

Emission Inventory Report**AIR QUALITY MODELING ANALYSIS FOR THE
DENVER EARLY ACTION OZONE COMPACT:
Development of the 2002 Base Case Modeling Inventory**

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1. INTRODUCTION

ENVIRON International Corporation and Alpine Geophysics, LLC are performing photochemical modeling for the Denver Regional Air Quality Council (RAQC) and Colorado Department of Public Health and Environment (CDPHE) to support the development of a 8-hour ozone attainment control plan for Denver, Colorado as part of an Early Action Compact (EAC) State Implementation Plan (SIP) due in 2004. The June 5, 2002 to July 23, 2002 modeling period was selected along with a 36/12/4/1.33 km nested-grid modeling domain that includes Mexico in the south to Wyoming in the north and California in the west to western Missouri to the east. A Modeling Protocol has been prepared that describes the rationale for the episode selection, model and domain selection and procedures for performing the photochemical modeling and 8-hour ozone attainment demonstration (Tesche et al., 2003a). The same ENVIRON/Alpine science team is also performing 8-hour ozone EAC modeling for the San Juan County, New Mexico area for the New Mexico Environmental Department (Tesche et al., 2003b).

The June 5 - July 23, 2002 episode is being modeled in CAMx using a Lambert Conformal Projection (LCP) nested grid configuration with grid resolutions of 36, 12, 4 and 1.33 km. In CAMx, emissions are separated between surface (surface and low level point) emissions and elevated point source emissions. For the surface emissions, a separate emission inventory is required for each grid nest, i.e., four inventories. For elevated point sources, a single emission inventory is prepared covering all grid nests. Figure 1-1 displays the modeling domain including the nested grid configuration. Emission inventories were prepared for the 2002 base year.

This report describes the emission inventory preparation for the June 5 - July 23, 2002 modeling episode for the Denver Colorado EAC air quality modeling. Emission inventories are processed using version 2x of the Emissions Processing System (EPS2x) for area, off-road, on-road mobile and point sources (ENVIRON, 2001). The purpose of the emissions processing is to format the emission inventory for CAMx photochemical modeling. Data sources and processing steps required to develop the emission inventory are documented in the following sections.

A discussion of the emission processing required to develop the model-ready emission inventory is presented in Section 2. Section 3 presents the data sources and processing steps for the development of the 2002 Base Year inventory. Section 4 summarizes the inventory by major emission source category: area, on-road mobile, off-road mobile stationary point sources and biogenics.

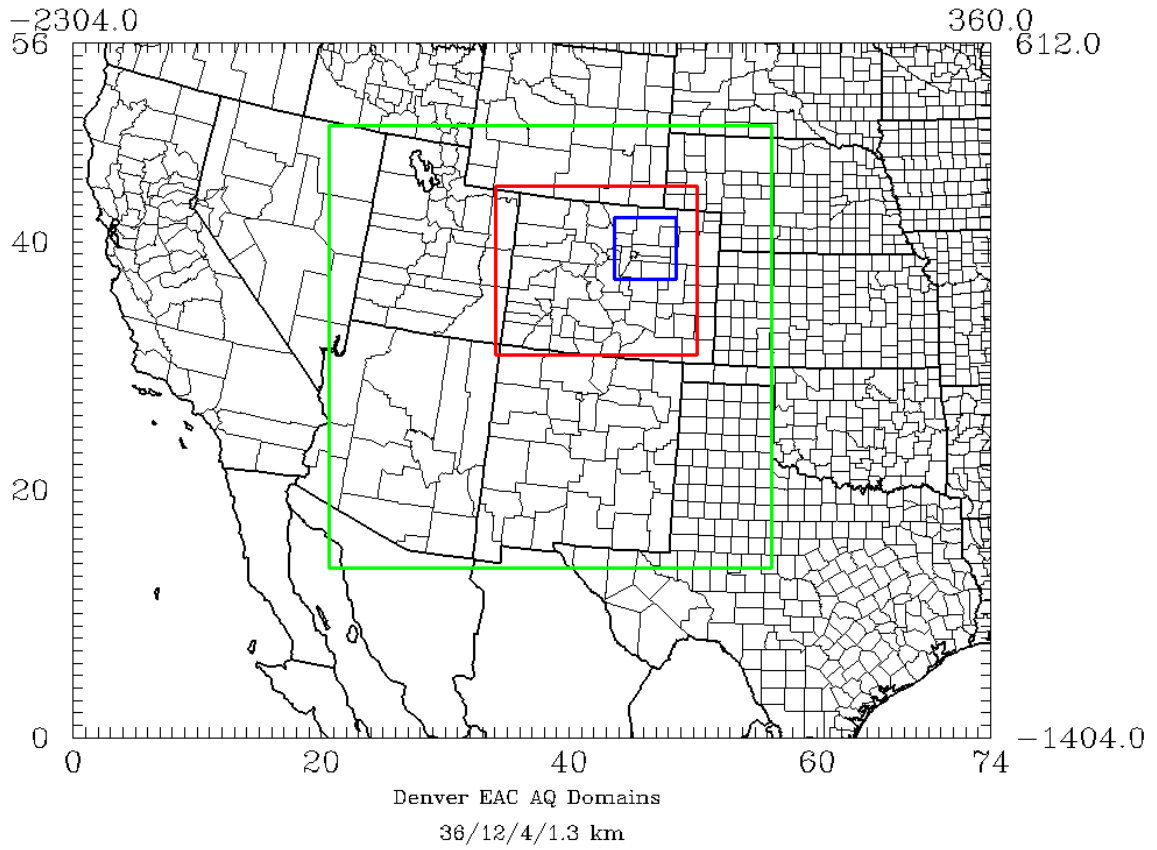


Figure 1-1. Denver EAC air quality modeling domains.

2. EMISSION INVENTORY PROCESSING

CAMx requires two types of emission input files:

1. Surface emissions from area, mobile, off-road, low-level point and biogenic sources are gridded to the CAMx nested grid system. This means that separate surface emissions files will be prepared for the 36 km, 12 km and 4 km grids. The surface emissions are injected into the lowest layer of the model.
2. Elevated emissions from major point sources are injected into CAMx at the coordinates of each source. The plume rise for each source is calculated by CAMx from stack parameters so that the emissions are injected into the appropriate vertical layer. Emissions from selected major NO_x emitters may be treated with the CAMx Plume-in-Grid (PiG) module.

The June 5 - July 23, 2002 episode is being modeled in CAMx using a Lambert Conformal Projection (LCP) nested grid configuration with grid resolutions of 36, 12, 4 and 1.33 km. In CAMx, emissions are separated between surface (surface and low level point) emissions and elevated point source emissions. For the surface emissions, a separate emission inventory is required for each grid nest, i.e., four inventories. For elevated point sources, a single emission inventory is prepared covering all grid nests.

Emissions for different major source groups (e.g., on-road mobile, off-road mobile, area, point and biogenic) are processed separately and merged together prior to CAMx modeling. This simplifies the processing and assists quality assurance (QA) and reporting tasks. The biogenic inventories were generated with both GloBEIS version 3.1, which includes various enhancements to estimate the effects of drought conditions on biogenic emissions.

Emissions Modeling

The emission files were prepared using version 2x of the Emissions Processing System (EPS2x). The emissions model performs several tasks:

Temporal adjustments: Adjust emission rates for seasonal, day-of-week and hour-of-day effects.

Chemical speciation: Emission estimates for total VOC are converted to the more detailed chemical speciation used by the Carbon Bond 4 (CB4) chemical mechanism in CAMx. Total unspciated NO_x emissions are allocated to NO and NO₂ components.

Gridding: The spatial resolution of the emissions must be matched to the CAMx grid(s). Area sources are often estimated at the county level, and are allocated to the grid cells within each county based on spatial surrogates (e.g., population and economic activity). Mobile source emissions may be link specific (from transportation models) so links must be allocated to grid cells.

Growth and Controls: Emissions estimated for one year may need to be adjusted for use in a different year. For the base case modeling, a large portion of the emission inventory data is based on EPA's NEI99 and so the growth, or projection, modules of EPS2x will be utilized.

Quality Assurance: The emissions model includes powerful QA and reporting features to keep track of the adjustments at each processing stage and ensure that data integrity is not compromised.

The outputs from the emissions model are called the "model-ready" emissions, and are day-specific, gridded, speciated and temporally (hourly) allocated. EPS2x performs all of the processing steps for the anthropogenic emissions. The biogenic emissions are prepared using a different model (GloBEIS) because they are based on different input data and have specialized processing requirements (e.g., dependence on temperature, solar radiation and drought conditions).

Emissions for different major source groups (e.g., mobile, off-road mobile, area, point and biogenic) are processed separately and merged together prior to CAMx modeling. This simplifies the processing and assists quality assurance (QA) and reporting tasks. The biogenic inventories were generated with both GloBEIS version 2.2 and GloBEIS version 3.1, which includes various enhancements to estimate the effects of drought conditions on biogenic emissions.

Chemical Speciation

Emission estimates for total VOC must be converted to the more detailed chemical speciation used by the Carbon Bond 4 (CB4) chemical mechanism in CAMx. Total unspciated NOx emissions are allocated to NO and NO₂ components.

The overall accuracy of the emission inventory is affected by the speciation of criteria pollutants, especially VOC emissions. The VOC speciation of the emission inventory should match what is present in the ambient VOC data. Uncertainties in the emission inventory, including chemical speciation, affects the accuracy of the resulting modeling inventory and, in turn, the results of the airquality model simulation. The emission inventory data used by ENVIRON and the CDPHE for this project have been developed following accepted EPA protocols.

The EPS2 emission model includes default speciation profiles by SIC/SCC codes. These profiles are based on EPA default data as well as of various updates and improvements incorporated to account for such things as variations in fuels, solvent composition, and chemical mechanisms used in the air quality models.

Except for oil and gas emission sources in Northwest New Mexico, discussed in Section 3, the default EPS2 speciation cross reference and profiles were used to develop the inventory. Listings of speciation profiles and cross reference data are too voluminous to include in this report as there are literally hundreds of possible profile codes and assignments. An electronic archive of the data used for speciation of the inventory can be made available if desired.

Spatial Allocation

The spatial resolution of the emissions must be matched to the CAMx grid(s) for air quality modeling. Area and off-road mobile sources are estimated at the county level, and are allocated to the grid cells within each county based on spatial surrogates (e.g., population and economic activity). Link specific mobile source emissions (from transportation models) also must be allocated to grid cells. Biogenic emissions are gridded for the modeling domain using the GloBEIS model.

Spatial allocation of regional or county-level emission estimates is accomplished through the use of spatial surrogates or spatial allocation factors (SAFs) for each emission source category or group of source categories. Spatial surrogates are typically based on the proportion of a known region-wide characteristic variable that exists within the region of interest. Traditionally the development of spatial gridding surrogates for dispersion modeling applications has been performed by a variety of methods depending on the emission source category being considered, the required spatial resolution, the geographic extent of the domain, and the particular characteristics of the geospatial data available. The same spatial allocation methodologies can also be applied to general arbitrary regions. Spatial surrogates must define the percentage of regional or county level emissions from a particular source category that is to be allocated to some spatial region, typically a modeling grid cell. For most area and off-road sources, these percentages are based on areas of a particular land use/land cover type while for on-road mobile source categories, the percentages are usually based on total length of a certain road type or a transportation network. Often human population is also used as a spatial surrogate for certain emission source categories.

The processing and development of gridding surrogates is usually performed using GIS. To develop spatial surrogates, or SAFs, the appropriate surrogate databases (i.e., land use, population, roadways, railways, etc), the user-specified region, and the regional/county boundaries are first imported into the GIS as geospatial coverages. Through intersecting, or overlaying, these coverages, the appropriate areal and/or linear percentages can be calculated as follows. The spatial data are first intersected with the regional boundaries to generate a new coverage that contains polygons, or arcs, with attributes associated with the spatial data and the regional boundaries. The total area, or length, of a particular land use, or roadway type, within each region or county can then be calculated. The resulting coverage is then overlaid with the arbitrary user-defined region to associate the spatial attributes of the region with the land use and regional/county boundary attributes. These procedures result in the generation of new polygons, each of which has all of these attributes as well as the corresponding areas, or lengths. The spatial allocation factors are then generated by forming ratios of the total area, or length, in each region and county to the corresponding total area, or length of the particular spatial data type within each county. The resulting SAFs are then multiplied by the county-level emission estimates to obtain the emission estimate for the general user-defined region.

Spatial surrogates can be developed from several sources of spatial data describing the Land Use/Land Cover (LULC), transportation networks and population characteristics. Land use data can be obtained from the USGS EROS Data Center web site (<http://edcftp.cr.usgs.gov/pub/data/landcover/states>) and are a subset of the National Land Cover Dataset (NLCD). This dataset provides dominant land use data for each state at a spatial resolution of 30 meters. This dataset includes 21 LULC categories based on a Modified

Anderson Level 2 categorization scheme. More detailed descriptions of the NLCD land use types are available from the USGS web site.

The EPA has developed spatial surrogates for emission inventory development (ftp://ftp.epa.gov/EmisInventory/emiss_shp/). These data are based on USGS LULC data and the 1990 US Census. The EPA is currently developing spatial surrogates for emission inventory development, including source category-surrogate cross-reference data. These data are based on the NLCD LULC data and 2000 US Census population and transportation network data. The data are being developed for entire conterminous US at a spatial resolution of 4-km. The data were scheduled for release to the public in late spring 2003, but the project has not been completed and only the GIS cover data are available at this time.

Spatial surrogate data for LULC, population and housing statistics, and roadway distributions were derived from EPA datasets. The GIS-based spatial surrogate database developed by the EPA from USGS LULC data and 1990 Census was gridded at a spatial resolution of 4km for the RPO LCP modeling domain by Alpine Geophysics and used as the basis for the gridding surrogates. The recently developed EPA surrogate database using 2000 US Census and TIGER Line data were incorporated into the gridding surrogates used for this project. The spatial surrogates for population, housing and roadways were updated with the more recent EPA database developed from the 2000 Census data. Time and resource constraints precluded the development of LULC-based surrogates using the 2000 EPA database.

Surrogates used in the development of the gridded emission inventory are presented in Table 2-1. Appendix A presents the source category/surrogate assignments used for development of the gridded inventory. Table A-1 presents the SCC/Surrogate assignments used for area sources. Off-road mobile source surrogate assignments are presented in Table A-2, while on-road mobile source surrogate assignments are presented in Table A-3.

Table 2-1. Spatial surrogates codes and definitions used for emission inventory development.

Surrogate Code	Surrogate Definition
1	Population
2	Housing
3	Area
4	Water bodies
5	Agricultural land
6	Airports
7	Shipping ports
8	Railroads
9	Urban land
10	Rural land
11	Forest land
12	Urban primary roads
13	Rural primary roads
14	Urban secondary roads
15	Rural secondary roads

3. INVENTORY DEVELOPMENT AND DATA SOURCES FOR 2002

The CDPHE provided emission inventory data for 2002 for the entire State of Colorado. For the remaining states within the modeling domain, the EPA's 1999 National Emission Inventory (NEI99) was used. These 1999 emission estimates were projected to the 2002 base year using the EPS2x growth and projection modules with growth factors developed with the EGAS model. The New Mexico Oil and Gas Association (NMOGA) provided emission estimates for un-permitted oil and gas production wells in the northeast corner of the state. Emission data for Mexico were based on a draft inventory as used in the BRAVO modeling study (ENVIRON, 2003)

Emissions data was provided by Alpine Geophysics and differs from the EPA's version 2 of the NEI99 in that several improvements were incorporated based on the draft version 3 NEI database. These improvements were primarily associated with the residential fossil-fuel combustion source category, the inclusion of updated data for Midwest states developed by the Lake Michigan Air Directors Consortium (LADCO), and the inclusion of point source data for some Eastern US states. The NEI99 version 2/verison 3 data is referred to hereafter simply as the NEI99. The data were obtained as ASCII files in IDA format. The IDA files were reformatted to AFS/AMS file format for processing with EPS2x.

A summary of data sources for the development of the modeling emissions inventory is provided in Table 3-1.

Table 3-1. Summary of emissions data sources.

Category	Region	Data Source
Mobile	Denver Metro	CDPHE link-based, MOBILE6
	Other Colorado	CDPHE
	Outside Colorado	EPA NEI99 Version 2, MOBILE6
Offroad	Colorado	CDPHE emissions data
	Outside Colorado	EPA NEI99 Version 2
Area	Colorado	CDPHE emissions data
	Outside Colorado	EPA NEI99 Version 2
Oil & Gas	Colorado	Included in Point Source inventory
	New Mexico	NMOGA Un-permitted data base
	Outside CO and NM	EPA NEI99 Version 2
Point	Colorado	CDPHE emissions data
	Outside Colorado	EPA NEI99 Version 2
Biogenic	Entire Domain	GloBEIS3 with BELD3 LULC data and drought adjustment

Point Sources

Point source data were obtained from different sources, processed separately and merged prior to modeling. The data include:

- Colorado point sources
- Other State point sources
- Mexico point sources

The point source data are processed for a typical peak ozone (PO) season weekday and weekend day. Continuous Emissions Monitoring (CEM) data was provided by the CDPHE, which are hourly episode day specific data, for major NO_x sources. However, due to the scheduling and resource constraints these data were included in the 2002 base year emissions inventory. The 2002 Colorado point source data were provided EPS2x AFS input format.

For all states other than Colorado, data for criteria pollutants from the NEI99 is used. Point source emissions for Mexico were obtained in as ASCII IDA formatted files and re-formatted for processing with EPS2x.

The criteria for selecting NO_x point sources for plume in grid treatment within the 4 and 1.33-km modeling domains is 2 tons NO_x on any episode day. For the regional emissions grid, the NO_x criteria is 25 tons per day on any episode day.

On-Road Mobile Sources

On-road mobile emission sources were processed separately for the State of Colorado and all remaining states in the modeling domain and Mexico. For Colorado, link-based emissions data was provided for the Denver metropolitan area. HPMS-based VMT data provided by the CDPHE were used for the remaining counties in Colorado. All other on-road mobile emission estimates were based on the NEI99 database.

Colorado On-Road Mobile Source Emissions

The following discussion summarizes the data, assumptions, and methodology used to develop the on-road mobile source emissions inventory for the Denver area EAC photochemical modeling effort. Emissions were estimated for all counties in Colorado for the following episode days: June 25-July 1, 2002 and July 18-July 21, 2002. Two distinct approaches were applied based upon the type of activity data available to each specific county/region, each are described separately below. First, however, the data and assumptions applicable to both are presented.

Emission factors in all cases were obtained from the US EPA's MOBILE6 model. Temperature and humidity inputs were taken from MM5 modeling performed by Alpine Geophysics for the air quality modeling portion of this work. In-use control inputs for the Denver, Fort Collins, and Colorado Springs areas were provided by the CDPHE. These parameters describe the inspection and maintenance programs as well as fuel specifications such as oxygenate content and RVP. Local VMT (fleet) mixes were also provided. For counties not included in the group above, MOBILE6 modeling was done assuming the same RVP value (as the counties above) but no other controls.

Link-based activity (VMT) data for the Denver, Fort Collins, and Colorado Springs areas were provided by the CDPHE. Corresponding MOBILE6 emission factors were prepared by running the model over a range of temperatures, speeds, and humidity conditions. M6LINC, an internal ENVIRON tool, was used to estimate link-specific hourly emissions by mode (start exhaust, running exhaust, running loss, resting loss, hotsoak, and crankcase). Diurnal emissions were estimated outside of M6LINC since MOBILE6 diurnal emission factors cannot be obtained at specific temperatures. These emission factors were estimated by running MOBILE6 with daily minimum and maximum temperatures (rather than for a range of specific temperatures.) Table 3-2 summarizes the link-based NO_x, VOC and CO emissions for the Denver Metropolitan Area. The counties for which on-road mobile source emissions are based on transportation networks include: Adams, Arapahoe, Boulder, Denver, Douglas, Elbert, El Paso, Gilpin, Jefferson, Larimer, Teller and Weld.

Table 3-2. Denver Metropolitan Area link-based emission summary (tpd).

Date	NO _x	VOC	CO
6/25/02	235.38	197.70	1617.58
6/26/02	232.68	193.03	1623.81
6/27/02	236.13	201.10	1645.34
6/28/02	254.90	215.06	1727.42
6/29/02	193.83	171.44	1428.66
6/30/02	131.78	119.59	1058.97
7/01/02	219.86	198.45	1613.25
7/18/02	237.77	209.34	1682.98
7/19/02	248.78	219.22	1744.28
7/20/02	179.05	155.82	1371.46
7/21/02	135.11	115.76	1088.46

HPMS-based VMT data were provided by the CDPHE. These data encompass all counties in the state except those with link-based data. CDPHE staff stated that VMT in counties with link-based data were greater than their HPMS counterpart estimates; therefore, the link-based estimates were used without further reconciliation. Likewise, HPMS data were used for those counties without link-based data. For these latter counties, the only MOBILE6-related differences among them are their temperatures and humidity. Thus, for each episode day, minimum and maximum daily temperatures and daily average humidity were obtained for each county. These counties were then grouped into bins such that within a bin, the variations in minimum and maximum temperatures were no more than five degrees Fahrenheit. The average daily minimum and maximum temperatures and humidity were derived for each group and used in the emission factor modeling. Each of the twelve HPMS facility classes was assigned one of four MOBILE6 road types (non-ramp freeway, arterial, local, and ramp) and a national average speed. These speeds are presented in Table 3-3.

Table 3-3. Speeds used in emission factor modeling for counties with HPMS-based VMT.

Rural						Urban					
Interstate	Principal Arterial	Minor Arterial	Major Collector	Minor Collector	Local	Other Freeways & Express ways	Principal Arterial	Minor Arterial	Collector	Local	Interstate
56.23	44.32	39.32	34.32	29.66	29.66	44.35	44.35	19.67	19.67	19.67	19.67

Emissions were estimated by county, episode day, pollutant/emission mode, facility type, and vehicle class.

Regional On-Road Mobile Source Emissions

The NEI99 is the basis for the on-road mobile source regional emissions inventory for those states outside Colorado. Both county-level VMT and emission data were obtained as ASCII IDA formatted files. Due to the resource intensive processing required to estimate emissions from the VMT data for all counties outside Colorado, the county-level emissions data were used instead. These data were first projected to the 2002 base year using EPS2x with growth factor calculated using the EGAS model. The resulting county-level 2002 emissions estimate were treated as area source and processed with EPS2x. A road type distribution (urban primary, rural primary, urban secondary, rural secondary) was used to spatially allocate the on-road sources grid cells in each of the modeling domains.

Mexico on-road mobile source emissions were obtained on a state/municipality level and processed as area sources. The Mexico emission inventory data is for 1999. Due to a lack of growth factor information, no attempt was made to project these data to the 2002 base year.

Area and Off-Road Sources

The CDPHE provided 2002 emission inventories for Colorado area and off-road sources. The data were provided as EPS2x AMS formatted files. These data were processed using EPS2x and spatially allocated to grid cells using gridding surrogates based on the EPA's gridding surrogate database.

For all areas outside Colorado, the NEI99 is the basis for the area and nonroad regional emissions inventory. The NEI 1999 area and off-road emission inventory is (1) processed to extract the typical peak ozone season day data, (2) reformatted to AMS input file format and (3) processed with EPS2x.

Oil and Gas Emissions

Emissions data from oil and gas production wells within the modeling domain were obtained from the CDPHE as well as the New Mexico Oil and Gas Association (NMOGA). The CDPHE provided oil and gas emissions within the statewide inventory data files used for the project. Emission for oil and gas production on New Mexico was provided separately by NMOGA for numerous small un-permitted operations in the northeast corner of New Mexico.

In the San Juan Basin of New Mexico there are nearly 18,000 oil and gas wells in operation.

Each of these emit only a relatively small amount of emission and thus are not subject to permitting based on EPA guidelines. However, in aggregate, the large number of wells contribute a substantial amount of NO_x and VOC to the overall inventory.

Bruce Gantner of NMOGA provided NO_x and VOC emissions estimates for the three New Mexico counties within the San Juan Basin; San Juan, Sandoval, and Rio Arriba (Gantner, 2003). Flash, loading, working and standing, venting and fugitive VOC emission estimates were provided. NO_x emissions for various engine types were provided on a basin wide basis. Table 3-4 summarizes the VOC emissions from these sources. NO_x emissions for the entire basin totaled 28,234 tons per year

Table 3-4. Summary of oil and gas emissions for the San Juan Basin (tpy).

County	Loading	Flash	Working & Standing	Venting	Fugitive	Total
San Juan	193	197	3,518	16,775	2,073	22,756
Rio Arriba	167	189	2,416	13,687	1,424	17,883
Sandoval	17	22	107	103	63	312
Total	377	408	6,041	30,565	3,560	40,951

The San Juan Basin includes several oil and gas formation that span all three counties. Speciation information by formation were provided with the emissions data. Although the EPS2 model includes default speciation profiles for oil and gas operations, it was desirable to develop specific profiles for these sources since the information required to do so was provided. Table 3-5 presents the specific gas profiles for each of the four formations for which data was provided.

Table 3-5. Gas profiles by formation for the San Juan Basin

	Mesa Verde	Dakota	Pictures Cliffs	Gallup
Nitrogen	0.212	1.603	0	0.965
Carbon Dioxide	1.388	1.034	1.403	0.639
Methane	84.372	74.979	87.736	76.944
Ethane	8.221	12.163	6.373	10.823
Propane	3.19	6.488	2.651	6.552
Butanes	1.432	2.532	1,148	2.551
Pentanes	0.727	0.765	0.418	0.948
Hexanes	0.459	0.437	0.270	0.578
Benzene	0.0145	0.016	0.003	
Toluene	0.00706	0.003	0.0014	
Ethyl Benzene	0.00037	0.0001	0.0002	
Xylene	0.002	0.0006	0.001	

Speciation profiles were developed separately for each of the four formations based on the information in Table 3-5. Because the emissions data was provided by county, and not separately for each formation, an average speciation profile was used for all formations.

Estimated VOC emissions for natural gas escaping to the atmosphere (e.g., fugitive emissions at gas wells) did not include ethane because EPA has excluded ethane from the definition of VOC. However, ethane does have some potential to form ozone and this is accounted for in the CB4

and SAPRC99 chemical mechanisms used for ozone modeling. Also, ethane is generally the second largest constituent of natural gas, after methane, and so ethane may be a significant component of the ozone formation potential of natural gas. Therefore, we calculated the emissions of ethane that were associated with the reported VOC emissions for natural gas so that this ethane could be accounted for in the ozone modeling. The ethane emissions were calculated using the ethane/VOC ratio determined by chemical analysis of natural gas produced in the northern New Mexico area.

Temporal allocation of the annual emissions for oil and gas operation was assumed constant for NO_x emissions and VOC emissions except for working and standing emissions. For working and standing VOC emissions a specific monthly temporal profile was provided by NMOGA. Spatial allocation of emissions were based on the location of wells within each county for VOC emissions and on the location of wells across the entire basin for NO_x emissions.

Table 3-6 displays the resulting CB4 speciated emissions by county for the oil and gas VOC emissions, by county for the San Juan Basin based on the speciation profiles developed from the information supplied by NMOGA. Speciated ethane emissions are displayed in Table 3-7.

Table 3-6. Speciated VOC emissions from oil and gas operations in the San Juan Basin (tons/day)

County	VOC	PAR	TOL	XYL
Rio Arriba	57.4558	46.7920	0.0469	0.0161
Sandoval	0.8544	0.6958	0.0007	0.0002
San Juan	53.8748	43.8757	0.0440	0.0151
Total	112.1851	91.3635	0.0916	0.0314

Table 3-7. Speciated Ethane emissions from oil and gas operations in the San Juan Basin (tons/day)

County	Ethane	PAR
Rio Arriba	34.5743	7.3574
Sandoval	0.5558	0.1183
San Juan	44.8748	9.5494
Total	80.0051	17.0251

Biogenic Sources

Biogenic emissions were prepared using version 3.1 of the GloBEIS model (Yarwood et al., 1999 a,b). The GloBEIS model was developed by the National Center for Atmospheric Research and ENVIRON under sponsorship from the Texas Commission on Environmental Quality (TCEQ). Biogenic emissions developed using GloBEIS 2.2 have been used previously for air quality modeling in East Texas (Ref ET Report) as well as other regions throughout the US. Sensitivity simulations suggest the importance of drought effects on biogenic emissions as well as air quality modeling results. These effects have been documented by Hoats et al, 2003.

GloBEIS version 2.2 is based on the EPA BEIS2 model with the following improvements:

- Updated emission factor algorithm (called the BEIS99 algorithm).

- Compatible with the EPA's BELD3 landuse/landcover (LULC) database (EPA, 2000).
- Compatible with the TCEQ's Texas specific LULC database (Yarwood et al., 1999b) which includes local survey data for Northeast Texas developed by NETAC (ENVIRON, 1999).
- Ability to use solar radiation data for photosynthetically active radiation (PAR).

GloBEIS 3.1 requires input data for LULC, temperature, humidity, wind speed and solar radiation. Briefly, these data are:

- EPA BELD3 LULC data.
- Gridded, hourly temperature data from the MM5 meteorological model.
- Gridded, hourly humidity data from the MM5 meteorological model.
- Gridded, hourly wind speed data from the MM5 meteorological model.
- Hourly solar radiation (PAR) based on GOES satellite data as analyzed by the University of Maryland.

GloBEIS, version 3, was released in April 2002 (Guenther et al., 2002). GloBEIS3 includes new options such as effects of drought stress and prolonged periods of high temperature. GloBEIS was used to calculate day specific, gridded, speciated, hourly emissions of biogenic VOCs and NO_x for each modeling grid (36 km, 12 km, 4 km, 1.33 km). The BEIS99 emission factor algorithm was used with no correction for seasonal variation in biomass density. Biogenic emissions with drought conditions were estimated using the advanced features of GloBEIS3.

4. EMISSIONS SUMMARIES FOR 2002

All emission estimates in the following tables reflect gridded, model ready emissions. This means that for partial counties and/or states at the edge of a modeling domain, only the portion of emissions that is within the modeling domain is reported.

Tables 4-1 to 4-3 present emission summaries by major source type for all counties in Colorado.

Table 4-4 summarizes the gridded emissions by major source type for states other than Colorado.

Table 4-5 presents the gridded biogenic emissions for states other than Colorado.

Table 4-1. NOx emission summaries by major source type for Colorado counties.

County		Area			On-Road			Off-Road			Points			Biogenic		
NOx (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8001	Adams	0.350	0.339	0.372*	*	*	*	17.040	17.040	17.040	3.877	3.866	3.957	6.861	6.762	7.212
8003	Alamosa	0.045	0.043	0.048	1.302	1.299	1.276	1.174	1.174	1.174	0.063	0.063	0.063	1.598	1.675	1.589
8005	Arapahoe	0.992	0.955	1.067*	*	*	*	16.879	16.879	16.879	0.416	0.415	0.426	2.315	2.207	2.367
8007	Archuleta	0.009	0.009	0.009	0.945	0.946	0.906	0.381	0.381	0.381	0.055	0.055	0.055	0.480	0.514	0.528
8009	Baca	0.005	0.005	0.005	0.049	0.049	0.049	0.629	0.629	0.629	0.409	0.409	0.409	13.081	12.440	12.085
8011	Bent	0.004	0.004	0.004	0.443	0.443	0.446	1.864	1.864	1.864	0.248	0.248	0.628	5.831	5.624	5.517
8013	Boulder	0.426	0.411	0.456*	*	*	*	12.096	12.096	12.096	0.625	0.625	0.659	1.239	1.232	1.294
8015	Chaffee	0.016	0.016	0.017	1.179	1.179	1.185	0.295	0.295	0.295	0.030	0.030	0.030	0.342	0.369	0.383
8017	Cheyenne	0.002	0.002	0.002	0.402	0.393	0.402	1.928	1.928	1.928	5.340	5.340	5.340	5.801	5.899	5.402
8019	Clear Creek	0.014	0.014	0.015	5.323	5.320	5.248	0.343	0.343	0.343	0.154	0.154	0.154	0.087	0.091	0.094
8021	Conejos	0.008	0.008	0.008	0.569	0.561	0.555	0.986	0.986	0.986	0.000	0.000	0.000	1.520	1.597	1.485
8023	Costilla	0.004	0.004	0.004	0.467	0.467	0.462	0.385	0.385	0.385	0.000	0.000	0.000	1.884	1.991	1.923
8025	Crowley	0.003	0.003	0.003	0.229	0.211	0.229	0.423	0.423	0.423	0.172	0.172	0.172	3.397	2.885	3.250
8027	Custer	0.003	0.003	0.004	0.271	0.271	0.269	0.180	0.180	0.180	0.000	0.000	0.000	0.340	0.362	0.356
8029	Delta	0.024	0.023	0.025	1.862	1.852	1.775	0.746	0.746	0.746	0.017	0.017	0.017	2.052	2.199	2.215
8031	Denver	2.770	2.657	2.997*	*	*	*	23.643	23.643	23.643	0.646	0.641	0.617	0.359	0.329	0.349
8033	Dolores	0.003	0.003	0.003	0.247	0.247	0.246	0.512	0.512	0.512	0.387	0.387	0.387	0.903	0.991	1.008
8035	Douglas	0.030	0.030	0.032*	*	*	*	10.476	10.476	10.476	0.048	0.048	0.064	0.469	0.451	0.478
8037	Eagle	0.278	0.266	0.302	6.476	6.484	6.445	4.238	4.238	4.238	0.047	0.044	0.052	0.673	0.724	0.720
8039	Elbert	0.007	0.007	0.007*	*	*	*	1.510	1.510	1.510	0.069	0.069	0.083	1.607	1.558	1.613
8041	El Paso	0.603	0.581	0.646*	*	*	*	15.186	15.186	15.186	0.701	0.684	0.879	2.823	2.698	2.543
8043	Fremont	0.031	0.030	0.032	3.105	3.092	2.955	0.808	0.808	0.808	0.146	0.146	0.240	1.696	1.730	1.774
8045	Garfield	0.043	0.041	0.046	5.593	5.579	5.362	3.576	3.576	3.576	2.998	2.998	3.041	1.329	1.428	1.427
8047	Gilpin	0.004	0.004	0.005*	*	*	*	1.466	1.466	1.466	0.000	0.000	0.000	0.084	0.087	0.092
8049	Grand	0.056	0.053	0.060	1.632	1.612	1.607	3.133	3.133	3.133	0.130	0.130	0.130	0.480	0.515	0.515
8051	Gunnison	0.072	0.069	0.078	1.408	1.417	1.405	0.832	0.832	0.832	0.027	0.027	0.027	1.730	1.841	1.907
8053	Hinsdale	0.001	0.001	0.001	0.094	0.092	0.092	0.034	0.034	0.034	0.000	0.000	0.000	0.194	0.206	0.213
8055	Huerfano	0.007	0.007	0.007	1.603	1.595	1.541	2.168	2.168	2.168	0.010	0.010	0.010	2.319	2.248	2.065
8057	Jackson	0.005	0.005	0.005	0.283	0.282	0.281	0.915	0.915	0.915	0.000	0.000	0.000	0.827	0.877	0.891

County	Area			On-Road			Off-Road			Points			Biogenic			
NOx (tons/day)	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	
8059	Jefferson	0.532	0.515	0.568*	*	*	12.119	12.119	12.119	0.817	0.796	0.818	0.834	0.841	0.911	
8061	Kiowa	0.002	0.002	0.002	0.386	0.376	0.382	2.082	2.082	2.082	0.349	0.349	0.349	9.823	9.915	9.702
8063	Kit Carson	0.010	0.010	0.010	3.112	3.113	3.116	4.617	4.617	4.617	0.015	0.015	0.036	13.825	14.980	12.441
8065	Lake	0.010	0.010	0.011	0.762	0.755	0.749	0.194	0.194	0.194	0.033	0.033	0.033	0.086	0.093	0.095
8067	La Plata	0.083	0.080	0.090	4.203	4.243	4.143	1.957	1.957	1.957	5.648	5.624	5.652	1.515	1.641	1.676
8069	Larimer	0.218	0.211	0.232*	*	*	7.459	7.459	7.459	0.683	0.640	0.747	3.707	3.616	3.843	
8071	Las Animas	0.017	0.017	0.018	1.979	1.980	1.988	2.707	2.707	2.707	1.688	1.688	1.729	9.053	8.503	8.228
8073	Lincoln	0.008	0.008	0.008	1.283	1.303	1.281	2.874	2.874	2.874	0.082	0.082	0.085	6.957	6.846	6.941
8075	Logan	0.043	0.041	0.045	2.272	2.207	2.231	5.392	5.392	5.392	0.416	0.412	0.416	10.306	10.589	9.911
8077	Mesa	0.143	0.138	0.153	7.934	7.422	7.491	4.645	4.645	4.645	1.539	1.513	1.563	6.014	6.491	6.497
8079	Mineral	0.002	0.002	0.002	0.341	0.335	0.334	0.038	0.038	0.038	0.000	0.000	0.000	0.231	0.247	0.256
8081	Moffat	0.027	0.026	0.028	1.643	1.574	1.570	1.180	1.180	1.180	1.246	1.245	1.247	11.095	12.003	11.056
8083	Montezuma	0.033	0.032	0.035	2.917	2.912	2.780	1.191	1.191	1.191	0.689	0.689	0.689	3.285	3.570	3.605
8085	Montrose	0.031	0.030	0.033	2.990	2.899	2.870	1.001	1.001	1.001	0.128	0.128	0.133	3.384	3.655	3.678
8087	Morgan	0.040	0.039	0.043	2.788	2.711	2.735	6.792	6.792	6.792	0.427	0.427	0.454	9.913	9.977	9.787
8089	Otero	0.022	0.022	0.023	1.540	1.565	1.525	2.129	2.129	2.129	0.251	0.251	0.260	5.998	5.394	5.697
8091	Ouray	0.004	0.004	0.005	0.573	0.571	0.568	0.144	0.144	0.144	0.000	0.000	0.000	0.128	0.140	0.143
8093	Park	0.018	0.017	0.019	1.160	1.155	1.142	0.349	0.349	0.349	0.000	0.000	0.000	2.064	2.147	2.228
8095	Phillips	0.006	0.006	0.006	0.295	0.294	0.270	2.564	2.564	2.564	0.000	0.000	0.000	13.206	13.438	9.920
8097	Pitkin	0.223	0.214	0.243	1.684	1.690	1.662	1.922	1.922	1.922	0.000	0.000	0.000	0.225	0.244	0.247
8099	Prowers	0.016	0.016	0.017	1.150	1.149	1.160	2.911	2.911	2.911	0.282	0.166	0.286	7.932	7.939	8.046
8101	Pueblo	0.142	0.137	0.151	9.121	9.077	8.890	5.298	5.298	5.298	1.588	1.516	1.354	8.904	8.173	7.595
8103	Rio Blanco	0.014	0.013	0.014	0.512	0.513	0.490	0.755	0.755	0.755	5.741	5.741	5.741	4.688	5.060	4.693
8105	Rio Grande	0.017	0.016	0.018	0.835	0.839	0.832	1.233	1.233	1.233	0.015	0.015	0.027	1.543	1.666	1.720
8107	Routt	0.212	0.203	0.230	1.773	1.792	1.781	1.905	1.905	1.905	0.036	0.036	0.036	0.973	1.028	1.029
8109	Saguache	0.013	0.013	0.014	0.693	0.692	0.687	1.168	1.168	1.168	0.000	0.000	0.000	3.669	3.927	3.998
8111	San Juan	0.000	0.000	0.000	0.450	0.438	0.435	0.004	0.004	0.004	0.000	0.000	0.000	0.078	0.084	0.088
8113	San Miguel	0.006	0.006	0.007	0.696	0.695	0.665	0.349	0.349	0.349	0.435	0.435	0.437	1.610	1.750	1.768
8115	Sedgwick	0.007	0.007	0.007	0.330	0.330	0.338	1.638	1.638	1.638	0.000	0.000	0.000	4.861	4.780	3.671
8117	Summit	0.143	0.137	0.155	3.634	3.586	3.570	1.513	1.513	1.513	0.000	0.000	0.000	0.148	0.161	0.160

County		Area			On-Road			Off-Road			Points			Biogenic		
NOx (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8119	Teller	0.009	0.008	0.009	*	*	*	0.370	0.370	0.370	0.037	0.037	0.037	0.331	0.330	0.352
8121	Washington	0.005	0.005	0.005	1.043	1.036	1.021	5.840	5.840	5.840	0.000	0.000	0.000	11.136	11.442	10.407
8123	Weld	0.154	0.149	0.163	*	*	*	15.869	15.869	15.869	9.130	9.130	9.197	0.000	0.000	0.000
8125	Yuma	0.016	0.015	0.017	0.672	0.654	0.604	5.820	5.820	5.820	0.969	0.969	0.969	0.000	0.000	0.000

* On-road mobile sources for these counties are included in the link-based summaries of Table 3-2

Table 4-2. VOC emission summaries by major source type for Colorado counties.

County		Area			On-Road			Off-Road			Points			Biogenic		
VOC (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8001	Adams	14.640	14.639	14.640	*	*	*	7.140	7.140	7.140	13.033	12.300	16.373	8.982	8.119	9.392
8003	Alamosa	1.124	1.124	1.124	1.079	1.078	1.076	0.397	0.397	0.397	0.159	0.129	0.159	36.707	39.477	37.796
8005	Arapahoe	16.490	16.489	16.492	*	*	*	16.511	16.511	16.511	5.422	5.218	6.866	15.122	13.363	15.342
8007	Archuleta	0.300	0.300	0.300	0.708	0.735	0.737	0.428	0.428	0.428	0.039	0.039	0.039	221.021	244.401	260.685
8009	Baca	1.672	1.672	1.672	0.051	0.051	0.050	0.136	0.136	0.136	1.268	1.268	1.268	19.797	18.351	17.965
8011	Bent	0.572	0.572	0.572	0.408	0.403	0.409	1.306	1.306	1.306	0.052	0.052	0.066	17.474	16.880	16.678
8013	Boulder	9.915	9.914	9.916	*	*	*	9.229	9.229	9.229	4.562	4.528	5.741	76.189	75.380	84.476
8015	Chaffee	0.711	0.711	0.711	0.852	0.844	0.848	1.067	1.067	1.067	0.207	0.207	0.231	89.339	98.725	106.925
8017	Cheyenne	0.542	0.542	0.542	0.336	0.351	0.318	0.289	0.289	0.289	6.351	6.351	6.351	10.666	10.820	9.973
8019	Clear Creek	0.390	0.390	0.390	3.444	3.412	3.451	0.136	0.136	0.136	0.153	0.153	0.153	32.334	34.223	36.215
8021	Conejos	0.631	0.631	0.631	0.412	0.410	0.407	0.188	0.188	0.188	0.000	0.000	0.000	96.945	108.626	107.557
8023	Costilla	0.389	0.389	0.389	0.341	0.336	0.335	0.154	0.154	0.154	0.017	0.017	0.017	94.069	103.318	98.206
8025	Crowley	0.301	0.301	0.301	0.213	0.186	0.216	0.546	0.546	0.546	0.002	0.002	0.002	12.071	8.545	11.732
8027	Custer	0.118	0.118	0.118	0.198	0.201	0.200	0.229	0.229	0.229	0.004	0.004	0.004	110.341	119.644	119.858
8029	Delta	1.495	1.495	1.495	1.459	1.477	1.462	0.446	0.446	0.446	0.216	0.206	0.216	142.344	153.991	158.474
8031	Denver	21.027	21.024	21.033	*	*	*	14.301	14.301	14.301	5.574	4.972	9.706	12.027	10.221	12.041
8033	Dolores	0.231	0.231	0.231	0.179	0.179	0.180	0.124	0.124	0.124	0.496	0.496	0.496	108.745	121.467	129.147
8035	Douglas	2.133	2.133	2.133	*	*	*	8.767	8.767	8.767	1.684	1.643	1.834	122.366	116.601	137.366
8037	Eagle	0.954	0.953	0.955	4.306	4.277	4.273	1.531	1.531	1.531	0.461	0.449	0.461	200.029	219.080	225.258
8039	Elbert	1.082	1.082	1.082	*	*	*	0.667	0.667	0.667	0.169	0.169	0.187	43.016	40.476	45.124

County		Area			On-Road			Off-Road			Points			Biogenic		
VOC (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8041	El Paso	20.887	20.887	20.888	*	*	*	11.459	11.459	11.459	6.579	6.118	7.771	95.513	95.789	103.705
8043	Fremont	1.755	1.755	1.755	2.554	2.584	2.659	0.572	0.572	0.572	0.498	0.498	0.604	146.471	155.377	172.675
8045	Garfield	1.606	1.606	1.606	4.093	4.118	4.091	1.791	1.791	1.791	10.277	10.212	10.363	373.984	408.243	423.662
8047	Gilpin	0.145	0.145	0.145	*	*	*	0.163	0.163	0.163	0.022	0.022	0.022	23.506	23.664	26.991
8049	Grand	0.515	0.515	0.515	1.167	1.160	1.166	1.624	1.624	1.624	0.145	0.145	0.145	206.675	225.730	230.944
8051	Gunnison	0.545	0.545	0.545	1.043	1.057	1.062	1.622	1.622	1.622	0.142	0.142	0.305	371.872	416.052	443.035
8053	Hinsdale	0.031	0.031	0.031	0.066	0.066	0.066	0.180	0.180	0.180	0.000	0.000	0.000	110.522	121.038	130.739
8055	Huerfano	0.362	0.362	0.362	1.099	1.106	1.085	0.400	0.400	0.400	0.085	0.077	0.085	118.935	124.074	119.939
8057	Jackson	0.121	0.121	0.121	0.210	0.213	0.213	0.379	0.379	0.379	0.124	0.124	0.174	175.561	187.306	195.583
8059	Jefferson	17.750	17.750	17.751	*	*	*	13.630	13.630	13.630	7.023	6.875	7.850	114.900	112.251	130.803
8061	Kiowa	0.750	0.750	0.750	0.341	0.340	0.319	0.924	0.924	0.924	0.047	0.047	0.047	10.486	10.634	10.344
8063	Kit Carson	2.550	2.550	2.550	2.487	2.486	2.373	0.835	0.835	0.835	0.198	0.118	0.205	11.434	12.607	9.744
8065	Lake	0.341	0.341	0.341	0.571	0.559	0.559	0.658	0.658	0.658	0.063	0.063	0.090	33.549	37.467	39.129
8067	La Plata	1.946	1.946	1.946	3.445	3.472	3.552	2.180	2.180	2.180	1.552	1.552	1.580	165.241	183.832	195.420
8069	Larimer	10.477	10.477	10.477	*	*	*	9.425	9.425	9.425	3.921	3.863	4.395	252.451	246.145	268.008
8071	Las Animas	0.915	0.915	0.915	1.545	1.542	1.462	0.400	0.400	0.400	0.523	0.523	0.533	202.273	201.016	173.769
8073	Lincoln	1.691	1.691	1.691	0.937	0.886	0.930	0.477	0.477	0.477	0.227	0.227	0.269	20.181	19.453	20.452
8075	Logan	2.851	2.851	2.851	1.958	1.941	1.970	1.064	1.064	1.064	0.603	0.596	0.620	21.809	21.998	20.634
8077	Mesa	5.130	5.129	5.130	6.774	6.969	7.096	3.386	3.386	3.386	2.738	2.687	3.167	341.438	367.719	382.891
8079	Mineral	0.031	0.031	0.031	0.240	0.239	0.237	0.404	0.404	0.404	0.000	0.000	0.000	98.525	109.369	117.426
8081	Moffat	0.803	0.803	0.803	1.416	1.476	1.466	0.323	0.323	0.323	3.525	3.525	3.552	159.796	168.109	165.470
8083	Montezuma	1.255	1.255	1.255	2.438	2.454	2.531	1.061	1.061	1.061	0.791	0.778	0.809	134.214	147.713	157.849
8085	Montrose	1.799	1.799	1.799	2.558	2.541	2.542	0.564	0.564	0.564	0.346	0.332	0.402	289.225	311.352	323.207
8087	Morgan	2.744	2.744	2.744	2.382	2.370	2.413	1.197	1.197	1.197	1.532	1.461	1.533	18.974	19.097	18.227
8089	Otero	1.532	1.532	1.532	1.488	1.414	1.559	0.655	0.655	0.655	0.476	0.460	0.509	18.252	14.900	17.658
8091	Ouray	0.126	0.126	0.126	0.411	0.411	0.410	0.275	0.275	0.275	0.000	0.000	0.000	69.379	76.379	80.612
8093	Park	0.444	0.444	0.444	0.842	0.840	0.838	1.148	1.148	1.148	0.065	0.065	0.065	166.033	175.844	194.067
8095	Phillips	1.236	1.236	1.236	0.274	0.271	0.233	0.410	0.410	0.410	0.068	0.061	0.068	14.223	12.415	7.955
8097	Pitkin	0.568	0.567	0.568	1.300	1.303	1.299	1.451	1.451	1.451	0.111	0.111	0.111	114.494	127.101	132.523
8099	Prowers	2.017	2.017	2.017	1.098	1.085	1.104	0.633	0.633	0.633	0.473	0.213	0.681	11.634	11.711	11.992

County		Area			On-Road			Off-Road			Points			Biogenic		
VOC (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8101	Pueblo	6.974	6.974	6.975	7.947	7.693	8.032	2.600	2.600	2.600	1.776	1.750	2.301	48.830	45.527	43.708
8103	Rio Blanco	0.393	0.393	0.393	0.406	0.406	0.422	0.248	0.248	0.248	6.654	6.654	6.664	307.609	322.536	328.761
8105	Rio Grande	1.457	1.457	1.457	0.604	0.612	0.616	0.597	0.597	0.597	0.117	0.045	0.126	71.491	79.270	85.683
8107	Routt	0.897	0.896	0.897	1.456	1.468	1.457	0.833	0.833	0.833	0.091	0.077	0.091	395.680	405.236	421.327
8109	Saguache	0.859	0.859	0.859	0.519	0.523	0.520	0.207	0.207	0.207	0.016	0.016	0.016	244.187	275.919	295.423
8111	San Juan	0.048	0.048	0.048	0.321	0.322	0.320	0.005	0.005	0.005	0.000	0.000	0.000	51.576	57.522	62.624
8113	San Miguel	0.189	0.189	0.189	0.559	0.563	0.559	0.173	0.173	0.173	0.714	0.714	0.717	118.995	130.057	135.862
8115	Sedgwick	0.770	0.770	0.770	0.257	0.256	0.230	0.274	0.274	0.274	0.020	0.020	0.020	10.732	8.662	7.200
8117	Summit	0.632	0.632	0.632	2.306	2.283	2.262	1.034	1.034	1.034	0.361	0.361	0.372	100.418	113.501	115.017
8119	Teller	0.652	0.652	0.652	*	*	*	0.892	0.892	0.892	0.167	0.167	0.167	83.007	86.407	95.762
8121	Washington	2.725	2.725	2.725	0.891	0.858	0.899	0.831	0.831	0.831	0.851	0.825	0.878	15.074	15.402	13.601
8123	Weld	13.221	13.221	13.222	*	*	*	5.173	5.173	5.173	137.694	137.328	138.520	0.000	0.000	0.000
8125	Yuma	3.983	3.983	3.983	0.590	0.584	0.512	0.954	0.954	0.954	1.167	1.088	1.167	0.000	0.000	0.000

* On-road mobile sources for these counties are included in the link-based summaries of Table 3-2

Table 4-3. CO emission summaries by major source type for Colorado counties.

County		Area			On-Road			Off-Road			Points			Biogenic		
CO (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8001	Adams	0.150	0.148	0.156	*	*	*	103.581	103.581	103.581	3.442	3.436	3.465	1.073	1.034	1.123
8003	Alamosa	0.016	0.016	0.017	12.096	12.149	12.132	4.994	4.994	4.994	0.033	0.033	0.033	6.627	7.056	6.697
8005	Arapahoe	0.298	0.290	0.313	*	*	*	274.154	274.154	274.154	0.841	0.836	0.843	1.677	1.514	1.673
8007	Archuleta	0.003	0.003	0.004	8.911	9.052	8.932	3.143	3.143	3.143	0.007	0.007	0.007	26.545	29.167	30.528
8009	Baca	0.001	0.001	0.001	0.480	0.478	0.479	2.257	2.257	2.257	0.411	0.411	0.411	2.658	2.505	2.425
8011	Bent	0.001	0.001	0.001	4.666	4.627	4.662	4.532	4.532	4.532	0.238	0.238	0.442	2.897	2.786	2.747
8013	Boulder	0.144	0.141	0.151	*	*	*	137.234	137.234	137.234	0.383	0.383	0.533	10.703	10.915	11.832
8015	Chaffee	0.007	0.007	0.008	11.756	11.372	11.672	6.181	6.181	6.181	0.172	0.172	0.172	12.739	14.183	15.006
8017	Cheyenne	0.000	0.000	0.000	4.085	4.149	3.974	4.362	4.362	4.362	3.469	3.469	3.469	1.774	1.817	1.689
8019	Clear Creek	0.005	0.005	0.005	49.004	47.313	46.795	2.040	2.040	2.040	0.187	0.187	0.187	4.649	4.962	5.171
8021	Conejos	0.003	0.003	0.003	5.673	5.337	5.209	2.149	2.149	2.149	0.000	0.000	0.000	11.663	12.917	12.624

County		Area			On-Road			Off-Road			Points			Biogenic		
CO (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8023	Costilla	0.001	0.001	0.001	4.460	4.307	4.318	1.139	1.139	1.139	0.000	0.000	0.000	12.912	13.853	13.342
8025	Crowley	0.001	0.001	0.001	2.397	2.229	2.417	1.857	1.857	1.857	0.232	0.232	0.232	1.927	1.464	1.824
8027	Custer	0.001	0.001	0.001	2.554	2.464	2.472	1.970	1.970	1.970	0.000	0.000	0.000	14.748	15.956	15.580
8029	Delta	0.011	0.010	0.011	17.253	17.311	17.372	5.251	5.251	5.251	0.002	0.002	0.002	16.351	17.995	18.115
8031	Denver	0.663	0.640	0.709	*	*	*	235.877	235.877	235.877	0.748	0.744	0.761	1.125	1.005	1.125
8033	Dolores	0.000	0.000	0.000	2.374	2.292	2.300	1.280	1.280	1.280	0.339	0.339	0.339	14.038	15.926	16.403
8035	Douglas	0.045	0.045	0.046	*	*	*	139.255	139.255	139.255	0.110	0.097	0.176	11.341	10.650	11.589
8037	Eagle	0.066	0.063	0.071	59.508	59.220	57.689	20.387	20.387	20.387	0.014	0.013	0.015	23.664	26.284	26.332
8039	Elbert	0.005	0.005	0.005	*	*	*	9.295	9.295	9.295	0.010	0.010	0.010	5.659	5.364	5.613
8041	El Paso	0.218	0.214	0.227	*	*	*	175.510	175.510	175.510	0.768	0.759	0.814	10.932	10.811	11.362
8043	Fremont	0.017	0.017	0.017	28.270	28.355	29.090	6.397	6.397	6.397	0.194	0.194	0.213	19.636	20.837	22.377
8045	Garfield	0.021	0.020	0.021	51.260	50.648	50.825	24.877	24.877	24.877	2.722	2.722	3.155	43.329	48.068	47.952
8047	Gilpin	0.002	0.002	0.002	*	*	*	1.504	1.504	1.504	0.000	0.000	0.000	3.201	3.308	3.632
8049	Grand	0.016	0.015	0.017	16.281	15.338	15.441	7.247	7.247	7.247	0.074	0.074	0.074	24.780	27.318	27.409
8051	Gunnison	0.023	0.022	0.025	13.459	13.346	13.112	6.821	6.821	6.821	0.009	0.009	0.009	43.060	47.921	49.911
8053	Hinsdale	0.000	0.000	0.000	1.003	0.956	0.915	0.918	0.918	0.918	0.000	0.000	0.000	13.133	14.230	14.980
8055	Huerfano	0.003	0.003	0.003	14.580	14.637	14.365	4.035	4.035	4.035	0.025	0.025	0.025	14.961	15.498	14.994
8057	Jackson	0.001	0.001	0.001	2.681	2.661	2.688	2.279	2.279	2.279	0.000	0.000	0.000	19.044	20.707	21.052
8059	Jefferson	0.201	0.197	0.208	*	*	*	217.133	217.133	217.133	1.081	1.026	1.081	15.400	15.470	17.413
8061	Kiowa	0.000	0.000	0.000	3.980	3.956	3.883	4.366	4.366	4.366	0.057	0.057	0.057	1.754	1.795	1.759
8063	Kit Carson	0.003	0.003	0.003	30.316	30.169	29.486	8.738	8.738	8.738	0.008	0.008	0.127	1.896	2.134	1.676
8065	Lake	0.003	0.003	0.003	8.013	7.639	7.653	2.910	2.910	2.910	0.007	0.007	0.007	4.090	4.523	4.657
8067	La Plata	0.026	0.025	0.027	38.758	38.943	39.236	19.725	19.725	19.725	1.803	1.803	1.804	24.134	26.845	27.954
8069	Larimer	0.085	0.083	0.087	*	*	*	122.005	122.005	122.005	1.101	0.518	1.108	40.340	40.143	42.693
8071	Las Animas	0.005	0.005	0.005	19.338	19.246	18.376	3.940	3.940	3.940	1.367	1.367	1.407	28.138	27.850	25.296
8073	Lincoln	0.002	0.002	0.002	12.653	12.019	12.604	4.199	4.199	4.199	0.054	0.054	0.145	3.358	3.304	3.418
8075	Logan	0.012	0.012	0.012	22.395	22.255	22.435	10.176	10.176	10.176	0.117	0.074	0.117	3.507	3.645	3.332
8077	Mesa	0.062	0.061	0.065	72.080	73.726	74.343	39.651	39.651	39.651	1.202	1.156	1.207	37.350	41.594	42.087
8079	Mineral	0.001	0.001	0.001	3.612	3.347	3.303	1.540	1.540	1.540	0.000	0.000	0.000	12.812	14.066	14.791
8081	Moffat	0.008	0.008	0.008	15.062	15.185	15.211	4.982	4.982	4.982	0.576	0.576	0.576	24.903	27.009	25.184

County		Area			On-Road			Off-Road			Points			Biogenic		
CO (tons/day)		Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
8083	Montezuma	0.011	0.011	0.012	27.056	26.687	27.372	7.755	7.755	7.755	0.418	0.418	0.418	20.603	23.035	23.906
8085	Montrose	0.017	0.017	0.017	26.949	26.448	26.432	6.319	6.319	6.319	0.159	0.159	0.176	29.201	32.402	32.780
8087	Morgan	0.012	0.012	0.013	27.490	27.319	27.536	9.985	9.985	9.985	0.460	0.460	0.468	3.284	3.324	3.137
8089	Otero	0.009	0.009	0.009	15.780	15.372	16.229	6.051	6.051	6.051	0.073	0.073	0.081	2.896	2.449	2.726
8091	Ouray	0.001	0.001	0.001	5.477	5.290	5.304	1.361	1.361	1.361	0.000	0.000	0.000	5.756	6.526	6.722
8093	Park	0.007	0.007	0.007	11.541	11.186	10.938	5.975	5.975	5.975	0.000	0.000	0.000	18.254	19.472	20.661
8095	Phillips	0.002	0.002	0.002	3.089	3.059	2.841	4.086	4.086	4.086	0.000	0.000	0.000	0.642	0.659	0.441
8097	Pitkin	0.047	0.045	0.051	16.047	16.138	15.241	20.743	20.743	20.743	0.000	0.000	0.000	12.383	13.863	14.169
8099	Prowers	0.007	0.007	0.007	11.874	11.770	11.868	5.996	5.996	5.996	0.232	0.203	0.233	2.230	2.264	2.322
8101	Pueblo	0.051	0.050	0.053	89.624	87.342	90.491	35.362	35.362	35.362	0.492	0.476	0.476	7.889	7.409	6.937
8103	Rio Blanco	0.003	0.003	0.003	4.836	4.771	4.901	5.793	5.793	5.793	3.534	3.534	3.534	40.397	43.806	42.398
8105	Rio Grande	0.006	0.006	0.006	7.977	7.917	7.784	5.231	5.231	5.231	0.004	0.004	0.071	10.698	11.848	12.553
8107	Routt	0.048	0.046	0.052	16.335	16.413	16.258	6.209	6.209	6.209	0.008	0.008	0.008	30.243	32.362	32.586
8109	Saguache	0.002	0.002	0.002	6.592	6.469	6.405	2.264	2.264	2.264	0.000	0.000	0.000	34.343	38.291	40.075
8111	San Juan	0.000	0.000	0.000	4.637	4.437	4.253	0.085	0.085	0.085	0.000	0.000	0.000	6.277	6.971	7.386
8113	San Miguel	0.002	0.002	0.002	6.567	6.481	6.501	1.662	1.662	1.662	0.141	0.141	0.194	13.763	15.504	15.857
8115	Sedgwick	0.001	0.001	0.001	3.372	3.347	3.123	2.403	2.403	2.403	0.000	0.000	0.000	0.587	0.577	0.418
8117	Summit	0.029	0.028	0.031	36.978	34.334	33.902	8.618	8.618	8.618	0.003	0.003	0.003	12.465	14.040	13.975
8119	Teller	0.007	0.007	0.007	*	*	*	5.350	5.350	5.350	0.030	0.030	0.030	10.297	10.458	11.274
8121	Washington	0.001	0.001	0.001	10.484	10.213	10.506	6.577	6.577	6.577	0.000	0.000	0.000	2.561	2.644	2.297
8123	Weld	0.067	0.066	0.069	*	*	*	63.309	63.309	63.309	4.543	4.543	4.708	0.000	0.000	0.000
8125	Yuma	0.004	0.004	0.004	6.909	6.870	6.369	9.921	9.921	9.921	0.786	0.786	0.786	0.000	0.000	0.000

* On-road mobile sources for these counties are included in the link-based summaries of Table 3-2.

Table 4-4. Summary of gridded emissions by major source type for states other than Colorado.

State	Area			On-Road			Off-Road			Points			Anthropogenic		
	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
NOx															
Arizona	184.5	176.7	199.9	312.4	80.6	416.5	175.2	149.5	199.4	1.8	1.8	1.8	673.9	408.6	817.7
Arkansa	33.0	31.6	35.7	69.7	69.7	92.9	47.7	42.8	49.7	20.3	20.3	20.3	170.6	164.4	198.6
California	332.3	324.6	347.8	1599.2	1550.1	2066.8	936.1	834.4	1001.3	62.8	62.8	62.8	2930.4	2771.8	3478.7
Idaho	31.1	29.8	33.7	40.1	75.1	100.2	100.6	95.7	103.9	0.2	0.2	0.2	172.0	200.9	238.0
Iowa	39.5	38.0	42.6	95.8	109.9	146.6	373.0	361.3	382.6	1.4	1.4	1.4	509.7	510.5	573.1
Kansas	32.9	31.7	35.3	0.0	169.5	226.1	435.2	417.4	451.7	21.1	21.1	21.1	489.2	639.7	734.1
Louisiana	71.7	68.6	78.0	169.5	40.6	54.1	24.6	21.7	26.3	7.9	7.9	7.9	273.7	138.7	166.3
Minnesota	29.2	28.2	31.3	55.1	220.3	293.7	314.6	290.9	337.2	68.0	68.0	68.0	467.0	607.4	730.2
Missouri	32.6	31.5	34.9	189.4	173.6	231.5	230.7	218.0	235.1	10.1	10.1	10.1	462.8	433.1	511.6
Montana	0.1	0.1	0.1	149.6	0.2	0.3	1.2	1.2	1.2	0.0	0.0	0.0	150.9	1.5	1.6
Nebraska	35.5	34.0	38.4	200.5	108.8	145.0	431.1	421.6	439.6	58.8	58.8	58.8	725.9	623.3	681.8
Nevada	17.5	16.9	18.8	91.9	113.5	151.3	94.0	72.6	115.1	3.6	3.6	3.6	207.0	206.6	288.8
New Mexico	75.8	72.6	82.1	113.7	154.3	205.7	123.0	114.9	130.0	4.3	4.3	4.3	316.8	346.1	422.2
Oklahoma	87.9	84.2	95.2	277.8	276.9	369.2	227.5	214.3	233.6	203.0	203.0	203.0	796.2	778.4	901.0
Oregon	2.5	2.4	2.6	4.4	26.5	35.4	21.1	18.0	21.9	3.8	3.8	3.8	31.7	50.6	63.6
South Dakota	15.3	14.7	16.5	61.7	49.9	66.5	236.4	231.7	239.3	2.2	2.2	2.2	315.5	298.4	324.5
Texas	70.9	69.2	74.4	1262.1	1282.2	1709.7	816.3	738.4	887.6	51.8	51.8	51.8	2201.1	2141.6	2723.5
Utah	51.7	49.6	55.8	164.8	133.6	178.2	147.8	111.0	181.7	37.2	37.2	37.2	401.6	331.5	452.9
Wisconsin	1.8	1.7	1.9	13.8	8.7	11.6	6.1	5.6	6.5	1.4	1.4	1.4	23.0	17.5	21.4
Wyoming	216.6	207.0	235.7	19.6	55.9	74.5	113.7	108.3	117.5	13.9	13.9	13.9	363.8	385.1	441.5
Grand Total	1362.3	1313.0	1460.8	6777.4	6776.2	6779.8	4856.0	4469.3	5161.3	573.4	573.4	573.4	11682.9	11055.8	13771.3
VOC															
Arizona	447.7	447.6	447.9	231.8	48.5	309.0	278.4	273.4	178.0	7.3	7.3	7.3	965.2	776.8	942.2
Arkansa	134.0	134.0	134.0	43.5	43.5	58.0	78.3	77.5	31.7	14.3	14.3	14.3	270.2	269.3	238.1
California	1674.3	1673.8	1675.2	1285.8	1250.2	1666.9	1349.0	1328.4	860.6	60.1	60.1	60.1	4369.1	4312.5	4262.8
Idaho	122.0	122.0	122.1	21.5	50.7	67.6	84.3	83.4	48.1	0.4	0.4	0.4	228.3	256.6	238.2
Iowa	280.8	280.8	280.9	53.7	60.0	80.1	149.7	147.6	105.4	3.0	3.0	3.0	487.2	491.5	469.4
Kansas	349.1	348.9	349.3	0.0	103.8	138.5	146.9	143.7	115.6	46.8	46.8	46.8	542.8	643.3	650.2
Louisiana	63.0	62.9	63.1	103.8	26.6	35.5	42.7	42.2	18.6	29.5	29.5	29.5	239.0	161.2	146.6

State	Area			On-Road			Off-Road			Points			Anthropogenic		
	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
NOx															
Minnesota	478.2	478.2	478.2	38.3	160.8	214.4	155.8	151.2	125.7	50.0	50.0	50.0	722.3	840.2	868.3
Missouri	261.9	261.8	261.9	137.3	114.5	152.6	254.6	252.3	111.6	12.1	12.1	12.1	665.9	640.7	538.2
Montana	0.4	0.4	0.4	99.8	0.1	0.1	0.8	0.8	0.4	0.0	0.0	0.0	101.0	1.3	0.9
Nebraska	279.7	279.7	279.8	142.5	61.9	82.5	115.4	113.7	88.8	12.9	12.9	12.9	550.5	468.2	464.0
Nevada	151.0	151.0	151.1	71.0	99.6	132.8	117.8	113.7	77.8	0.9	0.9	0.9	340.6	365.2	362.5
New Mexico	191.0	190.9	191.1	71.4	104.9	139.8	72.9	71.5	44.5	11.1	11.1	11.1	346.4	378.4	386.5
Oklahoma	357.4	357.3	357.5	194.3	195.5	260.7	239.6	237.3	112.5	48.5	48.5	48.5	839.7	838.6	779.2
Oregon	31.3	31.3	31.3	1.4	15.3	20.4	68.8	68.3	23.7	9.5	9.5	9.5	110.9	124.4	84.9
South Dakota	122.5	122.5	122.5	22.8	26.1	34.8	94.0	93.3	60.4	0.0	0.0	0.0	239.4	241.9	217.8
Texas	1505.5	1505.5	1505.6	844.7	844.7	1126.2	825.8	811.2	528.2	147.9	147.9	147.9	3323.9	3309.2	3307.9
Utah	248.2	248.1	248.2	119.4	103.1	137.4	167.4	160.5	95.3	8.6	8.6	8.6	543.5	520.3	489.5
Wisconsin	19.4	19.4	19.4	10.3	4.8	6.4	4.5	4.5	3.1	0.1	0.1	0.1	34.3	28.8	29.1
Wyoming	60.1	60.0	60.4	11.3	33.1	44.1	61.9	61.0	31.1	21.5	21.5	21.5	154.8	175.5	157.0
Grand Total	6777.4	6776.2	6779.8	2319.5	2309.6	2339.3	4308.7	4235.5	2661.1	484.4	484.4	484.4	15075.0	14843.9	14633.4
CO															
Arizona	295.1	294.0	297.3	2408.6	549.8	3211.4	1931.9	1883.4	2153.7	0.7	0.7	0.7	4636.3	2728.0	5663.2
Arkansa	43.5	43.3	43.9	467.3	467.3	623.1	342.5	331.1	251.7	4.4	4.4	4.4	857.7	846.2	923.1
California	760.0	758.2	763.6	12929.3	12562.9	16750.5	9660.5	9443.5	10339.7	82.1	82.1	82.1	23431.9	22846.7	27935.9
Idaho	38.8	38.6	39.2	238.2	538.6	718.1	557.6	547.8	514.7	0.0	0.0	0.0	834.6	1125.0	1272.1
Iowa	41.6	41.4	42.1	554.9	621.0	828.0	1217.3	1194.3	1160.0	0.0	0.0	0.0	1813.8	1856.7	2030.1
Kansas	92.2	90.8	95.0	72.8	1078.0	1437.4	1250.2	1215.8	1324.4	11.4	11.4	11.4	1426.5	2396.0	2868.2
Louisiana	33.6	33.1	34.6	1005.3	279.6	372.8	187.7	182.4	152.7	3.2	3.2	3.2	1229.9	498.4	563.3
Minnesota	84.4	84.3	84.8	395.7	1666.4	2221.8	1748.8	1697.2	1744.3	32.6	32.6	32.6	2261.6	3480.5	4083.6
Missouri	99.3	99.0	99.8	1414.7	1159.7	1546.3	1257.3	1230.9	1014.6	5.7	5.7	5.7	2777.0	2495.3	2666.4
Montana	0.3	0.3	0.3	1024.9	1.1	1.5	3.7	3.6	2.6	0.0	0.0	0.0	1028.8	5.0	4.4
Nebraska	24.3	24.1	24.8	1422.7	616.6	822.2	932.3	913.9	927.0	17.4	17.4	17.4	2396.7	1572.0	1791.3
Nevada	89.9	89.8	90.2	776.6	1035.1	1380.2	753.0	717.8	861.4	37.0	37.0	37.0	1656.6	1879.7	2368.8
New Mexico	71.8	71.3	72.7	790.6	1173.8	1565.0	460.5	446.5	468.4	4.4	4.4	4.4	1327.3	1696.1	2110.6
Oklahoma	86.5	85.9	87.6	1938.1	1928.3	2571.0	1326.5	1300.2	1158.1	85.3	85.3	85.3	3436.4	3399.8	3902.0

State	Area			On-Road			Off-Road			Points			Anthropogenic		
	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd	Sat	Sun	Wkd
Oregon	16.8	16.8	16.8	12.8	180.6	240.8	251.4	246.9	160.7	11.2	11.2	11.2	292.2	455.5	429.5
South Dakota	16.1	16.0	16.2	243.2	277.0	369.3	595.5	586.6	530.7	0.2	0.2	0.2	854.9	879.7	916.5
Texas	324.1	323.3	325.8	8587.0	8587.0	11449.3	6065.9	5921.9	6620.2	43.0	43.0	43.0	15019.9	14875.1	18438.2
Utah	147.1	146.8	147.8	1273.0	1083.6	1444.8	931.1	869.8	874.2	49.1	49.1	49.1	2400.3	2149.3	2515.8
Wisconsin	4.0	3.9	4.0	108.9	57.9	77.2	46.8	45.8	40.3	0.0	0.0	0.0	159.6	107.6	121.5
Wyoming	50.0	48.7	52.7	133.6	374.0	498.7	331.3	323.1	269.4	14.4	14.4	14.4	529.4	760.3	835.2
Grand Total	2319.5	2309.6	2339.3	35797.9	34238.3	48129.4	29852.0	29102.9	30568.9	402.2	402.2	402.2	68371.6	66052.9	81439.9

Table 4-5. Gridded biogenic emissions for states other than Colorado.

CO (tpd)	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	1-Jul	18-Jul	19-Jul	20-Jul	21-Jul
AR	274.7	282.4	308.0	337.0	287.8	338.0	332.8	329.5	409.2	432.3	442.2
AZ	908.9	930.8	858.2	845.1	847.1	904.2	931.0	641.2	716.7	739.8	786.3
CA	1755.9	1623.0	1452.6	1405.4	1509.5	1723.4	1915.0	1538.1	1635.7	1942.7	1745.3
CO	816.3	798.4	756.9	768.1	870.0	917.4	921.6	838.9	788.6	680.5	689.8
IA	116.3	102.4	98.5	107.4	125.1	133.6	122.7	124.4	115.7	138.6	144.5
ID	549.1	565.8	567.1	507.8	473.0	445.6	388.3	508.6	464.7	457.0	532.7
KS	207.2	202.1	204.0	218.9	232.7	212.7	159.6	222.5	265.0	282.2	276.1
LA	130.2	132.4	127.4	140.4	151.6	179.8	165.5	202.9	211.3	213.8	206.7
MN	137.1	122.2	128.7	141.2	175.8	193.3	175.8	133.1	134.7	158.6	137.1
MO	269.4	265.1	269.9	288.0	305.0	283.2	270.4	265.5	290.4	367.5	370.6
MT	7.8	8.7	9.3	8.7	10.8	8.3	6.3	7.8	8.0	7.8	6.2
NE	239.4	235.0	232.7	279.2	313.9	290.7	266.0	318.9	326.5	331.3	229.2
NM	699.5	648.8	597.5	570.8	625.1	665.3	682.3	503.4	500.5	486.7	513.3
NV	506.6	532.5	508.1	507.2	538.7	591.6	593.4	410.0	420.4	519.2	572.8
SD	218.5	219.9	242.3	304.5	349.4	264.8	274.1	277.7	291.5	298.0	174.4
OK	385.2	393.6	432.2	469.2	384.0	374.3	319.2	446.0	518.2	542.4	564.6
OR	399.9	349.1	300.3	282.0	257.6	261.2	278.1	336.7	300.2	387.6	434.7
TX	1104.8	1110.9	1063.7	1107.5	1078.2	1124.8	1098.6	1312.9	1408.4	1438.4	1466.9
UT	639.7	625.1	586.3	584.3	610.2	661.9	666.6	511.0	519.3	519.9	573.1
WY	531.4	577.4	603.3	620.1	615.2	581.2	524.5	558.2	531.5	468.3	425.6
daily total	791.1	768.0	741.5	740.1	839.3	902.3	918.0	820.9	775.2	673.0	666.7
NOX (tpd)	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	1-Jul	18-Jul	19-Jul	20-Jul	21-Jul
AR	10.3	10.5	11.0	11.7	10.8	12.1	11.8	11.7	13.7	14.0	14.2
AZ	467.6	476.8	445.4	432.3	431.3	453.3	466.1	357.3	385.5	398.8	415.2
CA	422.2	406.8	374.8	373.3	402.7	433.9	460.0	367.0	396.2	422.5	395.5
CO	236.8	229.4	243.0	254.0	267.0	265.6	255.6	271.4	280.0	249.2	218.4
IA	764.9	700.1	668.8	712.1	797.1	836.9	780.8	774.3	717.0	835.3	820.6
ID	122.6	123.9	127.1	119.2	120.6	114.7	102.9	117.7	112.9	112.2	128.9
KS	688.4	643.7	675.0	729.1	756.0	709.8	591.1	751.1	837.0	833.4	780.8
LA	6.6	6.7	6.5	6.9	7.2	8.3	7.7	8.8	9.1	9.2	8.9
MN	407.2	370.4	380.5	408.8	474.5	500.3	468.7	393.0	385.8	443.5	386.9

MO	152.8	144.7	147.7	151.2	164.7	156.3	149.6	154.8	158.8	186.2	189.2
MT	4.2	4.4	4.7	4.4	5.2	4.3	3.7	3.9	4.2	4.2	3.6
NE	814.5	821.0	803.4	884.3	978.3	943.3	832.3	982.2	992.0	1030.7	823.5
NM	340.6	320.0	295.2	281.2	305.9	323.1	323.6	263.6	260.3	254.4	264.7
NV	360.5	367.7	358.6	361.3	376.1	398.9	400.8	311.4	314.2	371.9	396.2
OK	209.3	211.3	225.6	237.1	220.5	196.9	174.5	236.3	245.8	247.2	262.1
OR	77.0	69.1	66.2	66.2	64.5	60.8	58.4	72.1	61.4	73.6	83.9
SD	386.5	364.1	370.4	438.0	508.9	459.6	460.0	439.7	434.8	491.9	337.1
TX	789.6	798.8	785.8	807.8	782.8	752.7	746.2	819.0	817.9	851.2	848.7
UT	260.4	249.0	237.4	237.9	252.8	271.6	268.3	215.7	223.2	220.0	243.0
WY	203.4	208.5	216.4	226.2	247.7	238.1	225.3	212.5	210.6	199.4	177.6
daily total	192.9	189.5	198.4	207.9	219.8	222.2	211.7	223.9	228.4	207.4	183.9
VOC (tpd)	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	1-Jul	18-Jul	19-Jul	20-Jul	21-Jul
AR	2744.2	2957.2	3346.3	3787.2	2932.2	3470.4	3178.4	3254.3	4560.3	4955.4	5120.9
AZ	6248.6	6269.5	5840.9	5823.6	5785.2	6081.5	6401.5	4059.5	4608.9	4829.2	5134.7
CA	15571.4	13950.5	12547.8	11956.6	13504.0	14721.7	17422.6	13249.4	14343.4	16935.4	14479.2
CO	6773.1	6596.1	6208.9	6223.7	7124.6	7478.2	7731.7	6827.1	6353.3	5263.9	5291.8
IA	1362.5	1071.3	1080.0	1229.2	1482.9	1559.5	1453.7	1389.5	1163.3	1613.5	1736.3
ID	3710.2	3847.0	3855.7	3378.7	3101.8	2868.5	2506.4	3365.9	3045.0	2915.4	3458.5
KS	1680.6	1629.3	1649.6	1765.1	1918.4	1713.3	1134.3	1753.2	2178.3	2399.6	2311.6
LA	1204.2	1166.3	1172.0	1282.4	1372.6	1776.3	1558.2	2064.8	2162.5	2186.7	2095.4
MN	1310.2	1111.0	1166.1	1345.4	1713.8	1886.8	1755.6	1196.8	1216.0	1373.2	1257.8
MO	3104.1	3198.1	3268.0	3548.2	3869.8	3457.5	3293.1	2968.8	3340.9	4786.4	4815.5
MT	49.1	55.4	60.6	55.9	72.0	50.9	37.9	48.8	51.1	49.2	38.2
NE	2472.6	2281.4	2282.7	2872.5	3305.7	2869.1	2690.5	3250.1	3392.5	3519.6	2298.4
NM	4530.6	4123.5	3801.0	3557.0	3933.4	4252.9	4340.9	3042.5	2993.5	2928.7	3073.8
NV	2455.6	2572.5	2454.6	2444.2	2595.3	2834.2	2879.3	1956.4	2013.3	2507.5	2769.7
OK	4215.3	4321.6	4796.4	5435.2	4114.5	3844.9	2482.5	4874.2	6158.1	6509.2	6720.8
OR	2363.4	2044.1	1722.4	1597.3	1444.4	1468.4	1616.0	1946.8	1733.5	2284.9	2556.3
SD	1933.0	1898.0	2126.8	2857.8	3261.0	2204.0	2562.3	2396.4	2567.5	2742.4	1220.6
TX	10301.4	10001.2	9605.5	9915.4	8662.9	9712.1	9635.6	12943.6	14150.1	14434.1	14870.8
UT	4368.0	4330.5	4024.4	3988.3	4119.0	4333.7	4513.9	3359.9	3399.5	3359.7	3734.5
WY	3905.9	4314.4	4465.6	4521.7	4314.9	3976.0	3647.3	3982.4	3654.1	3244.5	2913.4

daily total	6455.0	6241.1	5940.3	5895.8	6793.7	7230.7	7557.0	6561.6	6106.2	5141.1	5029.6
ISOP (tpd)	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	1-Jul	18-Jul	19-Jul	20-Jul	21-Jul
AR	1606.1	1789.0	2072.3	2399.9	1744.5	2062.6	1793.3	1875.3	2848.9	3153.5	3275.9
AZ	2324.8	2258.6	2139.5	2175.9	2126.3	2178.2	2379.4	1292.0	1514.1	1631.5	1733.5
CA	7043.5	6046.5	5484.0	5121.4	6199.2	6387.9	8167.6	5788.0	6423.4	7496.2	5944.0
CO	3034.9	2938.7	2727.1	2693.7	3132.1	3274.5	3507.9	2954.5	2713.4	2129.1	2135.5
IA	998.9	751.0	771.8	893.3	1091.7	1142.2	1070.5	1000.1	801.0	1179.9	1283.4
ID	1227.0	1290.8	1296.2	1089.1	979.3	872.3	759.7	1067.4	948.7	853.0	1065.0
KS	922.7	894.4	903.3	959.8	1066.1	933.5	549.0	935.7	1206.0	1372.5	1312.4
LA	572.9	524.4	555.2	601.8	636.8	904.9	755.6	1081.0	1138.5	1151.0	1093.3
MN	883.3	730.7	765.6	906.2	1167.4	1284.8	1208.5	783.0	797.1	880.7	830.9
MO	2217.0	2326.0	2379.2	2600.6	2866.0	2525.6	2403.8	2094.0	2384.1	3576.8	3595.5
MT	7.9	9.5	11.2	10.2	15.0	7.1	4.9	7.5	8.9	7.8	5.4
NE	1588.3	1407.6	1407.7	1813.4	2130.4	1791.5	1680.1	2042.2	2160.1	2300.3	1473.1
NM	1232.9	1064.0	982.2	863.5	981.6	1111.2	1127.6	656.0	623.0	625.9	646.9
NV	166.3	176.3	163.3	154.6	166.2	161.2	191.3	113.5	119.5	164.0	196.4
OK	2748.6	2826.9	3151.3	3650.7	2651.9	2417.7	1265.4	3169.4	4181.0	4448.9	4574.4
OR	321.3	265.3	185.4	158.3	132.8	141.5	200.9	220.5	200.4	310.6	337.3
SD	1014.3	951.9	1068.7	1543.5	1770.9	1098.9	1422.2	1209.3	1315.7	1504.8	491.7
TX	5340.1	5003.1	4843.1	4944.1	3799.9	4634.9	4685.4	7082.9	7854.8	7997.5	8310.0
UT	1460.9	1494.0	1362.8	1332.2	1345.5	1324.2	1481.4	1037.7	1038.1	994.2	1130.0
WY	1291.7	1476.6	1497.6	1469.9	1277.9	1112.4	1062.4	1233.1	1034.9	937.9	822.4
daily total	2853.1	2744.6	2554.7	2515.7	2967.6	3120.0	3373.2	2802.6	2557.5	2062.4	1992.2

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