

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT**

---

**Greenhouse Gas (GHG) Inventories  
for the County of San Bernardino**

**Technical Document: Methodology, Assumptions,  
Data Sources and Inventory**

**May 2009**

## **ACKNOWLEDGEMENTS**

### **South Coast Air Quality Management District**

Elaine Chang, DrPH  
Deputy Executive Officer  
Planning, Rule Development & Area Sources

Jill Whynot  
Director of Strategic Initiatives  
Planning, Rule Development & Area Sources

This was a joint effort that included staff from several organizations, as listed below. Their contributions and assistance are appreciated.

#### **SCAQMD**

Ali Ghasemi, Program Supervisor  
Kathy Hsiao, Program Supervisor  
Susan Yan, Air Quality Specialist  
Robert Wu, Air Quality Specialist

#### **MDAQMD**

Richard Wales, Air Quality Engineer

#### **CARB**

Vijay Bhargava, Air Resources Engineer  
Walter Wong, Air Pollution Specialist  
Kevin Eslinger, Air Pollution Specialist

#### **COUNTY OF SAN BERNARDINO**

Julie Rynerson-Rock, Director, Land Use Services Department  
Jim Squire, Deputy Director, Advance Planning Division  
Doug Feremenga, Senior Planner, Advance Planning Division  
Robin Cochran, Deputy County Counsel

#### **CONSULTANT FOR COUNTY OF SAN BERNARDINO**

Michael Hendrix, Project Director of Air Quality/Climate Change, PBS & J

## TABLE OF CONTENTS

<b>Preface</b> .....	1
<b>Background</b> .....	1
<b>Emission Inventory Methodology</b> .....	2
Introduction .....	2
Source Categories .....	2
Stationary Sources .....	2
On-Road Mobile Sources .....	3
Off-Road Mobile Sources .....	4
Electricity Usage .....	4
Pollutants .....	5
Inventory Projection/Backcast.....	5
<b>Summary of San Bernardino GHG Inventories</b> .....	5
<b>References</b> .....	10
<b>Appendices</b>	
A – GHG Emissions per Major Source Categories .....	A-1 to A-11
B – GHG Emissions from Electricity Usage .....	B-1
C – San Bernardino County Land Use Map.....	C-1
D – Dairy, Manure and Digestive Methane Inventory Documentation.....	D-1
<b>List of Tables</b>	
1 – CO <sub>2</sub> E Inventory for Entire San Bernardino County, MMT .....	7
2 – CO <sub>2</sub> E Inventory for Unincorporated Areas of the County, MMT.....	7
A-1 – 1990 GHG Emissions per Major Source Category for San Bernardino County .....	A-1
A-2 – 2002 GHG Emissions per Major Source Category for San Bernardino County .....	A-3
A-3 – 2007 GHG Emissions per Major Source Category for San Bernardino County .....	A-5

A-4 – 2020 GHG Emissions per Major Source Category for San Bernardino County.....	A-7
A-5 – 2002 Daily Fuel Consumption per Major Source Category for San Bernardino County .....	A-9
B-1 – 1996 San Bernardino County GHG Emissions from Electricity Usage .....	B-1
B-2 – 2005 San Bernardino County GHG Emissions from Electricity Usage.....	B-1
D-1 – 1990 San Bernardino County Dairy GHG Emissions Summary .....	D-1
D-2 – 1990 San Bernardino County Dairy GHG Manure Methane Emissions .....	D-2
D-3 – 1990 San Bernardino County Digestive Methane Emissions .....	D-3
D-4 – 1990 San Bernardino County N <sub>2</sub> O Emissions from Manure Management .....	D-4
E-1 – San Bernardino County Population and Employment Data	E-1
E-2 – Population Data for Areas under County’s Jurisdiction .....	E-1

**List of Figures**

1 – 1990 San Bernardino County Inventory.....	9
2 – 2007 San Bernardino County Inventory.....	9
3 – 2020 San Bernardino County Inventory.....	9
C-1 – San Bernardino County Land Use Map .....	C-1

## **PREFACE**

This document summarizes the collaborative effort of staffs at the South Coast Air Quality Management District (SCAQMD), Mojave Desert Air Quality Management District (MDAQMD), the County of San Bernardino (County) and their consultants, to develop greenhouse gas (GHG) inventories for the County for the years 1990, 2007 and 2020. The purpose of this document is to outline the methods and assumptions used, the sources of data, the limitations of the estimates, and a summary of the inventories developed, by major source category. This approach largely relies on the same inventory methodology used to develop the latest Air Quality Management Plan (i.e., 2007 AQMP) and represents one approach for developing a GHG emissions inventory. There are other appropriate methodologies and protocols that can be used. This document may be useful to other cities or counties that are developing GHG inventories.

## **BACKGROUND**

The County is in the process of preparing a GHG Reduction Plan that will quantify emissions over which the County has discretionary land use or internal operational control, set a reduction target, and develop quantifiable mitigation measures to reduce those emissions. The County requested that SCAQMD assist with its effort to identify and inventory GHG emissions.

As part of a settlement agreement with the California Attorney General (hereafter, settlement agreement), the County of San Bernardino agreed that its GHG Plan would include the following:

- (1) Inventories for 1990, existing emissions, and 2020; and,
- (2) A target for reduction of the GHG emissions related to the County's discretionary land use decisions and internal county operations.

The County agreed to provide 1990 emissions for the entire County; however, the other two inventories were to include only areas under the County's discretionary land use authority and the County's internal operations. The County cannot regulate projects within boundaries of the incorporated cities, land managed by the federal government such as those lands under the Bureau of Land Management (BLM), and military bases and installations. Public utilities and railroads are generally not subject to the County's land use jurisdiction. Water districts/agencies are also not subject to the County's land use jurisdiction; however, private water companies generally are. Figure C-1 in Appendix C shows the map provided by the County, which depicts incorporated and unincorporated portions of the County, as well as federal and state lands within the County.

## EMISSION INVENTORY METHODOLOGY

### Introduction

The methodology used for developing this GHG inventory is primarily consistent with the SCAQMD 2007 Air Quality Management Plan (AQMP) inventory method, which utilized 2002 data as the base year. Since the County is located in two air basins (the South Coast and the Mojave Desert Air Basins), the data collected and developed by the MDAQMD was combined with the SCAQMD data. San Bernardino County staff also provided additional data to augment the AQMP inventory, such as electricity consumption<sup>1</sup> and dairy activity<sup>2</sup>. The following sections describe the key elements of the County GHG inventories.

### Source Categories

As described below, the GHG inventory has four major categories: stationary sources, on-road mobile sources, off-road mobile sources, and electricity usage.

Stationary sources: The stationary source emissions are grouped into two categories - point sources and area sources. Point source emissions are from facilities having one or more pieces of equipment registered and permitted with SCAQMD (e.g. power plants and manufacturing facilities). SCAQMD is able to collect facility emission-related information from the larger of these facilities. Area source emissions are from numerous smaller facilities (e.g., gas stations, and restaurants) or the source of emissions (e.g., consumer products and architectural coatings), for which locations may not be specifically identified.

For the stationary point and area source inventory, SCAQMD staff used the 2007 AQMP base year inventory (2002 data) stationary source emission inventory for the portion of San Bernardino County under SCAQMD jurisdiction. SCAQMD staff obtained the 2002 point and area source emission inventory for the Mojave Desert portion of San Bernardino County from the MDAQMD. The carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>) emissions for both stationary point and area sources associated with fuel combustion sources were calculated using the actual reported fuel consumption by fuel type, CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub> default Emission Factors (EFs), and fuel High Heating Values (HHVs). Default EFs were developed using Tables 3, 4, and 6 of the California Air Resources Board (CARB) Regulation for the Mandatory Reporting of GHG Emissions. The HHVs of the fuels were taken from AP-42<sup>3</sup>. For non-combustion sources, the CH<sub>4</sub> emissions were estimated utilizing the Total Organic Gases

---

<sup>1</sup> Obtained from the California Energy Commission

<sup>2</sup> Obtained from the San Bernardino County Department of Agriculture, Weights, and Measures, June 2008

<sup>3</sup> EPA 1995: AP-42: Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I: Stationary Point and Area Sources, Appendix A: Miscellaneous Data & Conversion Factors

(TOG) emissions and CARB speciation profiles used for the 2007 AQMP. Once the 2002 GHG emissions inventory was developed, it was backcasted to year 1990 and projected to future years using growth factors provided by Southern California Association of Governments (SCAG) for the 2007 AQMP.

The following sections provide additional information on inventory development for sub-categories.

### Agriculture

The County Department of Agriculture, Weights and Measures provided emissions estimates for livestock-dairy and manure management for the year 1990, which were added to the stationary and area source inventory under the major source category titled "Miscellaneous Processes, Farming Operations", with EIC 620. Details for dairy manure methane emissions, digestive methane emissions, N<sub>2</sub>O emissions from manure management and a summary of dairy emissions are provided in Appendix D. Growth projections for the agriculture sector for the County provided by SCAG were used to estimate emissions for the years 2007 and 2020. The CH<sub>4</sub> emissions for all other sources under farming operations (i.e. Livestock-Broilers, Layers, Turkeys, etc.) were calculated using the TOG emissions and CARB speciation profiles. N<sub>2</sub>O emissions were estimated using the dairy N<sub>2</sub>O emissions and ratio of the CH<sub>4</sub> emissions of each source to the Dairy category.

The 2002 GHG emissions from prescribed burning under the agricultural burning category with EIC 670 were calculated using the actual burning activities as reported in the 2002 emissions inventory and their associated EFs<sup>4</sup>.

### Landfills

The 2002 GHG emissions from landfill sources under the waste disposal category were estimated using the 2002 annual emission data as reported by these sources, CARB default EFs, and fuel HHVs.

On-road mobile sources: The CARB EMFAC2007 V2.3 mobile source emissions model is the source of the 2007 AQMP emission estimates for on-road motor vehicles. The California Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), and SCAG supply CARB with the data necessary to develop the on-road mobile source emissions inventory. The EMFAC2007 model contains an output for CO<sub>2</sub> and CH<sub>4</sub> emissions for specified inventory years. SCAQMD staff calculated N<sub>2</sub>O emissions based on CARB's

---

<sup>4</sup> EFs were developed using Andreae and Merlet report titled "Emission of Trace Gases and Aerosols from Biomass Burning, Global Biogeochemical Cycles", 2001, and CARB report on "Emission Factors for Open Burning of Agricultural Residues", August 2000

methodology (i.e., vehicle miles traveled and CARB N<sub>2</sub>O emission factors which are a function of vehicle type, model year, and fuel type). Currently, this model does not have data regarding natural gas vehicles and therefore, they are not included in this analysis.

Off-road mobile sources: Mobile sources not included in the on-road mobile source emissions inventory are considered as off-road mobile sources. CARB uses the OFFROAD Model to estimate emissions for more than one hundred off-road equipment types, including recreational vehicles, pleasure craft, and construction equipment. The emissions from ships, aircraft, locomotives and cargo handling equipment at marine ports or intermodal facilities are not included in the current OFFROAD Model. Therefore, the emissions from these categories need to be calculated using other category-specific models. Aircraft<sup>5</sup> emissions were calculated using fuel consumption provided by CARB and default EFs.

Locomotive emissions were estimated using an alternative approach. Staff used the CARB's statewide locomotive GHG emissions and the carbon monoxide (CO) ratio of the County to the state to estimate the emissions for this category. A different methodology should be considered as the GHG inventory is updated in the future. Emissions from Cargo Handling Equipment (CHE) associated with the locomotives were calculated by first estimating the CHE statewide CO<sub>2</sub> emissions for the years 1990, 2002, 2007 and 2020 using CARB 2004 CHE population activity, horse power, CO<sub>2</sub> EF, and growth factors. The growth factors were developed based on the 2004, 2010, and 2020 CHE population activities and interpolation and extrapolation. Then, the County CO<sub>2</sub> emissions were estimated using the CO ratio of the County to the state. The N<sub>2</sub>O and CH<sub>4</sub> emissions from this category were assumed to be negligible. The emissions from ships and commercial boats, and associated with marine ports were not applicable to San Bernardino County as these operations did not take place in this region.

Electricity usage: In order to account for GHG emissions that occurred due to consumption of electricity within the County regardless of where the emissions were generated, the County provided SCAQMD staff with the actual electricity usage for residential and non-residential sectors for the years 1996 and 2005 (see Appendix B). Estimates of electricity usage for both residential and non-residential sectors for the years 1990, 2007 and 2020 were derived based on the County's population and employment growth relative to the years 1996 or 2005 using the least squares straight line equation. Emission factors for electricity generation were as reported to the California Climate Action Registry for the Southern California Edison (SCE) service territory. These electricity usage emissions are presented for reference purposes only and were not added to the

---

<sup>5</sup> Based on the San Bernardino County Department of Airports, there are six airports that are operated by the County; Apple Valley, Baker, Barstow-Daggett, Chino, Needles, and Twentynine Palms. Further information (location, etc) about these airports can be accessed at: <http://www.sbcounty.gov/airports>



County inventories, since they partially overlap with the in-County power plant emissions.

### Pollutants

For purpose of the County GHG inventories, only three major pollutants were included: CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. These emissions are typically reported in millions of metric tons (MMT) of carbon dioxide equivalents (CO<sub>2</sub>E), which is the amount of CO<sub>2</sub> that would give the same global warming potential as a given amount of another GHG. For example, methane (CH<sub>4</sub>) is a GHG which has a higher global warming potential than CO<sub>2</sub>. To convert a metric ton of methane to a metric ton of CO<sub>2</sub>E, a factor of 21 is used (consistent with ARB's GHG inventory development, based on the second assessment report (1996) of the International Panel on Climate Change (IPCC)).

### Inventory Projection/Backcast

The most recently prepared complete stationary source emissions inventory for the County was the one for the year 2002. Therefore, the stationary source inventories for the years 1990, 2007 and 2020 were forecasted and backcasted from the 2002 inventory using the same growth surrogates and SCAG growth factors as used in the 2007 AQMP, Appendix III, Tables 2-2 through 2-7 for the SCAB portion of the County. The selection of the surrogate by which emission growth is projected depends on the type of activity. Generally these surrogates include employment growth, industry output growth, etc. The growth factors for the Mojave Desert portion of the County are consistent with the attainment demonstration used in the MDAQMD Federal 8-hour Ozone Attainment Plan, July 2008. The on-road and off-road GHG inventories were developed for all the above years using the CARB EMFAC2007 and 2007 OFFROAD models. The CARB models contain emission reductions from all rules adopted by 2007.

## **SUMMARY OF SAN BERNARDINO GHG INVENTORIES**

In addition to the year 2002, GHG emissions inventories were developed for the years 1990, 2007 and 2020, as described in the following sections. For 2007 and 2020, the settlement agreement required inventories of emissions related to internal County operations and the County's discretionary land use decisions. To estimate the areas under the County's discretionary land use authority, the County provided a map showing these areas and also provided the 2007 population data from the Department of Finance for the unincorporated areas of the County (see Appendix E). Figure C-1 in Appendix C shows the map provided by the County, which depicts incorporated and unincorporated portions of the County, as well as federal and state lands within the County. To determine the portion of GHG emissions attributable to the County, SCAQMD staff excluded the emissions from the operations that were not subject to the County's land use jurisdiction such as utilities, railroads, and military aircraft and proportioned the

remaining County-wide GHG emissions inventory based upon the population residing in the unincorporated area of the County. The percentage of population in the unincorporated areas compared to the total County population was calculated to be 14.6% (based on the 2007 California Department of Finance Projections) which was used to derive the GHG emissions. Therefore, after exclusion of the emissions associated with utilities, railroads, and military aircraft, the County-wide inventory shown in Table 1 was multiplied by 0.146 to estimate the GHG emissions from unincorporated portions of the County (see Table 2).

Table 1 summarizes the applicable inventories by milestone year by major source category. This information is for the County as a whole. The inventory in Table 1 includes all sources regardless of whether the County has authority to control the emissions.

**Table 1  
CO<sub>2</sub>E Inventory for Entire San Bernardino County, MMT**

	<b>Category</b>	<b>1990</b>	<b>2002</b>	<b>2007</b>	<b>2020</b>
Mobile On-Road	All	8	10	11	15
Mobile Off-Road	Locomotives	1	1	1	1
	Aircraft	0	0	0	1
	Other	0	1	1	1
Stationary	Utilities	3	3	4	5
	Landfills	1	1	1	1
	Other	13	12	14	17
<b>Total</b>		26	28	32	41
Electricity Usage		2	4	5	6

Table 2 shows the inventories for unincorporated areas of the County for the years 1990, 2002, 2007 and 2020.

**Table 2\*  
CO<sub>2</sub>E Inventory for Unincorporated Areas of the County, MMT**

	<b>1990</b>	<b>2002</b>	<b>2007</b>	<b>2020</b>	
Mobile On-Road	1.15	1.47	1.64	2.19	
Mobile Off-Road	0.12	0.14	0.15	0.22	
Stationary	1.82	1.76	2.02	2.53	
<b>Total</b>		3.08	3.37	3.82	4.95
Electricity Usage		0.35	0.53	0.66	0.87

\*The values in Table 2 are generated by multiplying the values in Table 1 (excluding the emissions from utilities, railroads, and military aircraft) by 0.146. These values are slightly off due to rounding the values in Table 1 to the nearest ton.

The following figures, Figures 1 through 3, show the relative contribution of each of these major categories to the County inventories for each of the key years selected. As shown in Figures 1 through 3, the mobile source category (on-road and off-road) contributes 35% and 44% of the total County GHG emissions in 1990 and 2020, respectively. This is consistent with the statewide inventory for which the mobile sources are the largest contributor, with 35% in 1990 and 38% in 2002 to 2004 average emissions of the state's total GHG emissions. The projected contribution of mobile sources increases slightly over this time period. These projected emissions do not account for potential reduction measures due to implementation of the AB 32 Scoping Plan, future AQMPs, or County reduction measures.

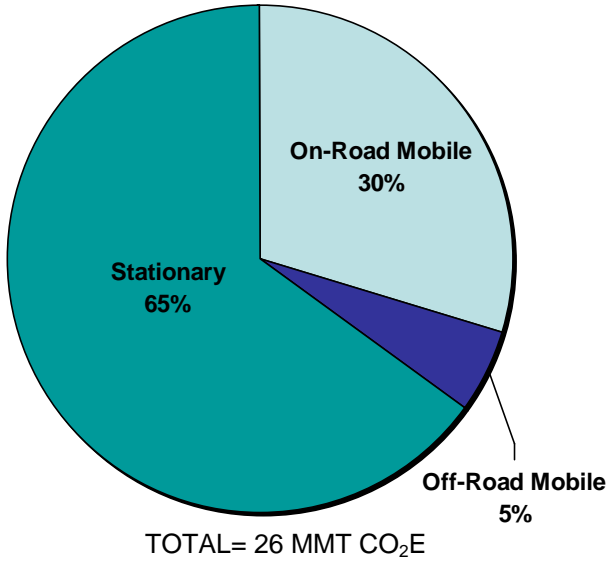
Tables A-1 through A-5 in Appendix A provide more detailed inventories by major source category for the years 1990, 2002, 2007 and 2020. The categorization is consistent with the AQMP inventory. The GHG emissions are presented in terms of tons per year (TPY) and Million Metric Tons (MMT) of CO<sub>2</sub>E. The emission values are rounded off to the nearest ton and therefore zero values range from 0.00 to 0.49. Table A-5 shows the daily fuel consumption by major source category by fuel type in 2002, which forms the basis for combustion-related GHG emission estimates.

## Discussion

The SCAQMD staff believes the GHG emissions inventory developed for San Bernardino County represents a first of its kind bottom-up GHG inventory at a local level. The inventory methodology is primarily based on the methodology used to develop the SCAQMD 2007 AQMP, and is consistent with the State Implementation Plan (SIP) approach, such that it can be easily integrated with the local SIP planning process. The methodology outlined in this document takes advantage of years of technical improvements for criteria pollutant inventories and the benefits of extensive public review and agency oversight. Enhancements were made to GHG inventories regarding indirect emissions (i.e., electricity consumption). As additional technical information and standardized GHG inventory protocols endorsed by CARB become available over time, the GHG inventories can be further enhanced by including additional pollutants, improved methodology or better emission factors.

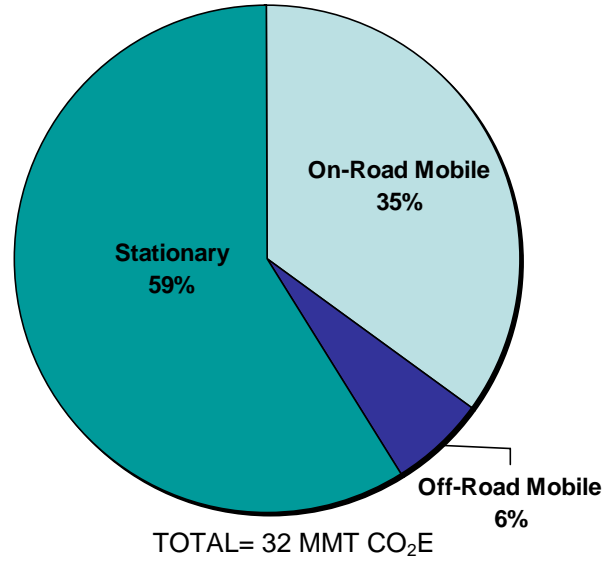
**Figure 1**

**1990 San Bernardino County Inventory**



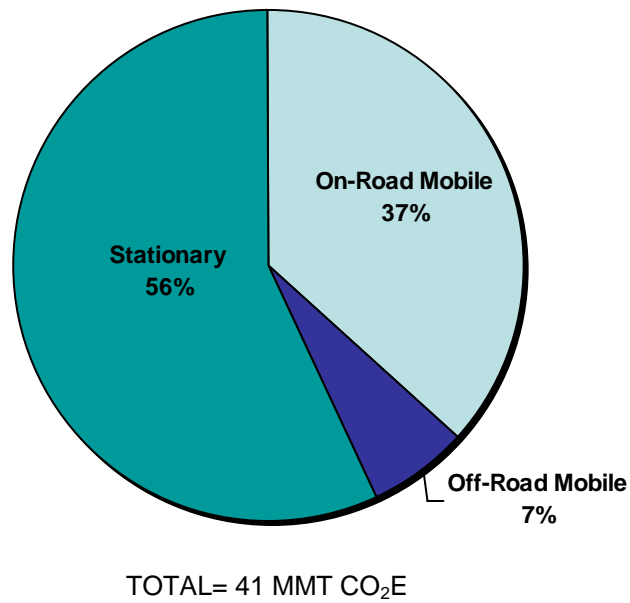
**Figure 2**

**2007 San Bernardino County Inventory**



**Figure 3**

**2020 San Bernardino County Inventory**



## REFERENCES

California Department of Finance. City/County Population and Housing Estimates, Table 2: E-5, January 1, 2007.

CARB, 2006. CARB OFFROAD Model Input Factors.

CARB, 2007. CARB EMFAC2007 Model.

CARB, 2007. CARB OFFROAD Model.

MDAQMD, 2008. Federal 8-Hour Ozone Attainment Plan.

San Bernardino County Department of Agriculture, Weights and Measures. Dairy Information, June 2008.

SCAG, 2004. Regional Transportation Plan.

SCAQMD, 2007. 2007 Air Quality Management Plan Appendix IV: District's Stationary and Mobile Source Control Measures.

SCAQMD, 2007. 2007 Air Quality Management Plan Appendix III; Base and Future Year Emission Inventories.

SCAQMD, 2007. 2007 Air Quality Management Plan.

U.S. EPA, 1998, Fifth Edition, Volume 1, Chapter 44: Greenhouse Gas Biogenic Sources 14.4 Enteric Fermentation – Greenhouse Gases, Supplement D., February 1998.

U.S. EPA, AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, January 1995.

U.S. EPA, Methods for Estimating Greenhouse Gas Emissions for Livestock Manure Management, Livestock Manure Management (March 2005) Draft.

**APPENDIX A**  
**GHG Emissions per Major Source Categories**

**Table A-1, 1990 GHG Emissions Per Major Source Category For San Bernardino County**

CODE	Source Category	Emissions (TPY)			MMT
		CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> E <sup>6</sup>
<b>Fuel Combustion</b>					
10	Electric Utilities	3,629,749	22	158	3
20	Cogeneration	1,751,372	28	187	2
30	Oil and Gas Production (Combustion)	2,087	0	0	0
40	Petroleum Refining (Combustion)	0	0	0	0
50	Manufacturing and Industrial	1,841,904	5	37	2
52	Food and Agricultural Processing	29,040	0	1	0
60	Service and Commercial	6,996,564	23	156	6
99	Other (Fuel Combustion)	198,642	1	8	0
<b>Total Fuel Combustion</b>		<b>14,449,357</b>	<b>79</b>	<b>548</b>	<b>13</b>
<b>Waste Disposal</b>					
110	Sewage Treatment	151,342	0	3	0
120	Landfills	625,649	1	11,026	1
130	Incineration	14,724	0	8	0
199	Other (Waste Disposal)	0	0	6,884	0
<b>Total Waste Disposal</b>		<b>791,715</b>	<b>1</b>	<b>17,921</b>	<b>1</b>
<b>Cleaning and Surface Coatings</b>					
210	Laundering	0	0	0	0
220	Degreasing	0	0	0	0
230	Coatings and Related Processes	2,589	0	52	0
240	Printing	0	0	0	0
250	Adhesives and Sealants	0	0	0	0
299	Other (Cleaning and Surface Coatings)	0	0	5	0
<b>Total Cleaning and Surface Coatings</b>		<b>2,589</b>	<b>0</b>	<b>56</b>	<b>0</b>
<b>Petroleum Production and Marketing</b>					
310	Oil and Gas Production	0	0	0	0
320	Petroleum Refining	0	0	0	0
330	Petroleum Marketing	0	0	1,866	0
399	Other (Petroleum Production and Marketing)	0	0	0	0
<b>Total Petroleum Production and Marketing</b>		<b>0</b>	<b>0</b>	<b>1,866</b>	<b>0</b>
<b>Industrial Processes</b>					
410	Chemical	0	0	33	0
420	Food and Agriculture	0	0	1	0
430	Mineral Processes	11,390	0	87	0
440	Metal Processes	0	0	0	0
450	Wood and Paper	0	0	0	0
460	Glass and Related Products	0	0	0	0
470	Electronics	0	0	0	0
499	Other (Industrial Processes)	0	0	10	0
<b>Total Industrial Processes</b>		<b>11,390</b>	<b>0</b>	<b>131</b>	<b>0</b>
<b>Solvent Evaporation</b>					
510	Consumer Products	0	0	0	0
520	Architectural Coatings and Related Solvent	0	0	0	0
530	Pesticides/Fertilizers	0	0	0	0
540	Asphalt Paving/Roofing	0	0	6	0

<sup>6</sup> MMTCO<sub>2</sub>E = [CO<sub>2</sub> (TPY) x 1 + N<sub>2</sub>O (TPY) x 310 + CH<sub>4</sub> (TPY) x 21] x 0.9072/1,000,000

Total Solvent Evaporation		0	0	6	0
Miscellaneous Processes					
610 Residential Fuel Combustion	2,125,406	4	36	2	
620 Farming Operations	0	67	52,668	1	
630 Construction and Demolition	0	0	0	0	
640 Paved Road Dust	0	0	0	0	
645 Unpaved Road Dust	0	0	0	0	
650 Fugitive Windblown Dust	0	0	0	0	
660 Fires	0	0	5	0	
670 Waste Burning and Disposal	2,887	9	67	0	
680 Utility Equipment	0	0	0	0	
690 Cooking	0	0	77	0	
699 Other (Miscellaneous Processes	0	0	0	0	
Total Miscellaneous Processes	2,128,293	80	52,853	3	
On-Road Motor Vehicles					
710 Light Duty Passenger Auto (LDA)	2,836,050	428	1135	3	
722 Light Duty Trucks 1 (T1 : up to 3750 lb.)	777,450	171	405	1	
723 Light Duty Trucks 2 (T2 : 3751-5750 lb.)	1,076,750	245	427	1	
724 Medium Duty Trucks (T3 : 5751-8500 lb.)	350,400	55	131	0	
732 Light Heavy Duty Gas Trucks 1 (T4 : 8501-10000 lb.)	354,050	36	161	0	
733 Light Heavy Duty Gas Trucks 2 (T5 : 10001-14000 lb.)	105,850	10	66	0	
734 Medium Heavy Duty Gas Trucks (T6 : 14001-33000 lb.)	73,000	5	131	0	
736 Heavy Heavy Duty Gas Trucks ((HHDGT > 33000 lb.)	25,550	3	40	0	
742 Light Heavy Duty Diesel Trucks 1 (T4 : 8501-10000 lb.)	7,300	0	0	0	
743 Light Heavy Duty Diesel Trucks 2 (T5 : 10001-14000 lb.)	29,200	0	0	0	
744 Medium Heavy Duty Diesel Truck (T6 : 14001-33000 lb.)	222,650	1	4	0	
746 Heavy Heavy Duty Diesel Trucks (HHDDT > 33000 lb.)	2,343,300	6	172	2	
750 Motorcycles (MCY)	14,600	11	62	0	
760 Diesel Urban Buses (UB)	18,250	0	0	0	
762 Gas Urban Buses (UB)	3,650	0	0	0	
770 School Buses (SB)	21,900	0	4	0	
776 Other Buses (OB)	7,300	0	4	0	
780 Motor Homes (MH)	40,150	3	15	0	
Total On-Road Motor Vehicles	8,307,400	977	2,756	8	
Other Mobile Sources					
810 Aircraft	233,779	2	10	0	
820 Trains	606,400	15	47	1	
830 Ships and Commercial Boats	0	0	0	0	
840 Recreational Boats	95,353	22	412	0	
850 Off-Road Recreational Vehicles	7012	11	99	0	
860 Off-Road Equipment	488,440	33	423	0	
870 Farm Equipment	56,703	0	18	0	
890 Fuel Storage and Handling	0	0	0	0	
895 Truck Stops	0	0	0	0	
Total Other Mobile Sources	1,487,685	83	1,010	1	
Total Stationary Sources	17,383,344	161	73,382	17	
Total On-Road Vehicles	8,307,400	977	2,756	8	
Total Other Mobile	1,487,685	83	1,010	1	
Total Anthropogenic	27,178,429	1,220	77,148	26	



**Table A-2, 2002 GHG Emissions Per Major Source Category For San Bernardino County**

CODE	Source Category	Emissions (TPY)			MMT
		CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> E
<b>Fuel Combustion</b>					
10	Electric Utilities	3,213,931	21	151	3
20	Cogeneration	1,784,526	28	188	2
30	Oil and Gas Production (Combustion)	2,087	0	0	0
40	Petroleum Refining (Combustion)	0	0	0	0
50	Manufacturing and Industrial	2,692,610	7	53	2
52	Food and Agricultural Processing	32,099	0	1	0
60	Service and Commercial	6,931,231	18	137	6
99	Other (Fuel Combustion)	186,028	1	8	0
<b>Total Fuel Combustion</b>		<b>14,842,512</b>	<b>75</b>	<b>537</b>	<b>13</b>
<b>Waste Disposal</b>					
110	Sewage Treatment	96,116	0	2	0
120	Landfills	838,672	1	6,874	1
130	Incineration	29,791	0	10	0
199	Other (Waste Disposal)	0	0	8,274	0
<b>Total Waste Disposal</b>		<b>964,578</b>	<b>2</b>	<b>15,160</b>	<b>1</b>
<b>Cleaning and Surface Coatings</b>					
210	Laundering	0	0	0	0
220	Degreasing	0	0	0	0
230	Coatings and Related Processes	4,655	0	52	0
240	Printing	0	0	0	0
250	Adhesives and Sealants	0	0	0	0
299	Other (Cleaning and Surface Coatings)	0	0	10	0
<b>Total Cleaning and Surface Coatings</b>		<b>4,655</b>	<b>0</b>	<b>62</b>	<b>0</b>
<b>Petroleum Production and Marketing</b>					
310	Oil and Gas Production	0	0	0	0
320	Petroleum Refining	0	0	0	0
330	Petroleum Marketing	0	0	2,015	0
399	Other (Petroleum Production and Marketing)	0	0	0	0
<b>Total Petroleum Production and Marketing</b>		<b>0</b>	<b>0</b>	<b>2016</b>	<b>0</b>
<b>Industrial Processes</b>					
410	Chemical	0	0	67	0
420	Food and Agriculture	0	0	2	0
430	Mineral Processes	21,635	0	110	0
440	Metal Processes	0	0	0	0
450	Wood and Paper	0	0	0	0
460	Glass and Related Products	0	0	0	0
470	Electronics	0	0	0	0
499	Other (Industrial Processes)	0	0	16	0
<b>Total Industrial Processes</b>		<b>21,635</b>	<b>0</b>	<b>194</b>	<b>0</b>
<b>Solvent Evaporation</b>					
510	Consumer Products	0	0	0	0
520	Architectural Coatings and Related Solvent	0	0	0	0
530	Pesticides/Fertilizers	0	0	0	0

540	Asphalt Paving/Roofing	0	0	6	0
Total Solvent Evaporation		0	0	6	0
Miscellaneous Processes					
610	Residential Fuel Combustion	1,518,936	3	26	1
620	Farming Operations	0	22	17,011	0
630	Construction and Demolition	0	0	0	0
640	Paved Road Dust	0	0	0	0
645	Unpaved Road Dust	0	0	0	0
650	Fugitive Windblown Dust	0	0	0	0
660	Fires	0	0	6	0
670	Waste Burning and Disposal	16,498	49	56	0
680	Utility Equipment	0	0	0	0
690	Cooking	0	0	107	0
699	Other (Miscellaneous Processes)	0	0	0	0
Total Miscellaneous Processes		1,535,434	74	17,206	2
On-Road Motor Vehicles					
710	Light Duty Passenger Auto (LDA)	3,580,650	219	624	3
722	Light Duty Trucks 1 (T1 : up to 3750 lb.)	1,182,600	157	175	1
723	Light Duty Trucks 2 (T2 : 3751-5750 lb.)	1,755,650	271	285	2
724	Medium Duty Trucks (T3 : 5751-8500 lb.)	1,069,450	109	146	1
732	Light Heavy Duty Gas Trucks 1 (T4 : 8501-10000 lb.)	197,100	26	40	0
733	Light Heavy Duty Gas Trucks 2 (T5 : 10001-14000 lb.)	47,450	6	11	0
734	Medium Heavy Duty Gas Trucks (T6 : 14001-33000 lb.)	32,850	5	22	0
736	Heavy Heavy Duty Gas Trucks ((HHDDGT > 33000 lb.)	21,900	4	15	0
742	Light Heavy Duty Diesel Trucks 1 (T4 : 8501-10000 lb.)	3,650	0	4	0
743	Light Heavy Duty Diesel Trucks 2 (T5 : 10001-14000 lb.)	32,850	0	0	0
744	Medium Heavy Duty Diesel Truck (T6 : 14001-33000 lb.)	313,900	1	4	0
746	Heavy Heavy Duty Diesel Trucks (HHDDT > 33000 lb.)	2,445,500	6	106	2
750	Motorcycles (MCY)	10,950	7	29	0
760	Diesel Urban Buses (UB)	21,900	0	0	0
762	Gas Urban Buses (UB)	7,300	1	0	0
770	School Buses (SB)	36,500	0	0	0
776	Other Buses (OB)	10,950	1	4	0
780	Motor Homes (MH)	47,450	6	7	0
Total On-Road Motor Vehicles		10,818,600	818	1,471	10
Other Mobile Sources					
810	Aircraft	197,782	2	8	0
820	Trains	825,780	21	65	1
830	Ships and Commercial Boats	0	0	0	0
840	Recreational Boats	117,413	29	285	0
850	Off-Road Recreational Vehicles	8,979	18	58	0
860	Off-Road Equipment	643,510	37	274	1
870	Farm Equipment	55,955	0	15	0
890	Fuel Storage and Handling	0	0	0	0
895	Truck Stops	0	0	0	0
Total Other Mobile Sources		1,849,418	106	705	2
Total Stationary Sources		17,368,815	151	35,182	16
Total On-Road Vehicles		10,818,600	818	1,471	10
Total Other Mobile		1,849,418	106	705	2
Total Anthropogenic		30,036,834	1,076	37,358	28

**Table A-3, 2007 GHG Emissions Per Major Source Category For San Bernardino County**

CODE	Source Category	Emissions (TPY)			MMT
		CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> E
<b>Fuel Combustion</b>					
10	Electric Utilities	3,983,087	23	165	4
20	Cogeneration	1,802,031	28	189	2
30	Oil and Gas Production (Combustion)	2,087	0	0	0
40	Petroleum Refining (Combustion)	0	0	0	0
50	Manufacturing and Industrial	3,129,100	8	61	3
52	Food and Agricultural Processing	36,285	0	1	0
60	Service and Commercial	7,878,006	19	150	7
99	Other (Fuel Combustion)	187,158	1	8	0
<b>Total Fuel Combustion</b>		<b>17,017,753</b>	<b>79</b>	<b>573</b>	<b>15</b>
<b>Waste Disposal</b>					
110	Sewage Treatment	91,015	0	2	0
120	Landfills	997,181	2	7,633	1
130	Incineration	40,267	0	11	0
199	Other (Waste Disposal)	0	0	9,358	0
<b>Total Waste Disposal</b>		<b>1,128,463</b>	<b>2</b>	<b>17,005</b>	<b>1</b>
<b>Cleaning and Surface Coatings</b>					
210	Laundering	0	0	0	0
220	Degreasing	0	0	0	0
230	Coatings and Related Processes	6,973	0	61	0
240	Printing	0	0	0	0
250	Adhesives and Sealants	0	0	0	0
299	Other (Cleaning and Surface Coatings)	0	0	14	0
<b>Total Cleaning and Surface Coatings</b>		<b>6,973</b>	<b>0</b>	<b>75</b>	<b>0</b>
<b>Petroleum Production and Marketing</b>					
310	Oil and Gas Production	0	0	0	0
320	Petroleum Refining	0	0	0	0
330	Petroleum Marketing	0	0	2,026	0
399	Other (Petroleum Production and Marketing)	0	0	0	0
<b>Total Petroleum Production and Marketing</b>		<b>0</b>	<b>0</b>	<b>2,026</b>	<b>0</b>
<b>Industrial Processes</b>					
410	Chemical	0	0	99	0
420	Food and Agriculture	0	0	2	0
430	Mineral Processes	29,842	0	118	0
440	Metal Processes	0	0	0	0
450	Wood and Paper	0	0	0	0
460	Glass and Related Products	0	0	0	0
470	Electronics	0	0	0	0
499	Other (Industrial Processes)	0	0	17	0
<b>Total Industrial Processes</b>		<b>29,842</b>	<b>0</b>	<b>236</b>	<b>0</b>
<b>Solvent Evaporation</b>					
510	Consumer Products	0	0	0	0
520	Architectural Coatings and Related Solvent	0	0	0	0
530	Pesticides/Fertilizers	0	0	0	0
540	Asphalt Paving/Roofing	0	0	7	0

Total Solvent Evaporation		0	0	7	0
<b>Miscellaneous Processes</b>					
610 Residential Fuel Combustion	1,540,926	3	26	1	
620 Farming Operations	0	15	11,793	0	
630 Construction and Demolition	0	0	0	0	
640 Paved Road Dust	0	0	0	0	
645 Unpaved Road Dust	0	0	0	0	
650 Fugitive Windblown Dust	0	0	0	0	
660 Fires	0	0	6	0	
670 Waste Burning and Disposal	255,207	765	91	0	
680 Utility Equipment	0	0	0	0	
690 Cooking	0	0	119	0	
699 Other (Miscellaneous Processes)	0	0	0	0	
<b>Total Miscellaneous Processes</b>	<b>1,796,133</b>	<b>783</b>	<b>12,035</b>	<b>2</b>	
<b>On-Road Motor Vehicles</b>					
710 Light Duty Passenger Auto (LDA)	3,686,500	247	391	3	
722 Light Duty Trucks 1 (T1 : up to 3750 lb.)	1,036,600	97	110	1	
723 Light Duty Trucks 2 (T2 : 3751-5750 lb.)	2,164,450	189	208	2	
724 Medium Duty Trucks (T3 : 5751-8500 lb.)	1,547,600	84	128	1	
732 Light Heavy Duty Gas Trucks 1 (T4 : 8501-10000 lb.)	237,250	14	22	0	
733 Light Heavy Duty Gas Trucks 2 (T5 : 10001-14000 lb.)	47,450	3	4	0	
734 Medium Heavy Duty Gas Trucks (T6 : 14001-33000 lb.)	29,200	3	11	0	
736 Heavy Heavy Duty Gas Trucks ((HHHGT > 33000 lb.)	14,600	2	11	0	
742 Light Heavy Duty Diesel Trucks 1 (T4 : 8501-10000 lb.)	62,050	0	0	0	
743 Light Heavy Duty Diesel Trucks 2 (T5 : 10001-14000 lb.)	40,150	0	4	0	
744 Medium Heavy Duty Diesel Truck (T6 : 14001-33000 lb.)	386,900	1	4	0	
746 Heavy Heavy Duty Diesel Trucks (HHDDT > 33000 lb.)	2,748,450	7	102	2	
750 Motorcycles (MCY)	29,200	16	66	0	
760 Diesel Urban Buses (UB)	18,250	0	0	0	
762 Gas Urban Buses (UB)	10,950	1	0	0	
770 School Buses (SB)	43,800	0	0	0	
776 Other Buses (OB)	14,600	1	4	0	
780 Motor Homes (MH)	58,400	6	4	0	
<b>Total On-Road Motor Vehicles</b>	<b>12,176,400</b>	<b>672</b>	<b>1,066</b>	<b>11</b>	
<b>Other Mobile Sources</b>					
810 Aircraft	238,344	2	10	0	
820 Trains	920,958	23	72	1	
830 Ships and Commercial Boats	0	0	0	0	
840 Recreational Boats	143,843	37	237	0	
850 Off-Road Recreational Vehicles	11,279	22	77	0	
860 Off-Road Equipment	704,410	40	219	1	
870 Farm Equipment	54,546	0	11	0	
890 Fuel Storage and Handling	0	0	0	0	
895 Truck Stops	0	0	0	0	
<b>Total Other Mobile Sources</b>	<b>2,073,379</b>	<b>124</b>	<b>626</b>	<b>2</b>	
<b>Total Stationary Sources</b>	<b>19,979,163</b>	<b>864</b>	<b>31,957</b>	<b>19</b>	
<b>Total On-Road Vehicles</b>	<b>12,176,400</b>	<b>672</b>	<b>1,066</b>	<b>11</b>	
<b>Total Other Mobile</b>	<b>2,073,379</b>	<b>124</b>	<b>626</b>	<b>2</b>	
<b>Total Anthropogenic</b>	<b>34,228,943</b>	<b>1,660</b>	<b>33,649</b>	<b>32</b>	

**Table A-4, 2020 GHG Emissions Per Major Source Category For San Bernardino County**

CODE	Source Category	Emissions (TPY)			MMT
		CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> E
<b>Fuel Combustion</b>					
10	Electric Utilities	4,955,987	24	181	5
20	Cogeneration	1,800,825	28	189	2
30	Oil and Gas Production (Combustion)	2,087	0	0	0
40	Petroleum Refining (Combustion)	0	0	0	0
50	Manufacturing and Industrial	4,085,956	10	78	4
52	Food and Agricultural Processing	46,801	0	1	0
60	Service and Commercial	9,832,548	23	184	9
99	Other (Fuel Combustion)	191,502	1	8	0
<b>Total Fuel Combustion</b>		<b>20,915,706</b>	<b>87</b>	<b>641</b>	<b>19</b>
<b>Waste Disposal</b>					
110	Sewage Treatment	114,895	0	2	0
120	Landfills	1,357,810	2	9,417	1
130	Incineration	61,969	0	15	0
199	Other (Waste Disposal)	0	0	11,187	0
<b>Total Waste Disposal</b>		<b>1,534,674</b>	<b>3</b>	<b>20,622</b>	<b>2</b>
<b>Cleaning and Surface Coatings</b>					
210	Laundering	0	0	0	0
220	Degreasing	0	0	0	0
230	Coatings and Related Processes	10,709	0	84	0
240	Printing	0	0	0	0
250	Adhesives and Sealants	0	0	0	0
299	Other (Cleaning and Surface Coatings)	0	0	22	0
<b>Total Cleaning and Surface Coatings</b>		<b>10,709</b>	<b>0</b>	<b>106</b>	<b>0</b>
<b>Petroleum Production and Marketing</b>					
310	Oil and Gas Production	0	0	0	0
320	Petroleum Refining	0	0	0	0
330	Petroleum Marketing	0	0	2,058	0
399	Other (Petroleum Production and Marketing)	0	0	0	0
<b>Total Petroleum Production and Marketing</b>		<b>0</b>	<b>0</b>	<b>2,059</b>	<b>0</b>
<b>Industrial Processes</b>					
410	Chemical	0	0	166	0
420	Food and Agriculture	0	0	2	0
430	Mineral Processes	46,989	0	149	0
440	Metal Processes	0	0	0	0
450	Wood and Paper	0	0	0	0
460	Glass and Related Products	0	0	0	0
470	Electronics	0	0	0	0
499	Other (Industrial Processes)	0	0	24	0
<b>Total Industrial Processes</b>		<b>46,989</b>	<b>0</b>	<b>341</b>	<b>0</b>
<b>Solvent Evaporation</b>					
510	Consumer Products	0	0	0	0
520	Architectural Coatings and Related Solvent	0	0	0	0
530	Pesticides/Fertilizers	0	0	0	0
540	Asphalt Paving/Roofing	0	0	9	0

Total Solvent Evaporation		0	0	9	0
Miscellaneous Processes					
610 Residential Fuel Combustion	2,050,359	4	35	2	
620 Farming Operations	0	9	6,957	0	
630 Construction and Demolition	0	0	0	0	
640 Paved Road Dust	0	0	0	0	
645 Unpaved Road Dust	0	0	0	0	
650 Fugitive Windblown Dust	0	0	0	0	
660 Fires	0	0	6	0	
670 Waste Burning and Disposal	255,207	765	81	0	
680 Utility Equipment	0	0	0	0	
690 Cooking	0	0	150	0	
699 Other (Miscellaneous Processes)	0	0	0	0	
Total Miscellaneous Processes	2,305,566	778	7,229	2	
On-Road Motor Vehicles					
710 Light Duty Passenger Auto (LDA)	4,602,650	129	150	4	
722 Light Duty Trucks 1 (T1 : up to 3750 lb.)	1,339,550	51	47	1	
723 Light Duty Trucks 2 (T2 : 3751-5750 lb.)	2,810,500	101	120	3	
724 Medium Duty Trucks (T3 : 5751-8500 lb.)	1,971,000	49	77	2	
732 Light Heavy Duty Gas Trucks 1 (T4 : 8501-10000 lb.)	357,700	8	11	0	
733 Light Heavy Duty Gas Trucks 2 (T5 : 10001-14000 lb.)	76,650	2	4	0	
734 Medium Heavy Duty Gas Trucks (T6 : 14001-33000 lb.)	47,450	2	4	0	
736 Heavy Heavy Duty Gas Trucks ((HHHGT > 33000 lb.)	21,900	1	4	0	
742 Light Heavy Duty Diesel Trucks 1 (T4 : 8501-10000 lb.)	69,350	0	4	0	
743 Light Heavy Duty Diesel Trucks 2 (T5 : 10001-14000 lb.)	51,100	0	0	0	
744 Medium Heavy Duty Diesel Truck (T6 : 14001-33000 lb.)	525,600	2	0	0	
746 Heavy Heavy Duty Diesel Trucks (HHDDT > 33000 lb.)	4,288,750	11	47	4	
750 Motorcycles (MCY)	54,750	20	77	0	
760 Diesel Urban Buses (UB)	25,550	0	0	0	
762 Gas Urban Buses (UB)	10,950	1	0	0	
770 School Buses (SB)	58,400	0	0	0	
776 Other Buses (OB)	21,900	0	0	0	
780 Motor Homes (MH)	83,950	4	0	0	
Total On-Road Motor Vehicles	16,417,700	381	544	15	
Other Mobile Sources					
810 Aircraft	573,241	5	24	1	
820 Trains	1,143,196	29	89	1	
830 Ships and Commercial Boats	0	0	0	0	
840 Recreational Boats	225,110	47	146	0	
850 Off-Road Recreational Vehicles	17,991	37	120	0	
860 Off-Road Equipment	871,085	40	135	1	
870 Farm Equipment	50,921	0	4	0	
890 Fuel Storage and Handling	0	0	0	0	
895 Truck Stops	0	0	0	0	
Total Other Mobile Sources	2,881,544	158	519	3	
Total Stationary Sources	24,813,644	867	31,006	23	
Total On-Road Vehicles	16,417,700	381	544	15	
Total Other Mobile	2,881,544	158	519	3	
Total Anthropogenic	44,112,888	1,406	32,068	41	

**Table A-5, 2002 Daily Fuel Consumption Per Major Source Category For San Bernardino County**

<b>CODE</b>	<b>Source Category</b>	<b>Natural Gas (mmscf)</b>	<b>LPG/ Propane/ Butane (1000 gal)</b>	<b>Diesel/ Distillate Oil (1000 gal)</b>	<b>Gasoline (1000 gal)</b>	<b>Landfill Gas (mmscf)</b>	<b>Digester Gas (mmscf)</b>	<b>Residual Fuel Oil (1000 gal)</b>	<b>Jet Fuel (1000 gal)</b>	<b>Bituminous (Tons)</b>	<b>CNG (1000 gal)</b>
<b>Fuel Combustion</b>											
10	Electric Utilities	103.39	0.00	0.03	0.00	0.00	0.03	0.00	0.00	1071.17	0.00
20	Cogeneration	14.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1744.53	0.00
30	Oil and Gas Production (Combustion)	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00
40	Petroleum Refining (Combustion)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	Manufacturing and Industrial	103.63	40.67	67.28	0.11	0.00	0.00	0.41	0.00	0.00	0.00
52	Food and Agricultural Processing	1.32	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	Service and Commercial	270.21	39.27	166.13	27.06	0.00	0.73	0.00	1.01	0.00	0.00
99	Other (Fuel Combustion)	0.00	0.00	38.09	0.00	1.32	1.25	0.00	0.00	0.00	0.00
<b>Total Fuel Combustion</b>		<b>492.94</b>	<b>79.94</b>	<b>272.12</b>	<b>27.76</b>	<b>1.32</b>	<b>2.01</b>	<b>0.41</b>	<b>1.01</b>	<b>2815.70</b>	<b>0.00</b>
<b>Waste Disposal</b>											
110	Sewage Treatment	0.00	0.00	0.04	0.00	0.00	6.92	0.00	0.00	0.00	0.00
120	Landfills	0.00	0.00	0.00	0.00	83.38	0.00	0.00	0.00	0.00	0.00
130	Incineration	1.28	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00
199	Other (Waste Disposal)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Waste Disposal</b>		<b>1.28</b>	<b>0.00</b>	<b>0.04</b>	<b>0.00</b>	<b>83.38</b>	<b>6.99</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Cleaning and Surface Coatings</b>											
210	Laundrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	Degreasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
230	Coatings and Related Processes	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
240	Printing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	Adhesives and Sealants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
299	Other (Cleaning and Surface Coatings)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Cleaning and Surface Coatings</b>		<b>0.21</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Petroleum Production and Marketing</b>											
310	Oil and Gas Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	Petroleum Refining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

330	Petroleum Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
399	Other (Petroleum Production and Marketing)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production and Marketing		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial Processes											
410	Chemical	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
420	Food and Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
430	Mineral Processes	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
440	Metal Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
450	Wood and Paper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
460	Glass and Related Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	Electronics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
499	Other (Industrial Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Industrial Processes		0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Solvent Evaporation											
510	Consumer Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
520	Architectural Coatings and Related Solvent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
530	Pesticides/Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
540	Asphalt Paving/Roofing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Solvent Evaporation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous Processes											
610	Residential Fuel Combustion	66.94	7.10	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
620	Farming Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
630	Construction and Demolition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
640	Paved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
645	Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
650	Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
660	Fires	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
670	Waste Burning and Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
680	Utility Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
690	Cooking	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
699	Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Miscellaneous Processes		66.94	7.10	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
On-Road Motor Vehicles											
710	Light Duty Passenger Auto (LDA)	0.00	0.00	2.94	1036.38	0.00	0.00	0.00	0.00	0.00	0.00
722	Light Duty Trucks 1 (T1 : up to 3750 lb.)	0.00	0.00	13.05	330.25	0.00	0.00	0.00	0.00	0.00	0.00



723	Light Duty Trucks 2 (T2 : 3751-5750 lb.)	0.00	0.00	1.71	507.74	0.00	0.00	0.00	0.00	0.00	0.00
724	Medium Duty Trucks (T3 : 5751-8500 lb.)	0.00	0.00	0.83	307.90	0.00	0.00	0.00	0.00	0.00	0.00
732	Light Heavy Duty Gas Trucks 1 (T4 : 8501-10000 lb.)	0.00	0.00		59.78	0.00	0.00	0.00	0.00	0.00	0.00
733	Light Heavy Duty Gas Trucks 2 (T5 : 10001-14000 lb.)	0.00	0.00		14.80	0.00	0.00	0.00	0.00	0.00	0.00
734	Medium Heavy Duty Gas Trucks (T6 : 14001-33000 lb.)	0.00	0.00		10.64	0.00	0.00	0.00	0.00	0.00	0.00
736	Heavy Heavy Duty Gas Trucks ((HHDGT > 33000 lb.)	0.00	0.00		8.40	0.00	0.00	0.00	0.00	0.00	0.00
742	Light Heavy Duty Diesel Trucks 1 (T4 : 8501-10000 lb.)	0.00	0.00	0.74		0.00	0.00	0.00	0.00	0.00	0.00
743	Light Heavy Duty Diesel Trucks 2 (T5 : 10001-14000 lb.)	0.00	0.00	7.94		0.00	0.00	0.00	0.00	0.00	0.00
744	Medium Heavy Duty Diesel Truck (T6 : 14001-33000 lb.)	0.00	0.00	77.50		0.00	0.00	0.00	0.00	0.00	0.00
746	Heavy Heavy Duty Diesel Trucks (HHDDT > 33000 lb.)	0.00	0.00	602.82		0.00	0.00	0.00	0.00	0.00	0.00
750	Motorcycles (MCY)	0.00	0.00	0.00	6.62	0.00	0.00	0.00	0.00	0.00	0.00
760	Diesel Urban Buses (UB)	0.00	0.00	5.81		0.00	0.00	0.00	0.00	0.00	0.00
762	Gas Urban Buses (UB)	0.00	0.00	0.00	2.11	0.00	0.00	0.00	0.00	0.00	0.00
770	School Buses (SB)	0.00	0.00	8.55	0.85	0.00	0.00	0.00	0.00	0.00	0.00
776	Other Buses (OB)	0.00	0.00	1.79	1.63	0.00	0.00	0.00	0.00	0.00	0.00
780	Motor Homes (MH)	0.00	0.00	1.47	12.60	0.00	0.00	0.00	0.00	0.00	0.00
Total On-Road Motor Vehicles		0.00	0.00	725.15	2,299.70	0.00	0.00	0.00	0.00	0.00	0.00
Other Mobile Sources											
810	Aircraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.17	0.00	0.00
820	Trains	0.00	0.00	201.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
830	Ships and Commercial Boats	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
840	Recreational Boats	0.00	0.00	0.92	47.29	0.00	0.00	0.00	0.00	0.00	0.00
850	Off-Road Recreational Vehicles	0.00	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00
860	Off-Road Equipment	0.00	0.00	143.94	24.15	0.00	0.00	0.00	0.00	0.00	9.34
870	Farm Equipment	0.00	0.00	13.81	0.52	0.00	0.00	0.00	0.00	0.00	0.00
890	Fuel Storage and Handling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
895	Truck Stops	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Other Mobile Sources		0.00	0.00	360.07	77.16	0.00	0.00	0.00	51.17	0.00	9.34
Total Stationary Sources		562.35	87.04	272.88	27.76	84.70	9.00	0.41	1.01	2815.70	0.00
Total On-Road Vehicles		0.00	0.00	725.15	2299.70	0.00	0.00	0.00	0.00	0.00	0.00
Total Other Mobile*		0.00	0.00	360.07	77.16	0.00	0.00	0.00	51.17	0.00	9.34
Total Anthropogenic		562.35	87.04	1,358.10	2,404.62	84.70	9.00	0.41	52.18	2,815.70	9.34

## APPENDIX B

### GHG EMISSIONS FROM ELECTRICITY USAGE

Table B-1  
1996 San Bernardino County GHG Emissions from Electricity Usage\*

Emissions from Electricity Usage are derived from the following equation:

$$\text{Emissions}_{(\text{elec})} (\text{TPY}) = ((\text{Annual Consumption} \times \text{Emission Factor})/2000^*)$$

To convert from TPY to Million Metric Tons (MMT multiply TPY by (0.9072/1,000,000))

	Annual Electrical Consumption (MWh)	Emission Factor**			CO <sub>2</sub> TPY	CH <sub>4</sub> TPY	N <sub>2</sub> O TPY	CO <sub>2</sub> E MMT***
		CO <sub>2</sub> lbs/MWh	CH <sub>4</sub> lbs/MWh	N <sub>2</sub> O lbs/MWh				
<b>Residential</b>	<b>3,537,000</b>	<b>640</b>	<b>0.0067</b>	<b>0.0037</b>	<b>1,131,840</b>	<b>11.85</b>	<b>6.54</b>	<b>1.03</b>
<b>Non-Residential</b>	<b>6,822,000</b>				<b>2,183,040</b>	<b>22.85</b>	<b>12.62</b>	<b>1.98</b>
<b>Total</b>	<b>10,359,000</b>				<b>3,314,880</b>	<b>34.70</b>	<b>19.16</b>	<b>3.01</b>

\*The activity data was provided by the San Bernardino County (Obtained from the California Energy Commission)

\*\*Emission Factor for electricity usage as reported to California Climate Action Registry for Southern California Edison.

\*\*\*CO<sub>2</sub> equivalent conversion factors are from Table 2 of CARB's regulation for Mandatory Reporting of GHG emissions.

Table B-2  
2005 San Bernardino County GHG Emissions from Electricity Usage

Emissions from Electricity Usage are derived from the following equation:

$$\text{Emissions}_{(\text{elec})} (\text{TPY}) = ((\text{Annual Consumption} \times \text{Emissions Factor})/2000^*)$$

To convert from TPY to Million Metric Tons (MMT multiply TPY by (0.9072/1,000,000))

	Annual Electrical Consumption (MWh)	Emission Factor**			CO <sub>2</sub> TPY	CH <sub>4</sub> TPY	N <sub>2</sub> O TPY	CO <sub>2</sub> E MMT***
		CO <sub>2</sub> lbs/MWh	CH <sub>4</sub> lbs/MWh	N <sub>2</sub> O lbs/MWh				
<b>Residential</b>	<b>5,208,000</b>	<b>640</b>	<b>0.0067</b>	<b>0.0037</b>	<b>1,666,560</b>	<b>17.45</b>	<b>9.63</b>	<b>1.51</b>
<b>Non-Residential</b>	<b>9,551,000</b>				<b>3,056,320</b>	<b>32.00</b>	<b>17.67</b>	<b>2.78</b>
<b>Total</b>	<b>14,759,000</b>				<b>4,722,880</b>	<b>49.44</b>	<b>27.30</b>	<b>4.29</b>

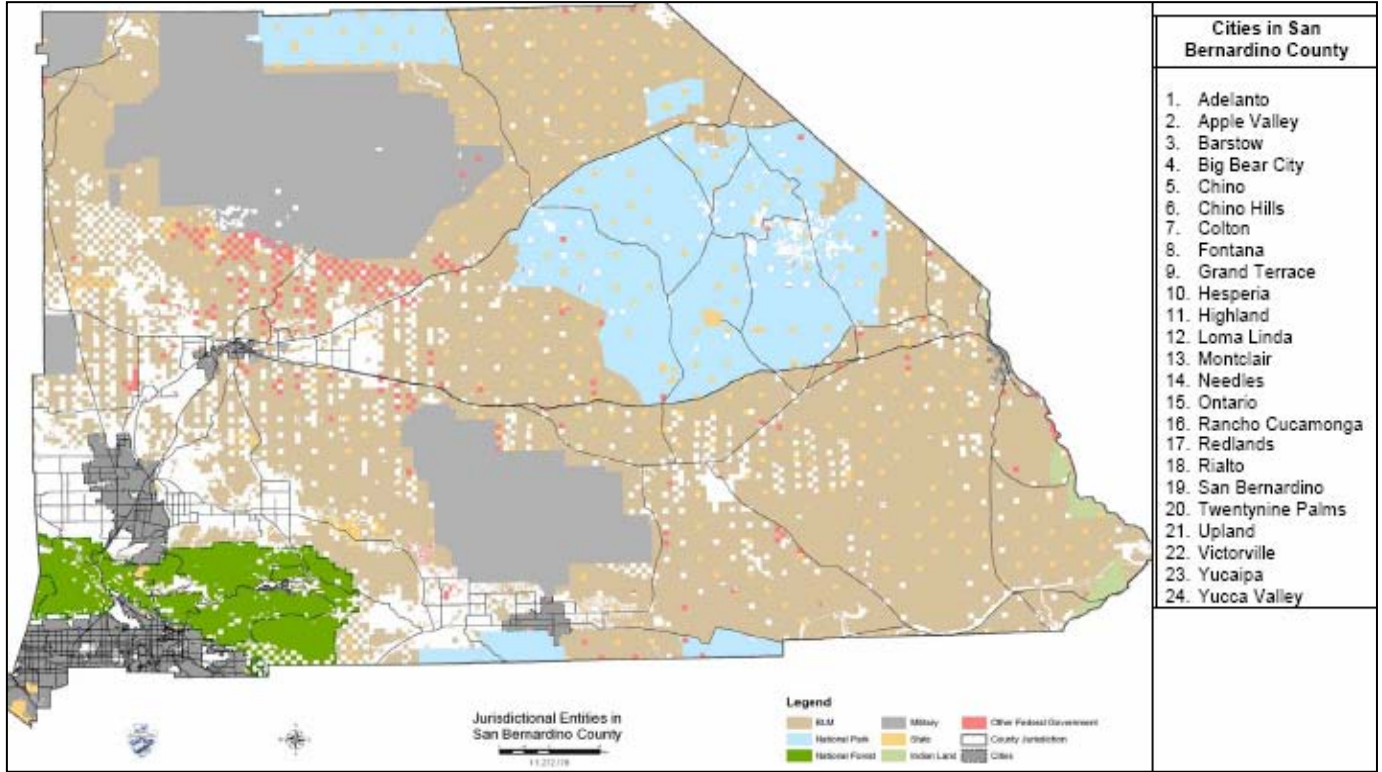
\*The activity data was provided by the San Bernardino County

\*\*Emission Factor for electricity usage as reported to California Climate Action Registry for Southern California Edison.

\*\*\*CO<sub>2</sub> equivalent conversion factors are from Table 2 of CARB's regulation for Mandatory Reporting of GHG emissions.

## APPENDIX C

### Figure C-1, San Bernardino County Land Use Map



Source: San Bernardino County Land Use Services Department, 2009

## APPENDIX D

### DAIRY, MANURE AND DIGESTIVE METHANE INVENTORY DOCUMENTATION

Table D-1  
1990 San Bernardino County Dairy GHG Emissions Summary\*

Total Milk Cows	Total Calves	Total Acres	Total Methane Emissions (MT/yr)	Total N <sub>2</sub> O Emissions (MT/yr)	CO <sub>2</sub> E (MT/yr)
<b>188,000</b>	<b>152,000</b>	<b>5,425</b>	<b>41,562.0</b>	<b>52.9</b>	<b>889,192</b>

\*The data was provided by the San Bernardino County Department of Agriculture, Weights and Measures, June 2008

Table D-2  
1990 San Bernardino County Dairy GHG Manure Methane Emissions

Animal	Head	Typical Animal Mass* (lbs)	Total Animal Mass (kg)	kg VS**/1000 kg Animal Mass/day	Total VS Produced (kg/yr)	Max. Methane Produced per kg of VS (m3/kg)	Methane Conversion Factor	Total Annual Methane Emissions (m3/yr)	Total Annual Methane Emissions (MT/yr)	Methane (lbs/day)	CO <sub>2</sub> E (MT/yr)
<b>Milk Cows</b>	<b>160,000</b>	<b>1,400</b>	<b>101,605,733</b>	<b>9.44</b>	<b>350,092,715</b>	<b>0.24</b>	<b>0.51</b>	<b>42,683,304</b>	<b>28,256.4</b>	<b>154,829</b>	<b>593,383</b>
<b>Dry Cows</b>	<b>28,000</b>	<b>1,120</b>	<b>14,224,803</b>	<b>6.82</b>	<b>35,409,801</b>	<b>0.17</b>	<b>0.02</b>	<b>108,354</b>	<b>71.7</b>	<b>393</b>	<b>1,506</b>
<b>Heifers (1-2 yrs)</b>	<b>76,000</b>	<b>1,003</b>	<b>34,576,794</b>	<b>6.41</b>	<b>80,897,596</b>	<b>0.17</b>	<b>0.02</b>	<b>247,547</b>	<b>163.9</b>	<b>898</b>	<b>3,441</b>
<b>Calves (3 mos-1 yr)</b>	<b>57,000</b>	<b>500</b>	<b>12,927,515</b>	<b>6.41</b>	<b>30,245,861</b>	<b>0.17</b>	<b>0.02</b>	<b>92,552</b>	<b>61.3</b>	<b>336</b>	<b>12,867</b>
<b>Calves (&lt;3 mos)</b>	<b>19,000</b>	<b>300</b>	<b>2,585,503</b>	<b>6.41</b>	<b>6,049,172</b>	<b>0.17</b>	<b>0.02</b>	<b>18,510</b>	<b>12.3</b>	<b>67</b>	<b>257</b>
<b>TOTALS***</b>	<b>340,000</b>		<b>165,920,348</b>		<b>502,695,145</b>			<b>43,150,267</b>	<b>28,565.5</b>	<b>156,523</b>	<b>599,875</b>

\*Typical Animal Mass from Dairy Technical Report

\*\*Volatile Solids

\*\*\*In total (#s may be slightly off due to rounding)

Source: EPA Methods for Estimating Greenhouse Gas Emissions from Livestock Manure Management (2005).

**Table D-3  
1990 San Bernardino County Digestive Methane Emissions**

<b>Animal</b>	<b>Head</b>	<b>Digestive Methane Emission Factor (lbs/cow/yr)</b>	<b>Digestive Methane Emissions (lbs/yr)</b>	<b>Digestive Methane Emissions (MT/yr)</b>	<b>Methane (lbs/day)</b>
<b>Milk Cows</b>	<b>160,000</b>	<b>119.10</b>	<b>19,056,000</b>	<b>8,662</b>	<b>52,208</b>
<b>Dry Cows</b>	<b>28,000</b>	<b>119.10</b>	<b>3,334,800</b>	<b>1,516</b>	<b>9,136</b>
<b>Heifers (1-2 yrs)</b>	<b>76,000</b>	<b>61.00</b>	<b>4,636,000</b>	<b>2,107</b>	<b>12,701</b>
<b>Calves (3 mos-1 yr)</b>	<b>57,000</b>	<b>20.60</b>	<b>1,174,200</b>	<b>534</b>	<b>3,217</b>
<b>Calves (&lt;3 mos)</b>	<b>19,000</b>	<b>20.60</b>	<b>391,400</b>	<b>178</b>	<b>1,072</b>
<b>TOTALS</b>	<b>340,000</b>		<b>28,592,400</b>	<b>12,997</b>	<b>78,335</b>
<b>Total Methane Emissions (MT/yr) (Manure + Digestive)</b>					<b>41,562</b>
<b>Total CO<sub>2</sub>E (MT/yr)</b>					<b>872,802</b>

Source: EPA 1998. AP-42, Fifth Edition, Volume I, Chapter 44: Greenhouse Gas Biogenic Sources 14.4 Enteric Fermentation – Greenhouse Gases, Supplement D., February 1998.

Table D-4  
1990 San Bernardino County N<sub>2</sub>O Emissions from Manure Management

**Liquid System**

Animal	Head	Factor	Typical Animal Mass (lbs)	Liquid Waste Factor	Liquid Waste Nitrogen (lbs/yr)	Liquid Waste Nitrogen (kg/yr)	Emission Factor (kg N <sub>2</sub> O-N/kg N)	N <sub>2</sub> O Emissions (N <sub>2</sub> O-N/kg N)	N <sub>2</sub> O (MT/yr)	N <sub>2</sub> O (lbs/day)
<b>Milk Cows</b>	<b>160,000</b>	<b>1.40</b>	<b>224,000</b>	<b>40.88</b>	<b>9,157,120</b>	<b>4,153,642</b>	<b>0.00</b>	<b>4,153.6</b>	<b>4.6</b>	<b>25</b>
<b>Dry Cows</b>	<b>28,000</b>	<b>1.12</b>	<b>31,360</b>	<b>24.64</b>	<b>772,632</b>	<b>350,464</b>	<b>0.00</b>	<b>350.5</b>	<b>0.4</b>	<b>2</b>
<b>Heifers (1-2 yrs)</b>	<b>76,000</b>	<b>1.03</b>	<b>78,280</b>	<b>24.64</b>	<b>1,928,623.5</b>	<b>874,818</b>	<b>0.00</b>	<b>874.8</b>	<b>1.0</b>	<b>5</b>
<b>Calves (3 mos-1 yr)</b>	<b>57,000</b>	<b>0.50</b>	<b>28,500</b>	<b>24.64</b>	<b>702,168.75</b>	<b>318,502</b>	<b>0.00</b>	<b>318.5</b>	<b>0.4</b>	<b>2</b>
<b>Calves (&lt;3 mos)</b>	<b>19,000</b>	<b>0.30</b>	<b>5,700</b>	<b>24.64</b>	<b>140,433.75</b>	<b>63,700</b>	<b>0.00</b>	<b>63.7</b>	<b>0.1</b>	<b>0.4</b>
<b>Subtotal Liquid*</b>	<b>340,000</b>				<b>12,700,978</b>	<b>5,761,126</b>		<b>5,761.1</b>	<b>6.5</b>	<b>34.4</b>

**Dry System**

Animal	Head	Factor	Typical Animal Mass (lbs)	Solid Waste Factor	Solid Waste Nitrogen (lbs/yr)	Solid Waste Nitrogen (kg/yr)	Emission Factor (kg N <sub>2</sub> O-N/kg N)	N <sub>2</sub> O Emissions (N <sub>2</sub> O-N/kg N)	N <sub>2</sub> O (MT/yr)	N <sub>2</sub> O (lbs/day)
<b>Milk Cows</b>	<b>160,000</b>	<b>1.40</b>	<b>224,000</b>	<b>10</b>	<b>9,157,120</b>	<b>4,153,642</b>	<b>0.02</b>	<b>20,768</b>	<b>22.9</b>	<b>125</b>
<b>Dry Cows</b>	<b>28,000</b>	<b>1.12</b>	<b>31,360</b>	<b>16</b>	<b>772,632</b>	<b>350,464</b>	<b>0.02</b>	<b>4,673</b>	<b>5.2</b>	<b>28</b>
<b>Heifers (1-2 yrs)</b>	<b>76,000</b>	<b>1.03</b>	<b>78,280</b>	<b>16</b>	<b>1,928,623.5</b>	<b>874,818</b>	<b>0.02</b>	<b>11,664</b>	<b>12.9</b>	<b>70</b>
<b>Calves (3 mos-1 yr)</b>	<b>57,000</b>	<b>0.50</b>	<b>28,500</b>	<b>16</b>	<b>702,168.75</b>	<b>318,502</b>	<b>0.02</b>	<b>4,247</b>	<b>4.7</b>	<b>26</b>
<b>Calves (&lt;3 mos)</b>	<b>19,000</b>	<b>0.30</b>	<b>5,700</b>	<b>16</b>	<b>140,433.75</b>	<b>63,700</b>	<b>0.02</b>	<b>849</b>	<b>1.0</b>	<b>5</b>
<b>Subtotal Dry*</b>	<b>340,000</b>				<b>12,700,978</b>	<b>5,761,126</b>		<b>42,201</b>	<b>46.5</b>	<b>254</b>
<b>Total Dry &amp; Liquid System*</b>								<b>47,963</b>	<b>53</b>	<b>288</b>

\*Numbers in totals may be off slightly due to rounding

Sources:

Liquid & solid waste factors and resulting liquid & solid waste nitrogen from SJVAPCD Dairy Technical Report, \_\_\_\_\_

Emission factor (kg N<sub>2</sub>O-N/kg N): EPA, Methods for Estimating Greenhouse Gas Emissions from Livestock Manure Management (March 2005) DRA

## APPENDIX E

### POPULATION AND EMPLOYMENT DATA

Table E-1 summarizes population and employment data used to project energy use in this analysis. All the socioeconomic data were provided by SCAG and used in the 2007 AQMP.

Table E-1

#### San Bernardino County Population and Employment Data

	1990	2002	2007	2020
Population	1,418,380	1,785,347	2,056,450	2,533,956
Employment	444,128	614,505	729,470	1,002,376

Table E-2 Summarizes Population Data for Areas under County's Jurisdiction

Table E-2

#### Population Data for Areas under County's Jurisdiction

	1990	2002	2007	2020
Population	207,083	260,661	300,242	369,958