APPENDIX C - CITY OF ROCKLIN 2008 COMMUNITY-WIDE BASELINE GREENHOUSE GAS EMISSIONS INVENTORY

City of Rocklin
2008 Community-Wide Baseline
Greenhouse Gas Emissions Inventory

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Acknowledgements

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1. Executive Summary

Climate change is quickly becoming a high priority among policy makers and residents alike. Through the stimulus-funded Energy Efficiency and Conservation Block Grant (EECBG) program, the City of Rocklin has chosen to address its contribution to climate change through the development of a baseline Community-Wide Greenhouse Gas (GHG) Emissions Inventory ("Inventory"). This Inventory identifies the major sources of greenhouse gas emissions within the city[5] and provides a baseline against which future progress can be measured. The Inventory will be used in conjunction with the City's General Plan Update and associated Environmental Impact Report (EIR).

What are Greenhouse Gas Emissions (GHGs)?

Gases that trap heat in the Earth's atmosphere are called greenhouse gases, or GHGs. Greenhouse gases include carbon dioxide, methane, nitrous oxide, and fluorinated gases. While many of these gases occur naturally in the atmosphere, modern human activity has led to a steep increase in the amount of GHGs released into the atmosphere over the last 100 years. Collectively, these gases intensify the natural greenhouse effect, thus causing global average surface temperatures to rise, which in turn affects global climate patterns. GHGs are often quantified in terms of CO_2 equivalent, or CO_2e, a unit of measurement that equalizes the potency of GHGs.

Source: Intergovernmental Panel on Climate Change (IPCC), 2007

It is important to note that while emissions from municipal operations were not separately analyzed, they are included as a subset of the community inventory in the commercial/industrial, transportation, and waste categories of the community-wide inventory. The municipal operations inventory, when completed, should not be added to the community analysis; rather it should be looked at as a slice of the complete picture.

To summarize, this Inventory does the following:

- Calculates GHGs from community-wide[6] activities, including municipal operations, within the City's jurisdictional boundary in calendar year 2008;
- Identifies the major sources of greenhouse gas emissions from community-wide sources;
- Provides City decision-makers and the community with adequate information to inform policy decisions; and
- Forecasts how emissions will grow in the community if no behavioral changes are made.

The 2008 community-wide baseline GHG Inventory represents a key step in the City of Rocklin's effort to improve air quality, enhance environmental sustainability, and ensure the safety and comfort of its residents for generations to come. In addition, this Inventory allows the City to quantitatively track and take credit for its numerous efforts related to energy efficiency and the mitigation of global climate change.

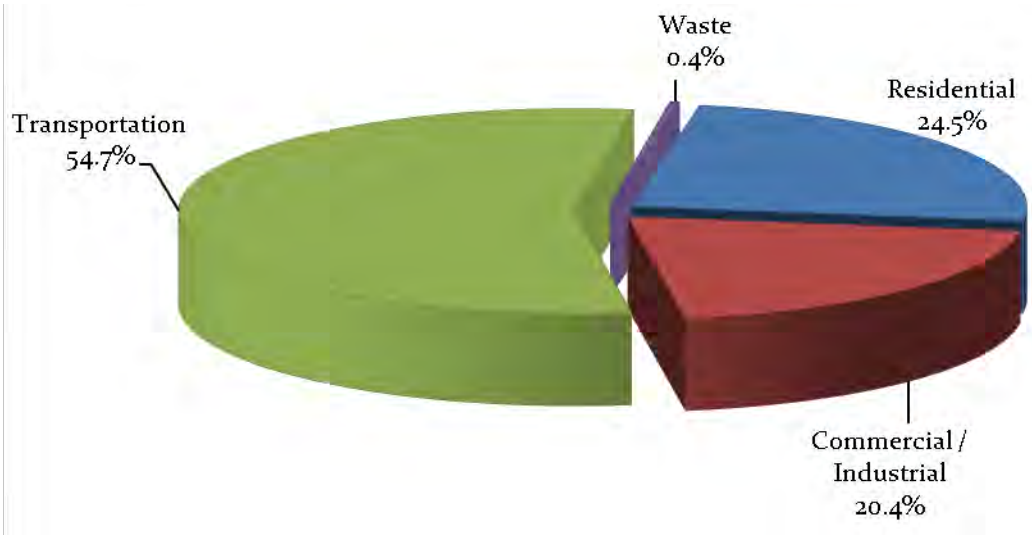
[5] *In this report, the term "city" refers to the area inside the jurisdictional boundary of the City of Rocklin, whereas "City" or "municipal" refers to those activities which are under the operational control of City agencies.*

[6] *"Community-wide" or "community" refers to all activities within the city (as defined above), including those from businesses, industrial processes, residents, vehicles, and municipal operations.*

1.1 Community-Wide GHG Inventory Results

The GHG Inventory identifies that the community of Rocklin emitted approximately 428,001 metric tons of CO_2e in the baseline year 2008. As shown in **Figure 1**, the transportation sector was the largest contributor to emissions (54.7%), producing approximately 234,207 metric tons of CO_2e in 2008. Emissions from the residential, commercial, and industrial sectors accounted for a combined 44.9% of the total. Largely due to Rocklin's single stream waste service, the waste sector contributed only 0.4% of emissions.

Figure 1 – Community-Wide Greenhouse Gas Emissions by Sector, 2008



The majority of emissions from the transportation sector were the result of gasoline consumption in private vehicles traveling on local roads and Interstate 80 (I-80) and State Route 65 (SR 65). GHG figures from the waste sector are the estimated future emissions that will result from the decomposition of waste generated by city residents and businesses in the base year 2008.

1.1.1 Data Limitations

This community-wide Inventory captures the major sources of greenhouse gases caused by activities within the city per standard practice. However, it is important to note that some likely emission sources were not included in the Inventory because of privacy laws, lack of data, or a lack of reasonable methodology for calculating emissions. It is estimated that these sources not included in the inventory comprise less than ~~10~~ 5% of total emissions in the city. It is likely that as greenhouse gas inventories become more common, methodology and accessibility to data will improve.

While an official protocol for community-wide emissions is not yet available from the State, this inventory is consistent with current best practices for greenhouse gas inventories. Inventories are commonly restricted to energy, transportation, and waste analysis due to lack of methodology or lack of reliable data to quantify other sources of emissions. This results in the exclusion of the following emission sources:

- Construction-related emissions
- Off-road vehicle emissions
- Propane emissions
- Refrigerant emissions
- Aircraft emissions
- Sewage treatment emissions

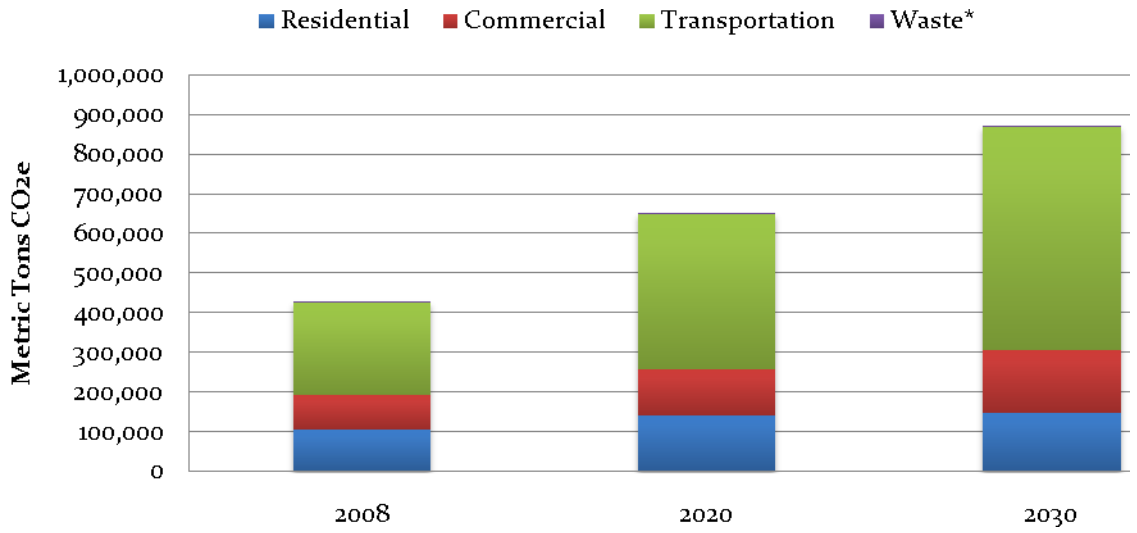
As inventory protocol and methodology advances, these sources can be incorporated into the baseline inventory. The current emissions sources are believed to comprise the vast majority of community-wide emissions.

With regard to refrigerant emissions, as a part of its AB 32 Scoping Plan, CARB developed specifications for commercial refrigeration systems to reduce high global warming potential direct and indirect greenhouse gas emissions. Direct refrigerant emissions occur from system leaks, ruptures, installations, maintenance, and end of life, while indirect emissions occur during equipment operation as a result of energy use. To further its efforts, CARB has now partnered with the California Energy Commission (CEC) to help develop new standards for commercial refrigeration systems that will be incorporated into the CEC's Title 24 Building Energy Efficiency Standards revisions for 2011. The new standards are anticipated to be adopted in June of 2011, to be implemented on January 1, 2013. Because new standards for commercial refrigeration systems are anticipated to become part of the Title 24 standards in the near future, this emissions inventory does not include any direct reduction efforts aimed at commercial refrigeration systems. However, should the Title 24 update process not proceed as anticipated and/or should the responsibility for regulating commercial refrigeration systems emissions be directed toward local governments, the City of Rocklin will consider addressing projects with commercial refrigeration systems with mitigation requirements to utilize low global warming potential (GWP) refrigerants or emission reduction efforts, as has been done previously by the City.

1.1.2 Forecast and Next Steps

If consumption trends continue the pattern observed in 2008, emissions will reach 651,599 metric tons of CO_2e by 2020 and 869,178 by 2030. This growth, shown in **Figure 2**, is due to projected increases in transportation, households, and jobs within the city.

Figure 2 – Business-as-Usual Greenhouse Gas Emissions Forecast



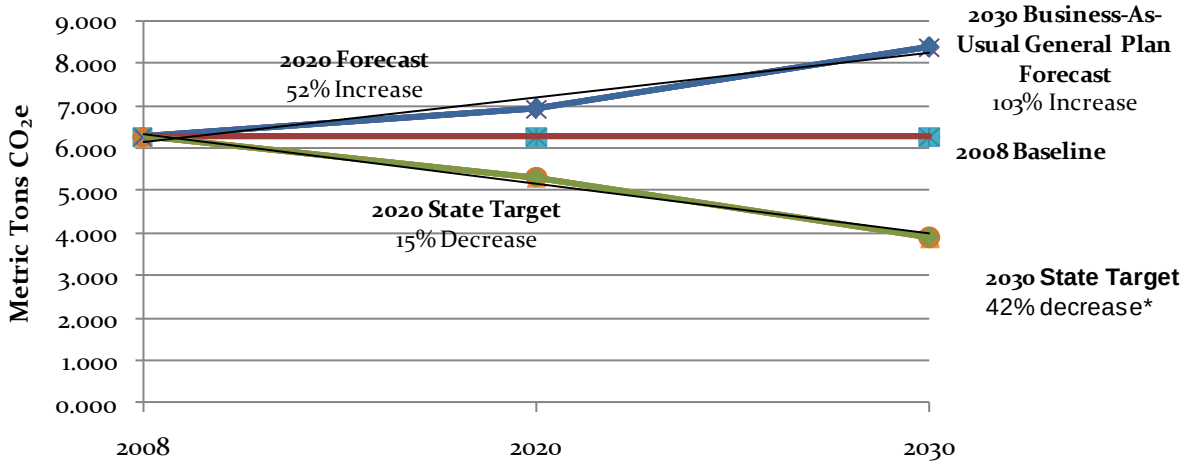
** Please note that waste emissions are less than 1% of total emissions and are therefore not visible at the scale of this figure.*

With this information, the City can make an informed determination of a reduction target. Presenting greenhouse gas emissions reductions as a per service population metric most accurately depicts the City's forecast emissions and reduction potential. Linking emissions to service population establishes a balanced point of comparison with other jurisdictions. Service population is an efficiency-based measure used to estimate the development potential of a general or area plan. Service population is determined by adding the number of residents to the number of jobs estimated for a given point in time. Service population was calculated using the General Plan growth assumptions for residential and non-residential land uses and I-PLACE$_3$S software which provides region-specific ratios of average employees per square footage of non-residential use as developed by the Sacramento Area Council of Governments (SACOG). The City of Rocklin's service population is presented in the table below.

Population and Jobs in the City of Rocklin	2008	2020	2030
Population	53,843	73,414	76,136
Jobs	14,488	20,744	27,659
Service Population (Population + Jobs)	68,331	94,158	103,795

This approach is similar to the metric approach that the California Air Resources Board will use for implementation of Senate Bill 375 (Steinberg, Chapter 728, Statutes of 2008).[7] A per service population metric is simple, easily understood by the public, and consistent with metrics currently in use by many Metropolitan Planning Organizations, including the Sacramento Area Council of Governments (SACOG). Conformance with the State of California's recommended reduction of 15% below present levels by 2020 would equal achieving emissions of 5.324 metric tons of carbon dioxide equivalent per service population.

Figure 3 – Rocklin Business-as-Usual Greenhouse Gas Emissions Forecast and State Reduction Targets



**2030 target is an interpolation of the Executive Order S-3-05 2050 target, which establishes a target of 80% below 1990 levels by 2050.*

[7] *Regional Targets Advisory Committee. September, 29, 2009. Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 376. http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf*

2.1. Baseline and Forecast Years

The City of Rocklin chose the baseline year of 2008 as the earliest year with strong data and for consistency with the General Plan. The State of California uses 1990 as a reference year to remain consistent with the Kyoto Protocol and because it has well-kept records of transportation trends and energy consumption in that year. However, cities and counties throughout California typically elect to use 2005 or 2006 as a baseline year because of the more reliable recordkeeping from those years and because of the large amount of growth that has occurred since 1990.

This Inventory uses a forecast year of 2020 to be consistent with the State of California GHG Inventory[8] forecast year and AB 32 target, both of which reference 2020. In addition, it is likely that any forecast beyond 2020 would have a significant margin of error because of unknown population growth rates and new technology.

2.2. Data Collection and Methodology

Creating the community emissions inventory required the collection of information from a variety of sources. Sources for community data included the Pacific Gas and Electric Company (PG&E), California Air Resources Board, and CalRecycle (formerly the California Integrated Waste Management Board). Data from the year 2008 was used in the inventory, with one exception: A subset of waste data by type was not available for 2008; therefore, this study utilizes a California statewide waste characterization study conducted in 2003–2004.

For community activities, emissions sources are categorized by scope. Scopes help us identify where emissions originate and what entity retains regulatory control and the ability to implement efficiency measures. The scopes are illustrated in **Figure 4** and defined as follows:

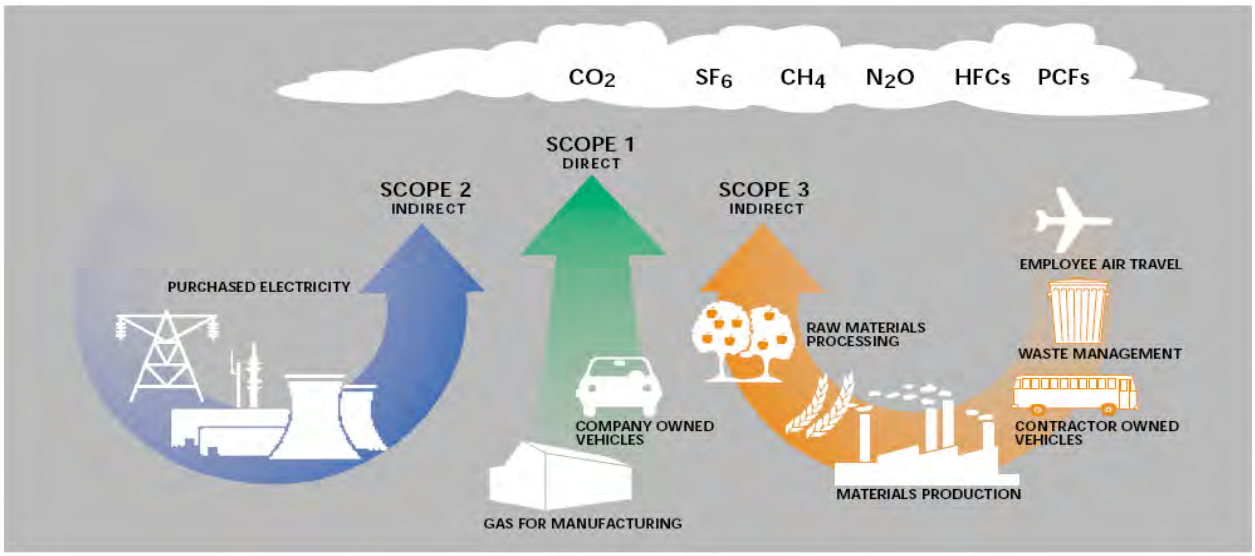
Scope 1. Direct emissions sources located within Rocklin, mostly from the combustion of fuels. Examples of Scope 1 sources include use of fuels such as gasoline and natural gas.

Scope 2. Indirect emissions that result because of ~~activates~~ activities within the jurisdictional boundary of the city, limited to electricity, district heating, steam and cooling consumption. Examples of Scope 2 sources include purchased electricity used within the city and associated with the generation of greenhouse gases at the power plant. These emissions should be included in the community-scale analysis, as they are the result of the community's electricity consumption.

Scope 3. All other indirect emissions that occur as a result of activity within the unincorporated areas. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community which decomposes at landfills either inside or outside the city.

[8] *California Greenhouse Gas Inventory, http://www.arb.ca.gov/cc/inventory/inventory.htm*

Figure 4 – Greenhouse Gas Emission Scopes



Source: NZBCSD (2002), The Challenge of GHG Emissions: the "why" and "how" of accounting and reporting for GHG emissions: An Industry Guide, New Zealand Business Council for Sustainable Development, Auckland

2.3. Data Sources

The data used to complete this Inventory came from multiple sources, as summarized in **Table 1**. Utility providers supplied electricity and natural gas consumption data associated with commercial, industrial, and residential buildings in 2008. Vehicle miles traveled (VMT) data was obtained from the General Plan Update Environmental Impact Report (EIR) Transportation Assessment. These data sources are further explained in the sector-specific discussions of this document.

Table 1 – Inventory Data Sources

Sector	Information	Unit of Measurement	Data Source
Residential	Electricity Consumption	~~Therms~~ kWh	PG&E
	Natural Gas Consumption	~~kWh~~ Therms	PG&E
Commercial/ Industrial	Electricity Consumption	~~Therms~~ kWh	PG&E
	Natural Gas Consumption	~~kWh~~ Therms	PG&E

Sector	Information	Unit of Measurement	Data Source
Transportation	VMT from trips originating or terminating within the city	Annual average VMT	General Plan EIR Transportation & Circulation Chapter
Solid Waste	Solid waste tonnage sent to landfill from activities in the city	Short tons	CalRecycle

2.4. Data Limitations

It is important to note that calculating community-wide greenhouse gas emissions with precision is a complicated task. It relies on numerous assumptions and is limited by the quantity and quality of available data. Because of these limitations, it is useful to think of any specific number generated by the model as an approximation of reality, rather than an exact value.

Despite these limitations, this inventory is the best-available snapshot of the city's greenhouse gas emissions. If methodology improves in the coming years, this baseline can be adjusted to reflect these changes. The following paragraphs highlight emissions that cannot be included in a GHG inventory under current science and policy direction, or because of lack of reliable data.

This Inventory does not separately analyze site-level emissions from specific sources such as refineries, landfills, and large industrial emitters. The emissions from industrial energy consumption and related transportation are included under the commercial/industrial category, but will not be analyzed independently as part of this Inventory. This is for two reasons: (1) state privacy laws prevent us from obtaining site-level energy consumption data from utility providers, and (2) it is the responsibility of the emitter, whether it is a large refinery or household, to perform their own energy audit and subsequent reduction process. Efforts to require site-level energy audits and greenhouse gas emissions reporting are being continually expanded and required by the California Climate Action Registry, U.S. Environmental Protection Agency, and California Air Resources Board.

The city's actual 2008 greenhouse gas emissions are likely to be slightly greater than what are reported in this document due to three main factors: (1) data limitations, (2) privacy laws, and (3) a lack of a reasonable methodology to collect or model emissions data from some emission sources.

Lack of available data prevented the calculation of emissions from community-wide freight and passenger trains, ports, off-road vehicles and equipment, propane use, and City government operations refrigerants. For rail, port, and other off-road vehicles and equipment emissions, the California Air Resources Board OFFROAD 2007 software provides emissions from rail activities; however, these numbers are aggregated for the entire Placer County area, including incorporated, unincorporated, and state or federally owned land. Without data specific to Rocklin and without a reasonable methodology for allocating the OFFROAD calculation, rail activity emissions were omitted. Lack of data availability also prevents the calculation of emissions from propane (liquefied petroleum gas, or LPG) created in the city. Propane is basically an unregulated fuel in California (except for storage and safety issues, which are regulated). Because it is an unregulated commodity, no data is collected by the state on propane sales or usage.

What's the difference between an emissions inventory and a carbon footprint?

An emissions inventory incorporates emissions directly caused by actions taken within the city that we know how to calculate. A carbon footprint, on the other hand, encompasses greenhouse gas emissions from the entire life cycle of a product or service. This could include the emissions from raising beef for sale at the supermarket or the fuel consumption associated with residents' flights in and out of Sacramento Airport. At this time, it is difficult to accurately estimate the community's carbon footprint. However, individuals may reduce their carbon footprint by buying locally produced foods and goods, reducing packaging, and other behavioral changes.

Lack of data availability also prevents the calculation of emissions from wastewater (sewage) created in the city. Municipalities, special services districts, and private landowners that collect, treat, and dispose of wastewater differ with regard to treatment and disposal methods, water efficiency requirements, impervious surface allowances, landscape irrigation efficiency standards, type of building stock, and data collection and reporting. As a result, it is unclear what portion of the sewage treated at each facility originates from city businesses and residents. For this reason, estimates associated with the city's share of sewage cannot be made at this time. Full accounting of emissions from wastewater collection, treatment, and disposal would require extensive coordination with special services districts, such as community services districts and sanitary districts, other municipalities, and private landowners.

Similarly, protocol and methodological barriers prevent us from including all emissions from the treatment and movement of water consumed by the community. Water in the city is provided by the Placer County Water Agency. The emissions from treatment facilities are the responsibility of the jurisdiction in which these facilities are located. As such, this Inventory only includes emissions from the electricity and natural gas consumed by water treatment facilities within the city's jurisdictional boundary. Lastly, there is a lack of reasonable methodology for estimating life-cycle emissions for the community. Life-cycle emissions are emissions associated with the production and disposal of items consumed by a community. For instance, a life-cycle assessment would estimate the emissions

associated with the planning, production, delivery, and disposal of each car currently in the city. In contrast, this analysis only captures how much that car drives within the city.

Given these limitations, it is likely that the city's emissions are slightly greater than presented in this Inventory. However, it is important to note that the emissions identified in this report are primarily greenhouse gases that the community has directly caused and has the ability to reduce through implementation of the City's Climate Action Plan.

2.5 Methodology

A baseline inventory (Inventory) of GHG emissions resulting from activities within the geopolitical boundary of Rocklin in calendar year 2008 was established. The Inventory will act as a baseline against which the City can measure future changes in GHG emissions and the effectiveness of reduction measures. As there is no protocol for community-wide GHG calculations at this time, the Inventory is based on a series of best practices and the California Air Resources Board Local Government Operations Protocol. The Inventory does not use ICLEI (Local Governments for Sustainability) Clean Air and Climate Protection (CACP) software.

GHG calculations include all six internationally recognized greenhouse gases regulated under the Kyoto Protocol: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). CO_2, C_2O, and CH_4 emissions constitute the majority of local government emissions. These GHGs are calculated using verified emissions coefficients and sources as outlined below. HFCs, PFCs, and SF_6 result from transportation refrigerants, industrial operations, and electricity generation. These emissions are discussed qualitatively in the City's emissions inventory for several reasons, including (1) a reliable source of activity data for these emissions does not exist or is unavailable due to privacy regulations; (2) these emissions constitute a small part of overall emissions; and (3) the majority of these GHGs are released by major manufacturers and power generators, all of which are regulated directly by the State.

GHGs are presented in metric tons (tonnes) of carbon dioxide equivalent (CO2e) per standard practice. Carbon dioxide equivalent accounts for the different potency, or global warming potential (GWP), of each greenhouse gas in order for all six GHGs to be compared on an equal basis.

The Inventory is based on historical activity data including vehicle miles traveled (VMT), energy consumption, and waste sent to landfills. Verified emission coefficients are applied to convert this activity data into carbon dioxide, methane, and nitrous oxide emissions. These subtotals are finally converted into total tonnes of CO2e using internationally recognized GWP factors developed by the Intergovernmental Panel on Climate Change (IPCC).

The sources of activity data and emission coefficients included in the Inventory are summarized in **Table 2**.

Table 2 – Emission Coefficient Sources

Sector	Activity Data Source	Emission Coefficient Source
Energy	2008 PG&E residential and commercial/ industrial electricity consumption	Verified CO_2 emission coefficient reported by PG&E <http://www.pge.com/about/environment/calculator/assumptions.shtml>
	2008 PG&E residential and commercial/industrial natural gas consumption	Verified CO_2, N_2O, and CH_4 emission coefficients from the California Air Resources Board (CARB) Local Government Operations Protocol v1.0 (Sept 2008)
Transportation	General Plan EIR traffic impact analysis	California Air Resources Board EMFAC 2007
Waste	2008 Municipal Solid Waste (MSW) and Alternative Daily Cover (ADC) tonnage by the California Integrated Waste Management Board (CIWMB) Waste Flow by Jurisdiction; Waste characterization by the CalRecycle 2004 Waste Characterization Report[9]	U.S. Environmental Protection Agency Waste Reduction Model (WARM)

[9] *The CalRecycle 2004 Waste Characterization Report is the most recent study determining average waste composition in California (paper, organics, metals, C&D, etc.). It is the standard for determining waste types for local government inventories in California.*

3. Community-Wide Inventory Results

The City of Rocklin is located in south Placer County in northern California. The city is 21 miles northeast of the city of Sacramento and 14 miles west of Auburn, in the western foothills of the Sierra Nevada range. Rocklin is bordered by the city of Lincoln to the north, city of Roseville to the south and west, unincorporated Placer County and State Route (SR) 65 to the west, and the town of Loomis to the east. The City of Rocklin is located in the rolling foothills of the Sierra Nevada range. Elevations in the city range from 150 to 525 feet above sea level. The community consists of urban areas, grasslands used for limited grazing, and riparian habitat areas, partially covered with native oaks and grasslands. Antelope Creek, Secret Ravine Creek, Pleasant Grove Creek, Clover Valley Creek, and Sucker Ravine Creek are perennial streams that provide riparian habitat for a variety of animals.

The area is served by two major highways, Interstate 80 (I-80) and State Route 65 (SR 65). I-80 provides access from Rocklin to Sacramento and the Bay Area to the west, and to the cities of Auburn and Reno to the east. SR 65 provides a connection to the cities of Lincoln and Marysville/Yuba City and SR 70 to the north and to the junction of I-80 to the south. Sierra College Boulevard connects to SR 193, which provides a link between the city of Lincoln and the community of Newcastle.

Scopes

The key principles to remember are that Scope 1 emissions are caused by activities within the city and emitted within the city (fuel combustion), while Scope 2 emissions are caused by activities within the city, but most likely are emitted outside of the city (electricity). Scope 3 emissions are indirect emissions, such as methane released from cattle, sheep, and waste decomposition.

3.1 Community-Wide Emissions by Scope

Although there are countless items that can be included in a community-scale emissions inventory, as discussed in Chapter 2, this Inventory includes Scope 1, Scope 2, and Scope 3 sources from the following sectors, consistent with ICLEI protocol:

- Residential
- Commercial/Industrial
- Transportation
- Waste

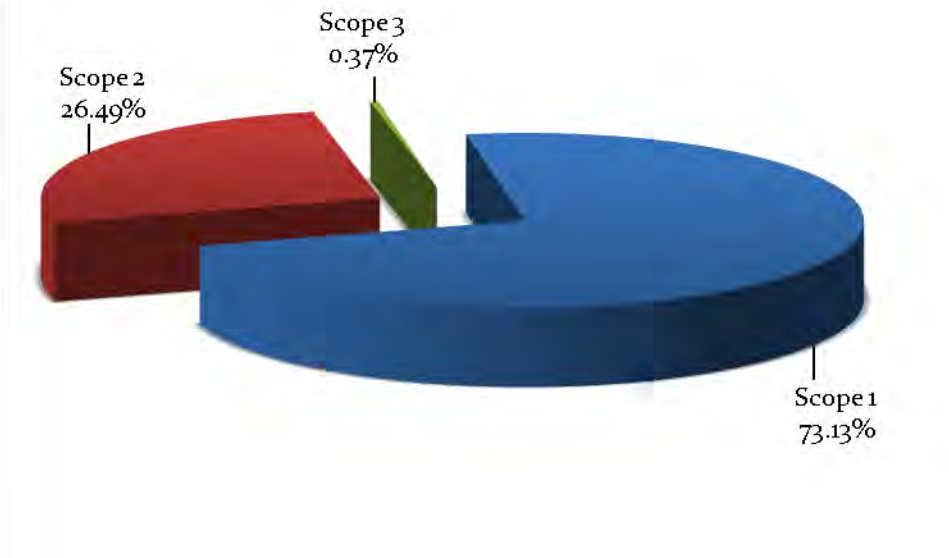
Table 3 summarizes the scopes of each sector in this analysis.

Table 3 – Baseline Greenhouse Gas Emissions by Scope

Sector	Scope 1 Emissions ($MTCO_2e$)	Scope 2 Emissions ($MTCO_2e$)	Scope 3 Emissions ($MTCO_2e$)	Total Emissions ($MTCO_2e$)
Residential	48,610	56,214	0	104,824
Commercial/Industrial	30,189	57,176	0	87,364
Transportation	234,207	0	0	234,207
Waste	0	0	1,605	1,605
Total	**313,006**	**113,390**	**1,605**	**428,001**
Percentage of Total	**73.13%**	**26.49%**	**0.37%**	**100.0%**

Including all sectors and scopes, the community emitted approximately 428,001 metric tons of CO_2e in 2008. As shown in **Figure 5**, the majority of community GHG emissions were Scope 1 (73.1%), with Scope 2 (29.49%) and Scope 3 (0.4%) constituting the remainder.

Figure 5 – Rocklin Baseline Emissions by Scope



The largest portion of Scope 1 emissions ~~came~~ comes from the transportation sector. These emissions qualify as Scope 1 because they involve the direct combustion of fuel within the jurisdictional boundary of the city. The second largest source of Scope 1 emissions was commercial and industrial natural gas use.

Commercial and industrial energy use generated the largest percentage of Scope 2 emissions; however, the difference between this sector and the residential sector is minimal.

3.2 All-Scope Emissions by Sector

As noted above, the community emitted approximately 428,001 metric tons of CO_2e in calendar year 2008. In addition to analyzing the data by scope, it can also be aggregated by sector. As depicted in **Figure 6** and **Table 4** below, the transportation sector was the largest emitter (54.7%) in 2008. Emissions from residential energy use produced 24.5% of emissions, while commercial and industrial energy use accounted for a combined 20.4%. The remaining 0.4% is attributed to emissions from waste.

Figure 6 – Rocklin Baseline Greenhouse Gas Emissions by Sector

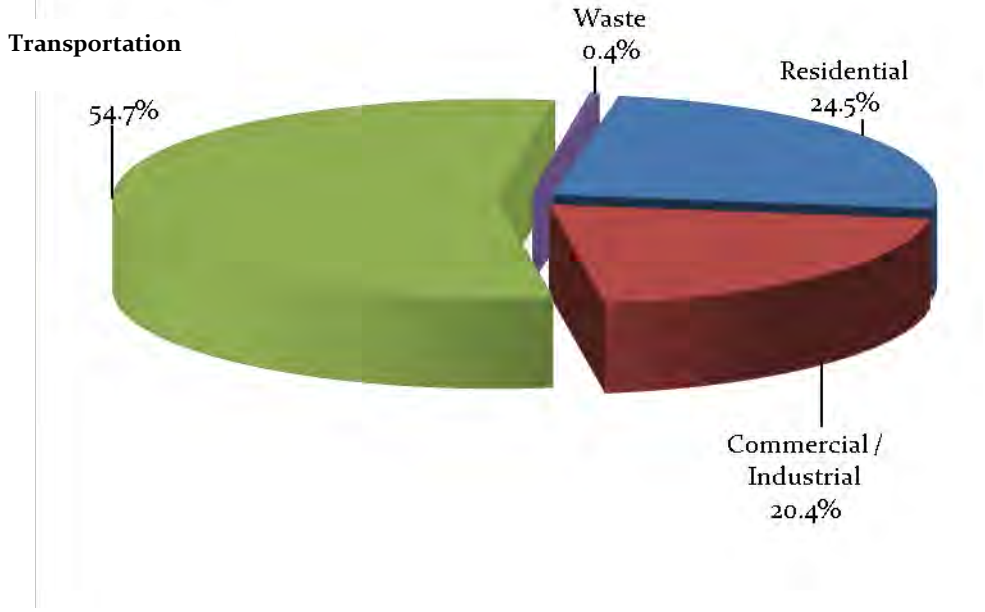


Table 4 – Rocklin Baseline Greenhouse Gas Emissions by Sector

2008 Baseline Greenhouse Gas Emissions	Metric Tons CO2e	Percentage of Total
Residential	104,824	24.5%
Commercial/Industrial	87,364	20.4%
Transportation	234,207	54.7%
Waste	1,605	0.4%
Total	**428,001**	**100.0%**

3.3 Transportation

As with the majority of California municipalities,[10] travel by on-road motorized vehicle constitutes the greatest percentage of greenhouse gas emissions in the city (54.7%). The Inventory does not include trains, boats, or off-road recreational vehicles, as there is no feasible methodology for calculating emissions from these sources.

These emissions result from the gasoline and diesel consumption of vehicle trips originating or terminating within the city. The 2008 General Plan Update Environmental Impact Report (EIR) provides the number of vehicle miles traveled (VMT) within Rocklin, as shown in **Table 5**. VMT was distributed by vehicle class and fuel according to Placer County averages included in the California Air Resources Board (CARB) EMFAC 2007 software.

Emissions that resulted from the air, rail, and boat travel of city residents were not included in the transportation sector analysis. As science and data collection methodology develop, it is likely that the greenhouse gas emissions from air, rail, and boat travel could be estimated as Scope 3 items.

Table 5 – Transportation Input and Output Data

Sector	Emissions Source	Input Data	Emissions Output ($MTCO_2e$/year)
Transportation	Vehicle Miles Traveled (VMT)	1,092,000 Daily VMT	234,207

3.4 The Built Environment (Residential, Commercial, Industrial)

With all scopes aggregated, 44.9% of total community-wide emissions in the year 2008 came from the "built environment." The built environment comprises residential, commercial, and industrial natural gas and electricity consumption. This analysis does not include emissions from other types of energy such as propane, solar, and wind due to lack of reliable sales, construction, or consumption data. The commercial and industrial sectors are combined in this Inventory due to a mandatory aggregating of commercial and industrial data by PG&E.[11]

[10] *For a list of California cities and counties that have developed GHG inventories, see the California Office of Planning and Research document here: http://www.opr.ca.gov/ceqa/pdfs/City_and_County_Plans_Addressing_Climate_Change.pdf*

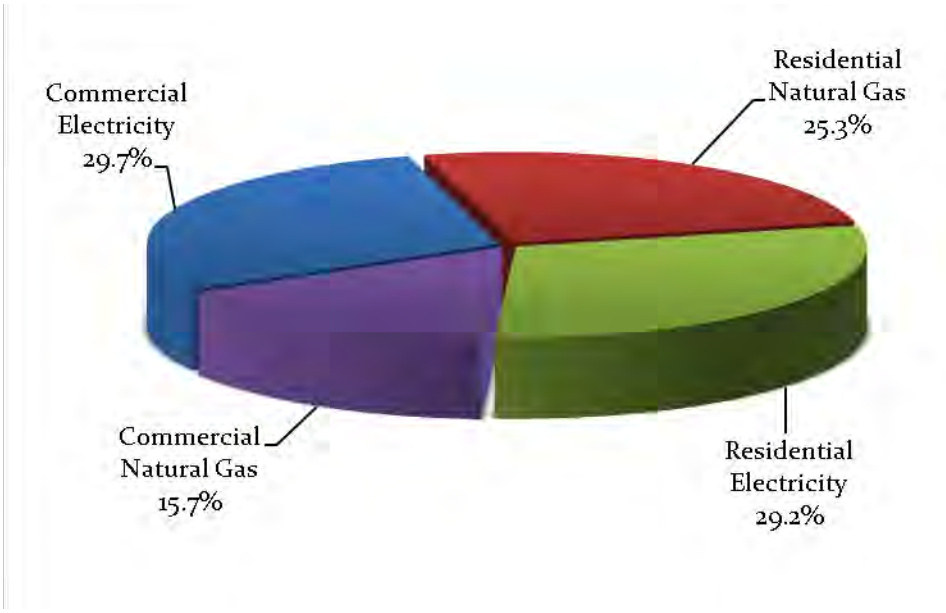
[11] *Commercial and Industrial Electricity and Natural Gas were combined into one section due to the California 15/15 rule. The 15/15 rule was adopted by the California Public Utilities Commission in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. Corie Cheeseman, Program Manager with Pacific Gas and Electric Company - Customer Energy Efficiency, provided this information.*

Table 6 – Energy Emissions by Sector and Source

Sector	Emissions Source	Input Data	Emissions Output (MTCO2e/ year)	% of Total Energy Emissions	% of Total Energy Emissions by Sector
Residential	Electricity	193,637,604 kWh/Year	56,214	29.2%	53.6%
	Natural Gas	9,159,404 Therms/Year	48,610	25.3%	
Commercial	Electricity	196,948,269 kWh/Year	57,176	29.7%	46.4%
	Natural Gas	5,688,385 Therms/Year	30,189	15.7%	
Total			**192,189**	**100.0%**	**100.0%**

In 2008, emissions from the built environment were split almost evenly between the commercial/industrial sector and the residential sector (see **Table 6**). All of the emissions calculated from the built environment were the result of local natural gas consumption (Scope 1) and local consumption of electricity generated outside of the city (Scope 2). Overall, natural gas consumption caused the majority of emissions from the built environment in 2008, as shown in **Figure 7.**

Figure 7 – Commercial and Residential Energy Emissions



It is useful to consider the causes behind significant variations in data when developing policies and programs to reduce emissions from each sector. For example, the policies that would aim to reduce emissions from the commercial/industrial sector may differ from those aiming to reduce emissions from

the residential sector based on the information above (and in the figures and tables below). In this regard, the emissions inventory provides valuable insight into policy development strategies.

3.4 Waste

Solid waste disposed of at managed landfills was responsible for 0.4% of total emissions for the community. The EPA's Waste Reduction (WARM) software calculates methane generation from waste sent to landfill in 2008 and accounts for the confirmed methane recovery factors.

Waste emissions are considered Scope 3 emissions because they are not generated in the base year, but will result from the decomposition of waste generated in 2008 over the full 100-year-plus cycle of its decomposition. In 2008, the community sent approximately 33,750 tons of waste to landfills. The 2004 California Statewide Waste Characterization Study provides standard waste composition for the State of California.[12] Identifying the different types of waste in the general mix is necessary, because decomposition of some materials generates methane within the anaerobic environment of landfills whereas others do not. Carbonaceous materials such as paper and wood actually sequester the methane released in managed landfills, thereby offsetting some or all of the emissions from food and plant waste.

Table 7 shows the estimated percentage of emissions coming from the various types of organic, methanogenic waste.

Table 7 – Waste Emissions by Type

Emissions Source	Input Data (Tons Landfilled*)	Emissions Output (MTCO2e/ year)	% of Total Waste Emissions
Aluminum Cans	67.5	0.7	0.04%
Steel Cans	270.0	2.8	0.18%
Glass	776.3	8.1	0.51%
HDPE	168.8	1.8	0.11%
PET	168.8	1.8	0.11%
Corrugated Cardboard	1,923.8	174.4	10.87%
Magazines/third-class mail	270.0	-24.2	-1.51%
Newspaper	742.5	-180.6	-11.26%
Office Paper	675.0	324.8	20.24%
Phonebooks	67.5	-16.4	-1.02%
Dimensional Lumber	3,240.0	-461.7	-28.77%
Food Scraps	4,927.5	913.8	56.94%

[12] *http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097*

Emissions Source	Input Data (Tons Landfilled*)	Emissions Output (MTCO2e/ year)	% of Total Waste Emissions
Yard Trimmings	776.3	-72.9	-4.55%
Grass	1,417.5	58.3	3.63%
Branches	101.3	-14.4	-0.90%
Mixed Paper, Broad	3,442.5	255.5	15.92%
Mixed Metals	2,261.3	23.7	1.48%
Mixed Plastics	2,868.8	30.0	1.87%
Mixed Organics	2,328.8	95.4	5.94%
Mixed MSW	4,556.3	455.8	28.40%
Carpet	708.8	7.4	0.46%
Personal Computers	405.0	4.2	0.26%
Concrete	1,451.3	15.2	0.95%
Fly Ash	33.8	0.4	0.02%
Tires	101.3	1.1	0.07%
Total	**33,750.0**	**1,604.9**	**100.0%**

3.5 Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. Currently, it is difficult to make meaningful comparisons between local inventories because of variations in the scope of inventories conducted. Only when ICLEI, the California Air Resources Board, and other organizations adopt universal reporting standards will local inventories be prepared in a consistent manner and therefore be comparable.

Simply dividing total community greenhouse gas emissions by population in 2008 (53,843) yields a result of 7.95 metric tons CO_2e per capita.[13] It is important to understand that this number is not the same as the carbon footprint of the average individual living in Rocklin. It is also important to note that the per capita emissions number for the city is not directly comparable to every per capita number produced by other emissions studies because of differences in emission inventory methods.

[13] *California Department of Finance. 2008. E-5 Report City/County Population and Housing Estimates.*

4. 2020 and 2030 Emissions Forecast

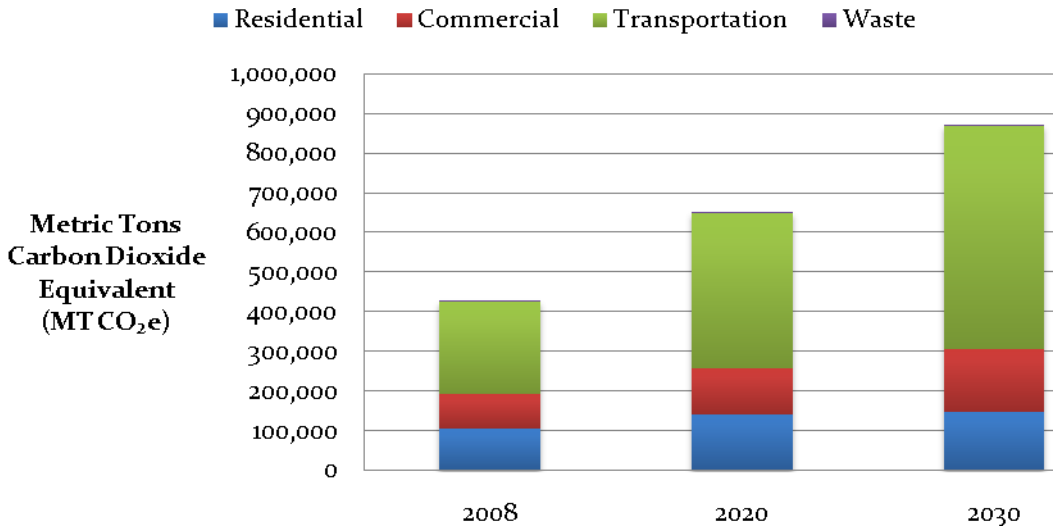
In order to assess the effectiveness of various reduction strategies, we must predict where emissions levels will be at the time of strategy implementation. To do this, we create what are called forecast years, or years when we take a snapshot of where annual emissions levels could be under various scenarios. Forecasting is completed by adjusting baseline levels of emissions consistent with household, population, commercial square footage, and transportation growth.

The basis for all growth scenarios is a business-as-usual projection. A business-as-usual projection predicts how greenhouse gas emissions will increase if behaviors and efficiencies do not change from 2008 levels, yet population, households, and vehicle miles traveled in Rocklin continue to increase. The business-as-usual analysis for Rocklin used analysis and assumptions included in the General Plan Update and General Plan Update EIR for the 2030 buildout scenario.

Consistent with state law, buildout is a worst-case scenario, or the maximum amount of development and population growth that the city could expect. While complete buildout is very unlikely for the City of Rocklin within the time frame of this emissions inventory, we use the projections in the General Plan Update buildout analysis in order to remain consistent with the General Plan Update EIR and state recommendations.

Given these caveats, the business-as-usual General Plan Update forecast found that if energy use, waste production, and transportation trends continue as they did in 2008, emissions within the City of Rocklin will grow by 52% in 2020 and by 103% in 2030 due to population, household, vehicular travel, and commercial growth.

Figure 8 – City of Rocklin 2020 and 2030 Business-as-Usual Forecast



** Please note that waste emissions are less than 1% of total emissions and are therefore not visible at the scale of this figure.*

Table 8 – City of Rocklin 2020 and 2030 Forecast

Business-As-Usual Forecast (Metric Tons CO2e)	2008 Baseline	2020 Forecast (% Change)	2030 Forecast (% Change)
Residential	104,824	140,703 (+34%)	145,920 (+39%)
Commercial	87,364	114,736 (+31%)	159,126 (+82%)
Transportation	234,207	393,971 (+68%)	561,863 (+140%)
Waste	1,605	2,188 (+36%)	2,270 (+41%)
Total	**428,001**	**651,599 (+52%)**	**869,178 (+103%)**

** Subtotals and totals may not equal the sum of component parts shown in this table due to rounding*

4.1. Development Assumptions: General Plan Buildout

The General Plan Update analyzed three residential buildout scenarios, based on low, mid-range, and high growth scenarios. These scenarios are based on regional growth forecasts, recent building permit trends, and historic growth factors. The City has assumed that the mid-range growth scenario is most likely to be the accurate average over the buildout horizon. In order to project buildout of non-residential development, the City estimated the annual average absorption rate (historic) for each land use category based on an annual average of the actual growth that occurred between 1992 and 2008.

The baseline figures and projections for the Rocklin business-as-usual projection are summarized in **Tables 9** through **12**.

Table 9 – City of Rocklin General Plan Update Population Projections

Year	Population	Change	% Change	Annual % Change
1990[1]	19,033			
2000[1]	36,330	17,297	91%	9.0%
2008[2]	53,843	17,513	48 %	6.0%
2015 Projected[3]	65,614	11,771	22%	3.1%
2020 Projected[3]	73,414	7,800	12%	2.4%
2030 Projected[3]	76,136	2,722	4%	0.5%

Sources: 1 U.S. Census (1990–2000), available at http://factfinder.census.gov.
2 DOF, 2008, available at http://www.dof.ca.gov/research/demographic/.
3 City of Rocklin, 2011, General Plan Update Environmental Impact Report, Table 3.0-2, in Section 3.0, Project Description..
Note: Since there is no certainty with regard to the actual pace of population growth, the City of Rocklin has developed population projections based on a low, mid-range, and high growth scenario. For planning purposes, the City has assumed that the mid-range growth scenario is the most likely, but the high-growth scenario was used for conservatively predicting greenhouse gas forecast assumptions. The low growth scenario assumes that residential building permits issued will average 200 dwelling units per year, resulting in a 2030 population of 66,133. The mid-range growth scenario (shown above) assumes that residential building permits issued will average 400 dwelling units per year, resulting in a residential buildout population of 76,136 by the year 2028. The high growth scenario assumes that residential building permits issued will average 600 dwelling units per year, resulting in the residential buildout population of 76,136 by the year 2021.

Table 10 – City of Rocklin General Plan Update Household Projections

Year	Households	Change	% Change	Annual % Change
2000[1]	14,421			
2008[2]	21,036	6,615	46%	5.8%
2015 Projected[3]	25,236	4,200	20%	2.8%
2020 Projected[3]	28,236	3,000	12%	2.4%
2030 Projected[3]	29,283	1,047	4%	3.7%

Sources:
1 U.S. Census, 1990 and 2000, available at http://factfinder.census.gov.
2 DOF, 2008, available at http://www.dof.ca.gov/research/demographic/.
3 City of Rocklin, 2011, General Plan Update Environmental Impact Report, Table 3.0-2 in Section 3.0, Project Description.
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Table 11 – City of Rocklin General Plan Update Non-Residential Growth Projection Scenarios

Land Use	1992	2008	2030	Buildout
Retail & Commercial Centers	819,000 sq. ft.	3,074,600 sq. ft.	6,176,050 sq. ft.	8,893,700 sq. ft.
Office	188,000 sq. ft.	1,066,900 sq. ft.	2,275,748 sq. ft.	7,043,300 sq. ft.
Industrial	1,890,000 sq. ft.	3,053,300 sq. ft.	4,652,832 sq. ft.	5,099,000 sq. ft.
Total	**2,897,000 sq. ft.**	**7,194,800 sq. ft.**	**13,104,630 sq. ft.**	**21,036,000 sq. ft.**

Source: City of Rocklin, 2011, General Plan Update Environmental Impact Report, Table 4-3B, page 4A-13

Table 12 – General Plan Update Vehicle Miles Traveled (VMT) with Origin or Destination (or both) in City of Rocklin

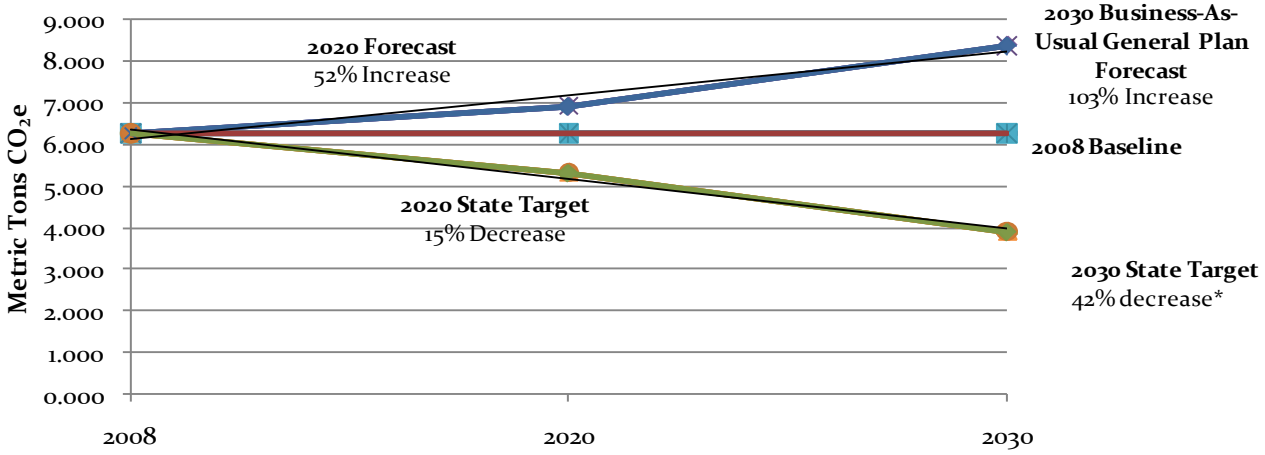
	Existing Conditions	Cumulative Conditions			
		Buildout of the Current General Plan	Buildout of the Proposed General Plan	Change in VMT with Proposed General Plan	
Daily	1,092,000	2,478,000	2,498,000	+20,000	0.8%
PM Peak Hour	92,500	209,100	212,200	+3,100	1.5%

Source: City of Rocklin, 2011, General Plan Update Environmental Impact Report.
Note: Estimated using the travel demand model

This magnitude of recommended state reductions relative to Rocklin's General Plan emissions forecast will require significant action at the local, regional, and state level. The State of California Air Resources Board adopted the AB 32 Scoping Plan in December 2008, which recommends that local agencies adopt a reduction target of 15% below current levels by 2020. The Air Resources Board has concluded that a 15% reduction from present levels is equivalent to achieving 1990 levels of greenhouse gas emissions. Year 1990 is not recommended as a reference point in local government inventories because of lack of reliable data.

Figure 9 below shows expected emissions growth relative to AB 32 reduction targets. It also shows 2030 emissions growth in comparison to a linear reduction target line set by Governor Schwarzenegger's Executive Order S-03-05. This Executive Order calls for an 80% reduction below 1990 levels by 2050, or approximately a 95% reduction from present levels. In 2030, a linear projection of this target would equate to approximately 42% of Rocklin's 2008 emissions.

Figure 9 – Business-as-Usual Emissions Growth and State Reduction Targets



**2030 target is an interpolation of the Executive Order S-3-05 2050 target, which establishes a target of 80% below 1990 levels by 2050.*

A 15% reduction is equivalent to achieving 5.324 metric tons of carbon dioxide equivalent per service population. The emissions inventory presents the reduction target as a per service population metric for purposes of accuracy and simplicity. A service population metric equalizes the impact of divergent growth rates between regions and creates a clear basis for comparison with other jurisdictions. Service population

emissions metrics are also consistent with Senate Bill 375 implementation (Steinberg, Chapter 728, Statutes of 2008).[14]

Figure 9 is also a depiction of Rocklin's challenge in attempting to meet state reduction targets. Emissions will continue to increase along the business-as-usual scenario while reduction efforts are initiated. The State is therefore requiring much more than a 15% decrease; the City must also reduce forecasted growth in emissions to achieve the reduction target. Specifically, the City will have to reduce forecasted emissions from 6.92 metric tons CO_2e per service population to 5.32 metric tons CO_2e per service population (a 29.98% decrease). In **Figure 9** above, this disparity is depicted by the difference between the blue line and the green line, both of which show projected increases or desired decreases relative to the red-colored baseline. The City's intent to address greenhouse gas emissions as development occurs through the CEQA review process will work to reduce Rocklin's projected business-as-usual emissions through evaluating local, regional, state, and national strategies and how they apply to Rocklin's emissions inventory that are presented in this document.

[14] Regional Targets Advisory Committee. September 29, 2009. Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375. http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf