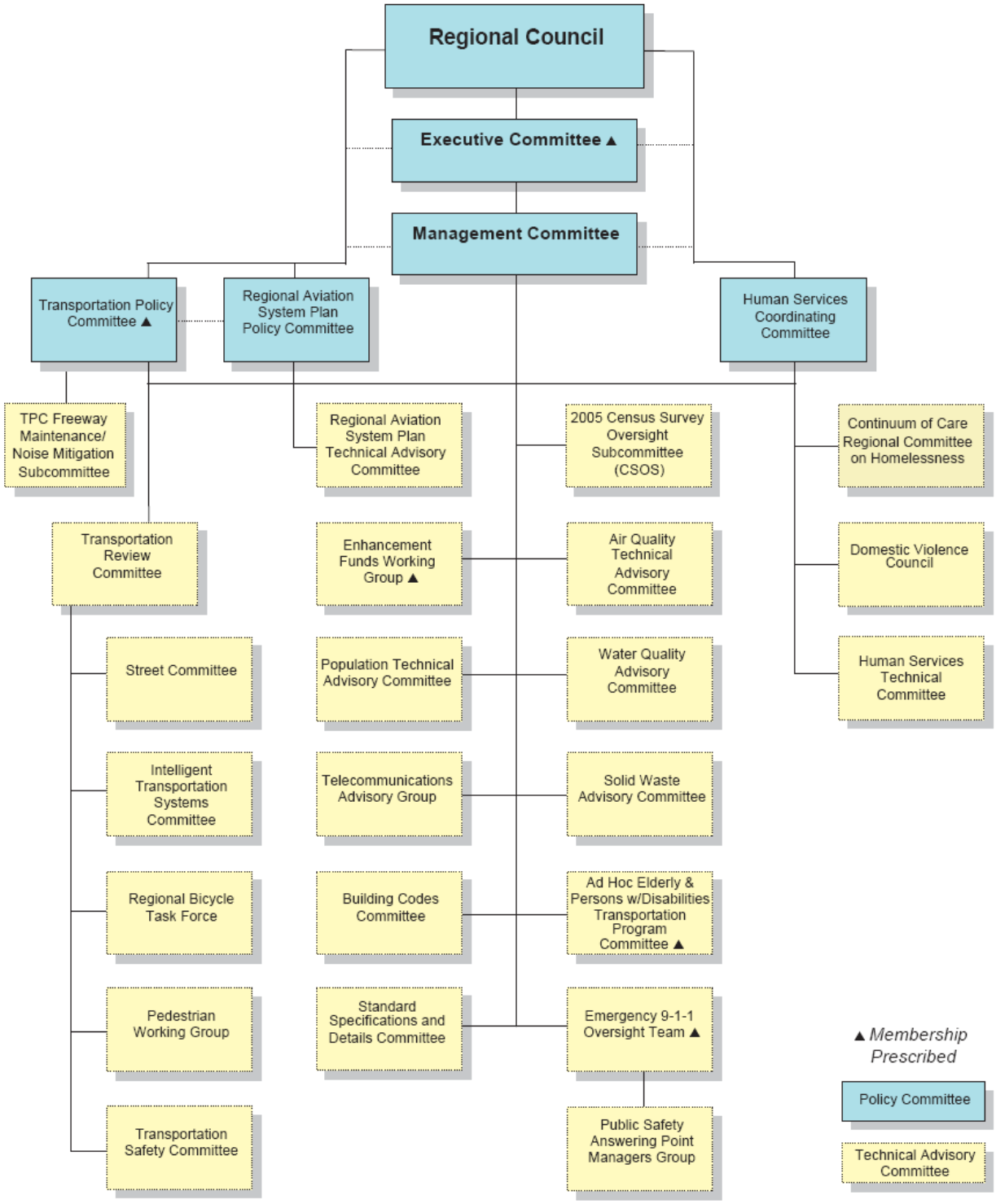

Figure 6-2 MAG Committee Structure

7 PARTICIPATING ORGANIZATIONS

Technical oversight for this project will be provided by the Air Quality Planning Team. This team includes staff representatives from the Maricopa Association of Governments (MAG), the Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Transportation (ADOT), and the Maricopa County Air Quality Department (MCAQD). The activities of this working group are directed by a Memorandum of Agreement among the agencies involved (see Attachment I). Representatives of other agencies, including EPA and the U.S. Department of Transportation, will be consulted on technical matters, as needed. The Air Quality Planning Team will meet as necessary during the CO modeling effort. Periodic reports on the status and progress of various phases of the modeling work will be presented at these meetings, and technical issues will be discussed and resolved.

8 SCHEDULE

The CO air quality modeling analysis for the MAG 2013 Maintenance Plan will be comprised of the following tasks:

1. Prepare a protocol document (this document) that describes the purpose, background, analysis objectives, and procedures to be followed in the remainder of the analysis.

2. Develop point, area, onroad mobile, and nonroad source CO emission inventories for the years 2006, 2015, and 2025. 2008 emissions will be derived from the 2008 PEI for CO.

3. Use data on traffic volumes and signal timings, and free-flow and idling emission factors from MOVES2010b to perform CAL3QHC hotspot modeling for intersections.

4. Conduct maintenance modeling demonstration for CO.

5. Write a technical support document (TSD) and plan.

6. Submit the plan for external review.

7. Complete the final revision to the plan.

8. Provide the plan for public review and hearing.

9. Obtain Air Quality Technical Advisory Committee's recommendation.

10. Obtain Management Committee's recommendation.

11. Obtain Regional Council's approval for the plan.

12. Submit the plan to ADEQ/EPA.

The schedule for these tasks is presented in Table 8-1.

Table 8-1 Schedule for the Modeling Demonstration for the MAG 2013 Carbon Monoxide Maintenance Plan

	2012							2013		
The 2013 CO Maintenance Modeling Task List	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Submit modeling protocol document to EPA										
Develop base year, 2006, 2015, and 2025 emissions inventory										
Perform CAL3QHC intersection modeling analysis										
Conduct the CO maintenance demonstration										
Write Technical Support Document (TSD) and Plan										
Provide TSD for external review and comments										
Prepare a final revision										
30-day comment period										
Air Quality Technical Advisory Committee (AQTAC)										
Management Committee & Regional Council										
Submit to EPA										

9 REFERENCES

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15. US EPA, (2001), Introduction to Area Source Emission Inventory Development. Emission Inventory Improvement Program (EIIP) Technical Report Series Volume III, January 2001.
16. US EPA, (2004), Model Change Bulletin, MCB#6, CAL3QHC, CAL3QHCR, September 1, 2004.

17. US EPA, (2005), Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Arizona, 70 FR 11553, March 2005.

18. US EPA, (2008), Air Emissions Reporting Requirements. 73 FR 76539, December 2008.

19. US EPA, (2010), Using MOVES in Project-Level Carbon Monoxide Analyses, EPA-420-B-10-041, December 2010.

20. US EPA, (2012), Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b, EPA-420-B-12-028, April 2012.

APPENDIX 1

Comments and MAG Responses on the Draft Modeling Protocol
in Support of the MAG 2013 Carbon Monoxide Maintenance Plan
for the Maricopa County Area, June 2012

Comments received from the Environmental Protection Agency (EPA) in an email from Scott Bohning dated June 25, 2012

Comment: I reviewed the CO maintenance plan protocol you provided back on June 13th ("Draft Modeling Protocol in Support of the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area", June 2012). Wienke Tax and Karina O'Connor also looked at it. You folks have done an excellent job on this. It covers what is needed, and I think it was a good idea to include the scaling of the old intersection work along with new intersection modeling. The use of multiple approaches will provide a solid basis for the maintenance demonstration. And the stability/mixing height information from AERMET is a good addition to the meteorological analysis in the weight of evidence portion. We have reviewed the conformity language and are comfortable with MAG's approach for budget years for the MAG 2013 CO Maintenance Plan. So, overall, we think this protocol will provide a good starting point for the 2013 CO maintenance plan.

MAG Response: We appreciate your positive feedback on the draft modeling protocol. We will also provide the protocol to the MAG Air Quality Planning Team for their review and comments.

ATTACHMENT 1

Interagency Memorandum of Agreement

MEMORANDUM OF AGREEMENT
AMONG
THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
AND
THE ARIZONA DEPARTMENT OF TRANSPORTATION
AND
MARICOPA COUNTY, BY AND THROUGH THE MARICOPA COUNTY ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY
AND
THE MARICOPA ASSOCIATION OF GOVERNMENTS

PURPOSE

The purpose of this Memorandum of Agreement is to provide the framework and guidelines to promote coordinated decision making in planning, development, and implementation, and enforcement of those actions necessary to attain and maintain the National Ambient Air Quality Standards in Maricopa County, hereafter referred to as the Nonattainment Area Plan, or NAP. This Memorandum is required pursuant to A.R.S. 49-406 D. and E. The Memorandum also provides the framework and guidelines for preparing plans designed to address other air pollution problems of regional concern.

SCOPE

This Memorandum is designed to address the control of the following pollutants: Carbon Monoxide, Ozone, Particulates, and Other Air Pollution Problems of Regional Concern.

The geographical area of concern is Maricopa County or the area specifically designated by the Administrator of the U.S. Environmental Protection Agency as not having attained the National Ambient Air Quality Standards for one or more of the pollutants named above.

RESPONSIBILITIES AND AUTHORITIES

The Arizona Department of Environmental Quality (ADEQ) has the primary authority in the State of Arizona for air pollution control and abatement. ADEQ is charged with preparation, development and maintenance of the State Implementation Plan (A.R.S. § 49-404); designation of areas of the state with respect to compliance with the National Ambient Air Quality Standards (A.R.S. § 49-405); and assuring that nonattainment area plans are implemented (A.R.S. § 49-406 J.). ADEQ has original jurisdiction and control over portable, mobile, and specific types of stationary air pollution sources (see A.R.S. § 49-402 A.). In addition, ADEQ is responsible for development of stationary source permitting procedures and standards (see A.R.S. § 49-480 B.). ADEQ is also responsible for providing technical assistance to political subdivisions of the State for implementing air pollution control programs (A.R.S. § 49-424 A.8.), conducting research on the amounts of hazardous air pollutants in ambient air and their impacts on human health (A.R.S. § 49-426.06); management and implementation of programs under the Air Quality Fee Fund (A.R.S. § 49-551), implementation of the Vehicle Emissions Inspections Program (A.R.S. § 49-521 through 550), and conducting research on vehicular emissions and clean burning fuels (A.R.S. § 49-553). The Department may delegate authority to a county for implementing air pollution control statutes (A.R.S. § 49-424 B.)

The Arizona Department of Transportation (ADOT) has exclusive control over state highways and all other state owned transportation systems (A.R.S. § 28-104). This includes the responsibility of multi-modal state transportation planning, cooperation with local governments, coordination of transportation planning with local governments, investigation of new transportation systems, and advising local governments concerning the development and operation of public transit systems (A.R.S. § 28-104).

The ADOT Director shall also enter into agreements on behalf of the state with political subdivisions for the improvement, maintenance and construction of mass transit systems, and shall provide rules for the application for and expenditure of all mass transit funds (A.R.S. § 28-108).

In addition, ADOT is authorized to conduct demonstration projects to evaluate the effectiveness of new, extended, improved or integrated public transportation services and carpooling or vanpooling activities in meeting regional transportation needs or in improving air quality (A.R.S. § 28-2611). These projects are funded by an annual distribution of $400,000 from the air quality fund (A.R.S. § 49-551). ADOT must also support ADEQ on reporting to the Legislature results of mobile source emissions Research, where applicable, per A.R.S. § 49-553.

The Maricopa County Environmental Quality and Community Services Agency (MC EQ&CSA) is the local air pollution control department for Maricopa County. The Agency has jurisdiction over air pollution sources not explicitly reserved for state jurisdiction (A.R.S. § 49-402); the Agency is delegated authority from the State of Arizona to regulate certain portable air pollution sources initially reserved for state jurisdiction (A.R.S. § 49-424); the Agency operates the Regional Travel Reduction Program (A.R.S. § 49-582 et seq), and is the principal government sponsor for the Voluntary No Drive Days Program (A.R.S. § 49-506). The Agency is also responsible for monitoring the ambient air quality of the region (A.R.S. § 49-473) through collecting and analyzing air quality data.

Within the Maricopa County Environmental Quality and Community Services Agency, the Assistant County Manager of the Agency is designated as the Air Pollution Control Officer. The Air Pollution Control Officer has the responsibility and authority to enforce the provisions of Article 3, Chapter 3, Title 49, "County Air Pollution Control", Arizona Revised Statutes. The Control Officer also has the responsibility for assuring adequate nonattainment plan implementation as prescribed by A.R.S. § 49-406.

The Maricopa Association of Governments (MAG) is a nonprofit Arizona corporation composed of elected officials from twenty-four cities and towns, Maricopa County, Gila River Indian Community, and the Arizona Department of Transportation. MAG has been designated by the Governor of Arizona as the lead planning organization for Maricopa County that, together with the State, is responsible for determining which elements of the State Implementation Plan revision will be planned, implemented, and enforced by State and local governments in Arizona (Governor Wesley Bolin, February 7, 1978; Clean Air Act § 174(a); and A.R.S. 49-406)). MAG is responsible for providing assistance to the Maricopa County Travel Reduction Regional Task Force and for recommending third and following year travel reduction targets, policies, standards and criteria for the Maricopa County Travel Reduction Program (A.R.S. § 49-582 and 49-588). Related directly to air quality, MAG is the official designated metropolitan transportation planning organization, and the designated agency for preparing population estimates and projections for the Maricopa County area. MAG is also responsible for making transportation/air quality conformity determinations, subject to the consultation procedures as provided by law (Clean Air Act § 176).

UNDERSTANDING/AGREEMENTS

In recognition and to facilitate the accomplishment of the foregoing, IT IS HEREBY AGREED that:

1. The Arizona Department of Environmental Quality; Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; and Maricopa Association of Governments will work through a coordinated effort to prepare the MAG regional air quality plans as described in Attachments One, Three, Four, and Five. Attachment One contains a description of the generalized roles and areas of expertise of the agencies, the MAG Air Quality Planning Team, and the MAG Air Quality Policy Team. Attachment Three contains the general implementation authorities for measures in the air quality plans. Attachment Four includes provisions for tracking plan implementation; determining reasonable further progress; assurances for adequate plan implementation, and adoption of control measures. Attachment Five contains the Work Programs for Preparing Air Quality Plans.

2. The Maricopa Association of Governments will maintain the MAG Regional Air Quality Planning Process for decision making as described in Attachment Two. This Attachment contains the roles of the MAG Regional Council, MAG Management Committee, MAG Air Quality Policy Committee, and ad hoc Working Groups. MAG will coordinate the preparation of the NAPs. Representatives from ADEQ, ADOT and MC EQ&CSA will be included as ex-officio members of the MAG Air Quality Policy Committee, and active members of all working groups associated with this MAG committee.

3. The Arizona Department of Environmental Quality; Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; Maricopa Association of Governments will pursue commitments to implement the measures in the NAPs. The aforementioned agencies will continue to evaluate and pursue the implementation of additional air pollution control measures as a result of the evaluations performed as described in Attachment Four.

EFFECTIVE DATE

The Agreement and all Amendments shall become effective on the date it has been signed by all parties to it.

TERM

This Agreement shall remain in effect from the effective date of the Agreement until such time it is terminated or superseded by a subsequent agreement. This Agreement may be terminated by any party to it, providing written notice of intent to terminate is provided to all other parties to the Agreement thirty days prior to the effective date of withdrawal of that party from the Agreement.

AMENDMENT

This Agreement may be amended at any time upon mutual written agreement of all parties. No agent, employee or other representative of any party to this Agreement is empowered to alter any of the terms of the Agreement, unless it is done in writing and signed by the Designated Officers of the respective parties, their authorized representatives, or duly appointed successors.

ATTEST

All terms of this Memorandum of Agreement are hereby acknowledged and agreed, as certified by the signatures of the Designated Officers affixed hereto:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

By _____
Edward Z. Fox, Director, Arizona Department of Environmental Quality

Date Nov 9, 1992

ARIZONA DEPARTMENT OF TRANSPORTATION

By _____
James Creedon, Acting Director, Arizona Department of Transportation

Date Nov 9, 1992

MARICOPA COUNTY, BY AND THROUGH THE MARICOPA COUNTY ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY

By _____
Betsy Bayless, Chairman, Maricopa County Board of Supervisors

Date 11.2.92

MARICOPA ASSOCIATION OF GOVERNMENTS

By _____
John J. DeBolske, Secretary, Maricopa Association of Governments

Date 11.2.92

MAG REGIONAL AIR QUALITY PLANNING TECHNICAL PROCESS

- All MAG regional air quality plans are prepared through a coordinated effort among the Arizona Department of Environmental Quality, Arizona Department of Transportation, Maricopa County Environmental Quality and Community Services Agency, and Maricopa Association of Governments.

MAG AIR QUALITY POLICY TEAM

Composition: ***Director of Arizona Department of Environmental Quality; Director of Arizona Department of Transportation; Air Pollution Control Officer of Maricopa County; MAG Secretary***

- Oversees preparation of plans and overall technical planning effort
- Resolves technical problems and issues

MAG AIR QUALITY PLANNING TEAM

Composition: ***Staff from the Arizona Department of Environmental Quality, Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; Maricopa Association of Governments***

Agency Roles

- Arizona Department of Environmental Quality - air quality modeling and technical assistance, mobile source emissions research and inventory, input for the comprehensive list of measures and feasibility analysis, information relating to the Vehicle Emission Inspection Maintenance Program, stationary and portable source control strategies, air quality research studies, State Air Quality Fund administration, adoption and submittal of State Implementation Plans to the Environmental Protection Agency, tracking plan implementation, assurances, special purpose air quality and meteorological monitoring for plan development and compliance
- Arizona Department of Transportation - State Transportation Improvement Program, other transportation plans and programs, input for the comprehensive list of measures and feasibility analysis
- Maricopa County Environmental Quality and Community Services Agency - stationary source emissions inventory and controls, coordinating the comprehensive emissions inventory, air quality monitoring data,input for comprehensive list of measures and feasibility analysis, mandatory travel reduction program, trip reduction data, voluntary no drive days program, tracking plan implementation, reasonable further progress, assurances, special purpose air quality and meteorological monitoring for plan development and compliance
- Maricopa Association of Governments - demographic projections and socioeconomic data, transportation modeling, air quality modeling, Regional Transportation Improvement Program, Regional Transportation Plan, other transportation plans and programs, congestion mangement system, conformity, input for comprehensive list of measures and feasibility analysis, development of the air quality plans, interface with state, county, and local entities, recommending future year travel reduction goals, policies, and standards to Maricopa County, assistance to Maricopa County for the mandatory travel reduction program, review reasonable further progress made to reduce air pollution and plan adjustments if necessary, review plan implementation

The technical planning work is closely coordinated with EPA Region IX staff, Federal Highway Administration, and Federal Transit Administration.

ATTACHMENT TWO

MAG REGIONAL AIR QUALITY PLANNING PROCESS

MAG REGIONAL COUNCIL

Composition: Elected officials from 24 cities and towns, Maricopa County, Gila River Indian Community, and Arizona Department of Transportation, Regional Public Transportation Authority

- Reviews all pertinent air quality data
- Adopts regional air quality plans
- Formally requests that state, county, local, and other appropriate agencies implement measures in the plans
- Approves trip reduction goals and policies and recommends to Maricopa County
- Determines conformity, subject to the consultation procedures as provided by law (Clean Air Act § 176)
- Maintains an air quality/transportation planning process consistent with federal law

MAG MANAGEMENT COMMITTEE

Composition: Managers from 24 cities and towns, Maricopa County, Gila River Indian Community, and Arizona Department of Transportation, Regional Public Transportation Authority

- Reviews all pertinent air quality and transportation data
- Recommends regional air quality and transportation plans
- Recommends trip reduction goals and policies

MAG AIR QUALITY POLICY COMMITTEE

Composition: 10 elected officials from cities and towns and Maricopa County and 9 citizen representatives + ex-officio representatives from Arizona Department of Environmental Quality, Arizona Department of Transportation, and Maricopa County Environmental Quality and Community Services Agency

- Reviews all pertinent air quality data from the technical planning process
- Reviews air quality research studies conducted by MAG, Arizona Department of Environmental Quality, EPA, Maricopa County Environmental Quality and Community Services Agency, etc.
- Reviews related data generated from other MAG regional planning areas such as transportation, transit, population, regional development, water quality, solid waste, etc.
- Studies in detail a comprehensive list of control measures. Data on the measures includes: description of the measures, air quality impacts, complementary measures, implementation responsibility, costs, advantages and disadvantages, etc.
- Recommends air quality measures for the plans
- Conducts public hearings on the plans
- Formally recommends regional air quality plans and control measures
- Recommends trip reduction goals and policies
- Conducts conformity reviews, subject to the consultation procedures as provided by law (Clean Air Act § 176)
- Reviews reasonable further progress made to reduce air pollution and recommends plan adjustments if necessary
- Provides input on the MAG congestion management system

ADDITIONAL WORKING GROUPS AS NECESSARY

ATTACHMENT THREE

IMPLEMENTATION OF MAG REGIONAL AIR QUALITY PLANS
GENERAL IMPLEMENTATION AUTHORITIES

STATE - ARIZONA DEPARTMENT OF ADMINISTRATION

- Travel reduction and adjusted work hours for state employees

STATE - ARIZONA DEPARTMENT OF COMMERCE

- Capitol Ridesharing Program

STATE - ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

- Mobile source emissions controls
- Mobile source emissions research
- Portable and some major stationary source controls
- Ambient air quality monitoring and research
- Assurances

STATE - ARIZONA DEPARTMENT OF TRANSPORTATION

- State and interstate transportation system planning, development and management (includes High Occupancy Vehicle Lanes, Freeway Management Systems, etc.)
- Vehicle registration and licensing
- Transit Assistance Grants

STATE - ARIZONA DEPARTMENT OF WEIGHTS AND MEASURES

- Oxygenated fuels
- Other fuel quality regulation (e.g. Reid Vapor Pressure)
- Stage I and Stage II vapor recovery

MARICOPA COUNTY - ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY

- Stationary source controls
- Delegated portable source controls
- Area source controls (e.g. *de minimis* sources, materials storage and handling, construction)
- Open burning control
- Mandatory Travel Reduction Program (TRP) and Voluntary No Drive Days
- Other transportation control measures in unincorporated areas
- Ambient air monitoring
- County roadways system planning, development and management
- Planning and zoning (unincorporated areas)
- Assurances

MAG CITIES AND TOWNS

- Municipal roadways system planning, development and management
- Transportation control measures (besides TRP)
- Planning and zoning
- Some area source controls (e.g. vacant land, construction practices)
- Public transit (including Regional Public Transportation Authority)

- Future year travel reduction goals, policies, standards, and criteria
- Ridesharing program
- Conformity determinations, as provided by law (Clean Air Act § 176)
- Allocation of Congestion Mitigation Air Quality Improvement Program Funds and Surface Transportation Program Funds

- As noted in the MAG regional air quality plans, the action taken by the MAG Regional Council to approve the Suggested Measures and Adopted Plan Measures does not commit each jurisdiction to implement those measures. As indicated in the resolutions and commitments, each jurisdiction determines which measures are reasonably available for implementation by that jurisdiction.

OTHER IMPLEMENTATION AND ADOPTION FUNCTIONS

This attachment includes provisions for tracking plan implementation and determining reasonable further progress; assurances for adequate plan implementation, and procedures and responsibilities for adoption of control measures and emissions limitations.

TRACKING PLAN IMPLEMENTATION AND DETERMINING REASONABLE FURTHER PROGRESS

Each agency is afforded a review and comment period for each ongoing portion of a plan or revision to a plan being prepared by another agency. Every effort will be made to incorporate the comments of the reviewing agency into each portion of the plan being prepared by another agency.

Maricopa County will develop monitoring guidelines with respect to reasonable further progress which will be consistent with the needs of the Arizona Department of Environmental Quality and U.S. EPA. Maricopa County will be responsible for tracking emissions from point, area and non-road mobile sources and for tracking implementation of control strategies. MAG will be responsible for tracking on-road mobile source emissions and conformity. Maricopa County will integrate the MAG information and reports with the Maricopa County information and submit it to the Arizona Department of Environmental Quality.

For the EPA, the primary means of demonstrating the rate of progress will be through the periodic inventories (i.e., complete, actual inventories) submitted every 3 years. EPA has indicated in the General Preamble Section III.A.3 (d) that they currently intend to rely on existing reporting requirements such as emission statements, periodic inventories, annual Aerometric Information Retrieval System update, and conformity reviews.

ASSURANCES FOR ADEQUATE PLAN IMPLEMENTATION

In order to comply with the Clean Air Act, State law provides an approach for assurances that State and local committed measures will be adequately implemented (A.R.S. §49-406 L and J.). If any person (includes State, County, local governments, regional agencies, and other entities) fails to implement a committed measure, the County would file an action in Superior Court to have the court order that the measure be implemented. Likewise, the ADEQ Director will backstop the County if it fails to implement a committed measure or if the County fails to backstop the local governments and regional agencies.

Regarding committed measures, A.R.S. §49-406 G. requires that each agency that commits to implement any control measure contained in the State Implementation Plan must describe the commitment in a resolution. The resolution must be adopted by the appropriate governing body of the agency. State law also requires the resolution to specify the following: (1) Its authority for implementing the limitation or measure as provided in statute, ordinance or rule: (2) A program for the enforcement of the limitation or measure; and (3) The level of personnel and funding allocated to the implementation of the measure.

As noted in the MAG regional air quality plans, the action taken by the MAG Regional Council to approve the Suggested Measures and Adopted Plan Measures does not commit each jurisdiction to implement those measures. As indicated in the resolutions and commitments, each jurisdiction determines which measures are reasonably available for implementation by that jurisdiction.

PROCEDURES AND RESPONSIBILITIES FOR ADOPTION OF CONTROL MEASURES AND EMISSIONS LIMITATIONS

According to A.R.S. §49-404 B., the ADEQ Director may adopt rules that describe procedures for adoption of revisions to the State Implementation Plan. The State, in accordance with these rules, and the governing body of the metropolitan planning organization (MAG) are required to adopt the nonattainment area plans (A.R.S. §49-406 H.).