Appendix 1

Review of the 1990 Base Year Emissions Inventory

for the

Maricopa County Ozone Nonattainment Area

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 9

75 Hawthorne Street
San Francisco, CA 94105-3901

DATE: October 1, 1997

MEMORANDUM

SUBJECT: MARICOPA COUNTY NAA 1990 OZONE PRECURSORS EMISSION INVENTORY - TECHNICAL SUPPORT DOCUMENT

FROM: Morris I. Goldberg, Environmental Engineer
Teshnical Support Office (AIR 7)

TO: Frances Prosser Wicher, Environmental Engineer
Planning Office (AIR 2)

Thru: John Kennedy, Chief - Technical Support Office (AIR 7)
Julia Barrow, Chief - Planning Office (AIR 2)

This memorandum provides my review and evaluation of the "1990 Baseyear Ozone Emission Inventory for Maricopa County, Arizona, Nonattainment Area - Final Submittal", dated July 1993. Through this Technical Support Document I recommend EPA approval of the Maricopa County ozone nonattainment area (NAA) baseyear emission inventory submittal as a part of the Arizona State Implementation Plan. The baseyear inventory is:
(1) reasonably accurate in that it uses established estimation and measurement methods approved by EPA, (2) comprehensive in that it estimates emissions from all categories of sources for the three ozone precursors, and (3) current in that it provides estimates of emissions for the 1990 baseyear as required by EPA and the Clean Air Act.

As is suggested in the EPA guidance, this inventory is comprised of annual and seasonal inventories of actual (as opposed to permitted or potential) volatile organic compound (VOC), oxides of nitrogen (NOx), and carbon monoxide (CO) emissions in the Maricopa Association of Governments Urban Planning Area (the Ozone Nonattainment Area). The baseyear inventories were the subject of a public hearing with the "MAG 1993 Ozone Plan for the Maricopa County Area." The inventory is found at Appendices - Volume One.

SUMMARY

Estimates of the actual emissions for the 1990 annual average weekday and the 1990 average (3-month) ozone season (July-September) weekday emissions are summarized for five broad categories of sources: (1) stationary point (2) area, (3) non-road mobile, (4) on-road mobile, and (5) biogenic (VOC only) sources, as recommended by EPA. Seasonal (0.96) and

weekday (0.87) factors are used to convert annual average estimates to summer weekday emissions. These ozone season weekday emission estimates are used in the ozone control strategy, and are summarized below. Modeling uses episodic day emissions derived from those of the ozone season weekday emissions. The total average summer day tonnage of emissions in the NAA in 1990 is 404 VOC, 323 NOx, and 1595 CO.

STATIONARY SOURCES

Over 150 stationary sources located inside the NAA, as well as 12 point sources located outside, but within 25 kilometers of the NAA, are listed with their emissions and subdivided into 27 subcategories. Rule effectiveness is applied to denoted sources to increase the emissions for those with control equipment, to account for increases due to upset-breakdown, startup-shutdown and other excess emissions not limited by regulation.

Stationary point sources in the NAA account for 28 tons (6.9%) of VOC, 78 tons (24%) of NOx, and 15 tons (0.9%) of CO per day on average during the three month summer ozone season (June - August). Of the stationary point source VOC emissions, 42% are from industrial surface coating, 25% are from other solvent use, 18% are from storage transportation and marketing of petroleum products and VOC liquids, 9% from industrial processes, 5% from stationary internal combustion engines, and the remaining 6% external combustion and non-industrial surface coating sources. Stationary sources of NOx emissions are predominately from stationary internal (51%) and external (49%) combustion sources.

AREA SOURCES

Area sources are both small stationary sources and true area sources. Over sixty source categories are used to summarize the emissions from the area sources. These sources account for 30% of the VOC, 2% of the NOx, and less than 1% of the CO from all sources in the NAA in the summer of 1990. Large VOC area source categories include pesticide application, consumer/commercial solvent use, vehicle refueling, architectural coatings, asphalt, and degreasing.

NON-ROAD SOURCES

Non-road mobile source emissions come from planes, trains, diesel, and 2 and 4-stroke gasoline equipment. The Federal Aviation Administration (FAA) Aircraft Engine Emissions Database (FAEED) and assumptions were applied to 12 military, commercial and municipal airports for landings and take-offs. Non-road equipment emissions far exceeded those from either planes and/or trains for all three pollutants. Nonroad equipment account for 95 and

73% of the non-road category VOC and NOx, while the non-road category constitutes 15% and

21% of the respective total inventories. No boats or coal burning locomotives are known to operate in the NAA.

ON-ROAD MOBILE SOURCES

Light duty gasoline vehicles contribute 57 and 73% of the on-road vehicle emissions of VOC and NOx, while the on-road category constitutes 21% of both the VOC and NOx total inventories. On-road emissions were estimated from the Highway Performance Monitoring System (HPMS) and augmented with Maricopa Association of Governments Transportation and Planning Office (MAGTPO) traffic counts and MAG geographic information system (GIS) street mileage for freeways, expressways, principal and minor arterials, collectors, and local roads using MOBILE 5. The submittal estimates that 88% of all registered in the NAA vehicles are subject to inspection and maintenance program (I/M) limitations.

BIOGENICS

The EPA model PC-BEIS using Sky Harbor International Airport climatological data and "1991 Arizona Agricultural Statistics." Because of the level of vegetation in the NAA, only 40 tons of VOC are estimated to on an annual basis.

QUALITY REVIEW

In addition to the internal reviews of draft inventories, outside evaluations were performed by EPA-OAQPS/EIB, EPA-Region IX, and Midwest Research Institute (MRI), SAI and Radian Corp. These reviews are either included or referenced in the submittal.

RECOMMENDATION

Based on my review, I recommend that EPA approve the Maricopa County ozone nonattainment area (NAA) baseyear emission inventory submittal as a part of the Arizona State Implementation Plan.

Appendix 2

MOBILE5a (3/29/97) Input and Output Files
Composite Emission Factor Table
for
Adjustments to the Base Year Inventory

Input 1990 Base - I/M Program

```
1
90base 1990 1990 I/M MOBILE5a O3 1/3/98
1          TAMFLG    tampering effects rates: 1 is nat
1          SPDFLG    speed by veh type: 1 is one for all
1          VMFLAG    VMT by veh type: 1 is nat default
3          MYMFLG    reg dist local but mi accum national
1          NEWFLG    basic emission rates: 1 is national
2          IMFLAG    I/M program: 2 is one program
1          ALHFLG    corr. factors: 1 is no corrections
2          ATPFLG    anti-tampering program: 2 is yes
5          RLFFLG    refueling losses: 5 is no refueling calculated
1          LOCFLG    local area param.: 1 is 1 for each scenario
2          TEMFLG    temp flag: 2 is local input
3          OUTFMT    format of output: 3 is 112 col
4          PRTFLG    pollutants: 4 is all
1          IDLFLG    idle emissions: 1 is no
3          NMHFLG    hydrocarbons: 3 is VOC
1          HCFLAG    HC by component: 1 is composite only
.071 .070 .078 .077 .079 .080 .077 .067 .045 .038
.037 .036 .044 .039 .032 .021 .012 .014 .014 .011
.008 .007 .006 .005 .032
.048 .058 .069 .068 .070 .104 .077 .061 .037 .033
.031 .028 .039 .037 .032 .023 .013 .019 .021 .019
.013 .013 .012 .009 .066
.082 .077 .092 .081 .067 .078 .070 .055 .032 .026
.026 .023 .042 .042 .038 .026 .017 .021 .022 .017
.011 .010 .010 .006 .029
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.015 .019 .015 .009 .052
.071 .070 .078 .077 .079 .080 .077 .067 .045 .038
.037 .036 .044 .039 .032 .021 .012 .014 .014 .011
.008 .007 .006 .005 .032
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.031 .028 .039 .037 .032 .023 .013 .019 .021 .019
.013 .013 .012 .009 .066
.047 .083 .076 .083 .082 .099 .087 .074 .031 .036
.040 .041 .054 .036 .024 .013 .013 .018 .017 .012
.008 .006 .005 .002 .013
.030 .036 .047 .049 .069 .097 .088 .063 .073 .105
.076 .267 .000 .000 .000 .000 .000 .000 .000 .000
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.009.002.012.009.005.008.005.006.005.002

Input: 1990 Base - No I/M Program

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1
90baseno 1990 no I/M MOBILE5a 1/3/98
1          TAMFLG    tampering effects rates: 1 is nat
1          SPDFLG    speed by veh type: 1 is one for all
1          VMFLAG    VMT by veh type: 1 is nat default
3          MYMFLG    reg dist local but mi accum national
1          NEWFLG    basic emission rates: 1 is national
1          IMFLAG    I/M program: 1 is no
1          ALHFLG    corr. factors: 1 is no corrections
1          ATPFLG    anti-tampering program: 1 is no
5          RLFFLG    refueling losses: 5 is no refueling calculated
1          LOCFLG    local area param.: 1 is 1 for each scenario
2          TEMFLG    temp flag: 2 is local input
3          OUTFMT    format of output: 3 is 112 col
4          PRTFLG    pollutants: 4 is all
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1          HCFLAG    HC by component: 1 is composite only
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.037 .036 .044 .039 .032 .021 .012 .014 .014 .011
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.031 .028 .039 .037 .032 .023 .013 .019 .021 .019
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.002.033.007.050.010.071.018.108.037.104.028.052.021.028.014.016.007.006.004.003
.009.002.012.009.005.008.005.006.005.002

Output: 1990 Base - I/M Program

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90base 1990 1990 I/M MOBILE5a O3 1/3/98
MOBILE5a (26-Mar-93)
I/M program selected:
0    Start year (January 1):             1977
   Pre-1981 MYR stringency rate:        28%
    First model year covered:           1967
    Last model year covered:            2020
    Waiver rate (pre-1981):             10.%
    Waiver rate (1981 and newer):        4.%
    Compliance Rate:                    97.%
    Inspection type:                    Test Only
   Inspection frequency                Annual
    Vehicle types covered:              LDGV - Yes
                                       LDGT1 - Yes
                                       LDGT2 - Yes
                                        HDGV - Yes
    1981 & later MYR test type:         2500 rpm / Idle
    Cutpoints, HC:  220.000   CO:    1.200   NOx:  999.000
Functional Check Program Description:
Check Start   Model Yrs  Vehicle Classes Covered        Inspection        Comp
      (Jan1)  Covered    LDGV   LDGT1  LDGT2  HDGV    Type      Freq      Rate
 ATP   1987    1975-2020  Yes    Yes    Yes    Yes Test Only     Annual    97.0%
Air pump system disablements:       Yes  Catalyst removals:                  Yes
Fuel inlet restrictor disablements: Yes  Tailpipe lead deposit test:         No
EGR disablement:                    No   Evaporative system disablements:    No
PCV system disablements:            No   Missing gas caps:                   Yes
Replacement Diesel Sales Fractions Input by User:
         1966   1967   1968   1969   1970   1971   1972   1973   1974   1975
         ____   ____   ____   ____   ____   ____   ____   ____   ____   ____
LDDV:    0.005  0.005  0.005  0.012  0.009  0.004  0.007  0.014  0.021  0.028
LDDT:    0.002  0.006  0.008  0.009  0.002  0.003  0.006  0.016  0.028  0.052
        1976   1977   1978   1979   1980   1981   1982   1983   1984   1985
         ____   ____   ____   ____   ____   ____   ____   ____   ____   ____
LDDV:    0.037  0.018  0.010  0.007  0.002  0.002  0.000  0.000  0.000  0.001
DDT:    0.104  0.108  0.071  0.050  0.033  0.021  0.017  0.023  0.024  0.032
```

	1986	1987	1988	1989	1990
LDDV:	0.000	0.001	0.001	0.001	0.001
LDDT:	0.024	0.049	0.045	0.045	0.045

VOC HC emission factors include evaporative HC emission factors.

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	3.59	4.38	5.30	4.71	11.65	1.42	1.02	2.93	10.19	4.124
Exhaust CO:	23.02	28.85	30.36	29.39	137.46	2.50	1.99	12.75	33.37	27.876
Exhaust NOX:	1.56	1.91	2.12	1.99	5.46	1.83	1.82	19.44	0.70	2.823

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	3.12	3.85	4.61	4.12	9.80	1.19	0.86	2.46	9.68	3.576
Exhaust CO:	19.14	24.50	25.31	24.79	107.86	1.98	1.57	10.08	26.60	22.999
Exhaust NOX:	1.61	2.02	2.22	2.09	5.70	1.69	1.68	17.94	0.78	2.798

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	30.0	30.0	30.0		30.0	30.0	30.0	30.0	30.0	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.77	3.46	4.12	3.70	8.57	1.02	0.73	2.11	9.29	3.183
Exhaust CO:	16.41	21.21	21.72	21.39	89.42	1.64	1.30	8.34	21.74	19.621
Exhaust NOX:	1.64	2.10	2.30	2.17	5.95	1.62	1.61	17.16	0.84	2.803

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	30.3	30.3	30.3		30.3	30.3	30.3	30.3	30.3	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.76	3.44	4.10	3.67	8.52	1.01	0.73	2.09	9.27	3.163
Exhaust CO:	16.28	21.04	21.54	21.22	88.57	1.62	1.29	8.25	21.49	19.453
Exhaust NOX:	1.64	2.11	2.30	2.18	5.96	1.62	1.61	17.13	0.85	2.804

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)

Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	36.7	36.7	36.7		36.7	36.7	36.7	36.7	36.7	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.43	3.09	3.65	3.29	7.52	0.86	0.62	1.77	8.91	2.804
Exhaust CO:	13.89	18.14	18.38	18.23	75.81	1.36	1.08	6.94	17.16	16.626
Exhaust NOX:	1.68	2.18	2.37	2.25	6.27	1.61	1.60	17.08	0.91	2.854

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)

Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	55.7	55.7	55.7		55.7	55.7	55.7	55.7	55.7	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.03	2.71	3.16	2.87	6.25	0.66	0.47	1.35	8.71	2.370
Exhaust CO:	13.20	18.35	17.99	18.23	81.24	1.26	1.01	6.45	15.60	16.329
Exhaust NOX:	2.32	3.00	3.31	3.11	7.18	2.25	2.24	23.87	1.22	3.908

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: Yes Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: Yes Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)

Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	59.3	59.3	59.3		59.3	59.3	59.3	59.3	59.3	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										

VOC	HC:	2.22	3.00	3.51	3.18	6.18	0.65	0.46	1.33	9.23	2.567
Exhaust	CO:	21.39	30.97	30.53	30.81	90.02	1.34	1.07	6.84	27.17	25.089
Exhaust	NOX:	2.59	3.34	3.70	3.47	7.35	2.54	2.52	26.94	1.34	4.355

Output: 1990 Base - No I/M Program

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90baseno 1990 no I/M MOBILE5a 12/18/97
MOBILE5a (26-Mar-93)
Replacement Diesel Sales Fractions Input by User:
         1966   1967   1968   1969   1970   1971   1972   1973   1974   1975
        _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
LDDV:    0.005  0.005  0.005  0.012  0.009  0.004  0.007  0.014  0.021  0.028
LDDT:    0.002  0.006  0.008  0.009  0.002  0.003  0.006  0.016  0.028  0.052
         1976   1977   1978   1979   1980   1981   1982   1983   1984   1985
         _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
LDDV:    0.037  0.018  0.010  0.007  0.002  0.002  0.000  0.000  0.000  0.001
LDDT:    0.104  0.108  0.071  0.050  0.033  0.021  0.017  0.023  0.024  0.032
        1986   1987   1988   1989   1990
         _____  _____  _____  _____  _____
LDDV:    0.000  0.001  0.001  0.001  0.001
LDDT:    0.024  0.049  0.045  0.045  0.045
VOC HC emission factors include evaporative HC emission factors.
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Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990        I/M Program: No        Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
                Anti-tam. Program: No      Operating Mode: 20.6 / 27.3 / 20.6   Altitude:  500. Ft.
                 Reformulated Gas: No
Phoenix, AZ                                Minimum Temp:  80. (F)         Maximum Temp: 104. (F)
                     Period 1 RVP:  8.0      Period 2 RVP:  8.0        Period 2 Start Yr: 2020
  Veh. Type:      LDGV     LDGT1     LDGT2      LDGT      HDGV      LDDV      LDDT      HDDV      MC      All Veh
                 ______   ______    ______    ______    ______    ______    ______    ______    ______   ______
Veh. Speeds:     20.0      20.0      20.0               20.0      20.0      20.0      20.0      20.0
    VMT Mix:      0.653     0.154     0.085              0.035     0.002     0.007     0.057     0.006
Composite Emission Factors (Gm/Mile)
VOC      HC:      4.44      5.59      6.28      5.84     12.50      1.42      1.02      2.93     10.12     4.976
Exhaust  CO:     37.14     48.74     50.43     49.34    158.46      2.50      1.99     12.75     33.37    42.616
xhaust NOX:      1.63      2.05      2.23      2.11      5.48      1.83      1.82     19.44      0.70     2.900
```

Emission factors are as of July 1st of the indicated calendar year.
ser supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	3.80	4.85	5.43	5.06	10.43	1.19	0.86	2.46	9.61	4.269
Exhaust CO:	30.71	41.33	41.99	41.56	124.34	1.98	1.57	10.08	26.60	35.150
Exhaust NOX:	1.68	2.17	2.33	2.23	5.72	1.69	1.68	17.94	0.78	2.877

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	30.0	30.0	30.0		30.0	30.0	30.0	30.0	30.0	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	3.34	4.31	4.82	4.49	9.08	1.02	0.73	2.11	9.22	3.764
Exhaust CO:	26.16	35.64	35.99	35.76	103.08	1.64	1.30	8.34	21.74	29.907
Exhaust NOX:	1.71	2.26	2.41	2.31	5.96	1.62	1.61	17.16	0.84	2.885

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	30.3	30.3	30.3		30.3	30.3	30.3	30.3	30.3	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	3.32	4.28	4.79	4.46	9.01	1.01	0.73	2.09	9.20	3.738
Exhaust CO:	25.93	35.35	35.68	35.47	102.11	1.62	1.29	8.25	21.49	29.644
Exhaust NOX:	1.71	2.26	2.42	2.32	5.97	1.62	1.61	17.13	0.85	2.886

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	36.7	36.7	36.7		36.7	36.7	36.7	36.7	36.7	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.90	3.79	4.25	3.95	7.91	0.86	0.62	1.77	8.84	3.280
Exhaust CO:	21.95	30.32	30.40	30.35	87.40	1.36	1.08	6.94	17.16	25.200
Exhaust NOX:	1.75	2.35	2.49	2.40	6.28	1.61	1.60	17.08	0.91	2.938

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	55.7	55.7	55.7		55.7	55.7	55.7	55.7	55.7	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.40	3.32	3.67	3.44	6.51	0.66	0.47	1.35	8.65	2.757
Exhaust CO:	20.82	30.83	29.83	30.47	93.66	1.26	1.01	6.45	15.60	24.669
Exhaust NOX:	2.42	3.23	3.48	3.32	7.20	2.25	2.24	23.87	1.22	4.026

Emission factors are as of July 1st of the indicated calendar year.
User supplied veh registration distributions.
Cal. Year: 1990 I/M Program: No Ambient Temp: 98.8 / 98.8 / 98.8 (F) Region: Low
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6 Altitude: 500. Ft.
Reformulated Gas: No
Phoenix, AZ Minimum Temp: 80. (F) Maximum Temp: 104. (F)
Period 1 RVP: 8.0 Period 2 RVP: 8.0 Period 2 Start Yr: 2020

Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Speeds:	59.3	59.3	59.3		59.3	59.3	59.3	59.3	59.3	
VMT Mix:	0.653	0.154	0.085		0.035	0.002	0.007	0.057	0.006	
Composite Emission Factors (Gm/Mile)										
VOC HC:	2.69	3.77	4.14	3.90	6.43	0.65	0.46	1.33	9.16	3.052
Exhaust CO:	34.23	52.50	51.04	51.98	103.78	1.34	1.07	6.84	27.17	39.026
Exhaust NOX:	2.71	3.59	3.89	3.70	7.37	2.54	2.52	26.94	1.34	4.487

Composite Emission Factor Calculations

MOBILE5a Run: 90base/90baseno 1/5/98

I/M splits: 88% I/M and 12% Non-I/M

Vehicle Class	Roadway Type	Speed (MPH)	EF - I/M (grams/mile)	EF-No I/M (grams/mile)	Composite EF (grams/mile)
LDGV	**Urban**				
	Fwys & Expwys	55.7	2.032	2.404	2.077
	Principal art.	30.3	2.756	3.288	2.820
	Minor art.	30.3	2.756	3.288	2.820
	Collectors	25	3.117	3.756	3.194
	Local roads	20	3.593	4.378	3.687
	Rural				
	Fwys & Expwys	59.3	2.221	2.691	2.277
	Principal art.	30.3	2.435	2.877	2.488
	Minor art.	30.3	2.435	2.877	2.488
	Collectors	30	2.774	3.310	2.838
	Local roads	20	3.593	4.378	3.687
LDGT1	**Urban**				
	Fwys & Expwys	55.7	2.709	3.318	2.782
	Principal art.	30.3	3.438	4.249	3.535
	Minor art.	30.3	3.438	4.249	3.535
	Collectors	25	3.846	4.806	3.961
	Local roads	20	4.380	5.531	4.518
	Rural				
	Fwys & Expwys	59.3	3.000	3.773	3.093
	Principal art.	30.3	3.086	3.770	3.168
	Minor art.	30.3	3.086	3.770	3.168
	Collectors	30	3.458	4.276	3.556
	Local roads	20	4.380	5.531	4.518

Vehicle Class	Roadway Type	Speed (MPH)	EF - I/M (grams/mile)	EF-No I/M (grams/mile)	Composite EF (grams/mile)
LDGT2	**Urban**				
	Fwys & Expwys	55.7	3.163	3.654	3.222
	Principal art.	30.3	4.097	4.743	4.175
	Minor art.	30.3	4.097	4.743	4.175
	Collectors	25	4.614	5.366	4.704
	Local roads	20	5.302	6.199	5.410
	Rural				
	Fwys & Expwys	59.3	3.509	4.128	3.583
	Principal art.	30.3	3.652	4.208	3.719
	Minor art.	30.3	3.652	4.208	3.719
	Collectors	30	4.123	4.773	4.201
	Local roads	20	5.302	6.199	5.410
HDGV	**Urban**				
	Fwys & Expwys	55.7	6.255	6.452	6.279
	Principal art.	30.3	8.516	8.894	8.561
	Minor art.	30.3	8.516	8.894	8.561
	Collectors	25	9.799	10.296	9.859
	Local roads	20	11.655	12.324	11.735
	Rural				
	Fwys & Expwys	59.3	6.183	6.379	6.207
	Principal art.	30.3	7.524	7.814	7.559
	Minor art.	30.3	7.524	7.814	7.559
	Collectors	30	8.575	8.959	8.621
	Local roads	20	11.655	12.324	11.735

Vehicle Class	Roadway Type	Speed (MPH)	EF - I/M (grams/mile)	EF-No I/M (grams/mile)	Composite EF (grams/mile)
LDDV	**Urban**				
	Fwys & Expwys	55.7	0.656	0.656	0.656
	Principal art.	30.3	1.015	1.015	1.015
	Minor art.	30.3	1.015	1.015	1.015
	Collectors	25	1.194	1.194	1.194
	Local roads	20	1.424	1.424	1.424
	Rural				
	Fwys & Expwys	59.3	0.646	0.646	0.646
	Principal art.	30.3	0.862	0.862	0.862
	Minor art.	30.3	0.862	0.862	0.862
	Collectors	30	1.024	1.024	1.024
	Local roads	20	1.424	1.424	1.424
LDDT	**Urban**				
	Fwys & Expwys	55.7	0.471	0.471	0.471
	Principal art.	30.3	0.728	0.728	0.728
	Minor art.	30.3	0.728	0.728	0.728
	Collectors	25	0.856	0.856	0.856
	Local roads	20	1.021	1.021	1.021
	Rural				
	Fwys & Expwys	59.3	0.463	0.463	0.463
	Principal art.	30.3	0.618	0.618	0.618
	Minor art.	30.3	0.618	0.618	0.618
	Collectors	30	0.734	0.734	0.734
	Local roads	20	1.021	1.021	1.021

Vehicle Class	Roadway Type	Speed (MPH)	EF - I/M (grams/mile)	EF-No I/M (grams/mile)	Composite EF (grams/mile)
HDDV	**Urban**				
	Fwys & Expwys	55.7	1.351	1.351	1.351
	Principal art.	30.3	2.089	2.089	2.089
	Minor art.	30.3	2.089	2.089	2.089
	Collectors	25	2.457	2.457	2.457
	Local roads	20	2.930	2.930	2.930
	Rural				
	Fwys & Expwys	59.3	1.329	1.329	1.329
	Principal art.	30.3	1.774	1.774	1.774
	Minor art.	30.3	1.774	1.774	1.774
	Collectors	30	2.106	2.106	2.106
	Local roads	20	2.930	2.930	2.930
MC	**Urban**				
	Fwys & Expwys	55.7	8.715	8.715	8.715
	Principal art.	30.3	9.270	9.270	9.270
	Minor art.	30.3	9.270	9.270	9.270
	Collectors	25	9.676	9.676	9.676
	Local roads	20	10.189	10.189	10.189
	Rural				
	Fwys & Expwys	59.3	9.227	9.227	9.227
	Principal art.	30.3	8.908	8.908	8.908
	Minor art.	30.3	8.908	8.908	8.908
	Collectors	30	9.290	9.290	9.290
	Local roads	20	10.189	10.189	10.189