



CITY OF BENICIA

2010 GHG EMISSIONS
INVENTORY UPDATE



FINAL as of April 2014 (draft completed in May 2013)
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Executive Summary

The City of Benicia has worked to implement Climate Action Plan (CAP) programs and policies in an effort to reduce greenhouse gas (GHG) emissions. Adopted in 2009, the Benicia CAP sets reduction goals for local government and community-wide emissions for 2010 and 2020. The purpose of this Inventory Update is to quantify 2010 emissions from sources in the city and compare those numbers to the baseline inventory that quantified 2000 emissions. This comparison will enable the City to evaluate progress towards meeting its 2010 reduction goals. This Inventory Update also summarizes future potential local GHG reductions attributable to recently passed State legislation and incorporates new data collection protocols that take into account region-specific data, both of which result in a more accurate accounting of emissions for 2000 and 2010, and therefore, a redefined path toward meeting 2020 goals.

The Inventory Update Report includes the following Sections:

- Introduction & Purpose (Chapter 1)
- 2010 Greenhouse Gas Inventory (Chapter 2)
- Moving Forward (Chapter 3)
- Acknowledgments (Appendix A)
- Tools, Calculations, Data Collection Sources, and Notes (Appendix B)
- Works Cited (Appendix C)

Inventory Update – Relationship to Baseline Inventory & CAP

In 2007, Benicia's City Council adopted a resolution to act on climate change and officially joined ICLEI – Local Governments for Sustainability. ICLEI is a recognized leader in local sustainability and provides training, protocols, and guidance documents to help local governments achieve sustainability, climate protection, and clean energy goals. ICLEI does not mandate or direct cities to implement specific projects or programs; instead, it serves as a resource for local governments. After joining ICLEI, the City chose to participate in ICLEI's Five Milestones Process for Climate Protection:

- Conduct a baseline emissions inventory and forecast
- Adopt an emissions reduction target for the forecast year
- Develop a climate action plan
- Implement plan policies and measures
- Monitor and verify results

In 2009, the City completed Milestones 1-3 and adopted a CAP that set reduction goals based on the baseline emissions inventory and forecast. The City also conducted an inventory for 2005 to determine if its emissions projections were accurate. Since 2009, the City has worked on Milestone 4, implementing CAP policies and measures. The purpose of this report is to monitor and verify the results of those efforts (Milestone 5).

Protocols – Changes Since 2008

Since the baseline GHG emissions inventory was conducted, both the Bay Area Air Quality Management District (BAAQMD) and ICLEI have updated their inventory protocols. ICLEI has provided new guidance on inclusion of additional emissions sources and has updated emissions coefficients to better reflect state and local conditions as opposed to using national averages that may artificially inflate emissions. The 2000 baseline inventory was updated for this report to reflect these protocols and guidance as follows.

1. Emissions Sources Added to Original Inventory

Emissions Source	Year 2000	Year 2010
Off-road Vehicles	Off-road vehicle emissions were included as a subcategory of Transportation emissions and labeled “Other” emissions.	Off-road emissions were labeled “Off-road” and new coefficients for diesel fuel were used to calculate emissions.
Water Delivery	Water delivery emissions were included in Building & Facility emissions.	Emissions were labeled “Water Delivery” so that local governments could identify ways to improve water distribution and processes to reduce energy and water consumption.
Waste	“Waste” was not included as a separate category in the 2000 inventory. Instead, all waste that was reported (sludge from wastewater treatment processes) was included in water delivery and treatment	Waste has been included as a separate category in this update and includes all waste generated by the local government and community respectively. Updated protocols require that the City report all waste generated in the City as it does exert some control over levels of waste, even though it is being sent outside the jurisdiction to a landfill.
Emissions from Large Facilities	Emissions data was collected by BAAQMD for permitted entities and was the only source of emissions data for large facilities.	Emissions for large facilities emitted 25,000MTCO ₂ e annually or greater is collected by the Environmental Protection Agency (EPA) and includes emissions from all sources at the facility, not just permitted sources. EPA data should be used instead of BAAQMD permit data if available for a full-accounting of emissions at large facilities.

2. Emissions Forecast

- a. Emissions forecasts allow the City to estimate future emissions so that it can determine the gap between projected emissions and its reduction goals. As part of this inventory update, the Business as Usual (BAU) and Adjusted Business as Usual (ABAU) forecasts were updated to reflect actual 2010 data as well as new modeling from the regional transportation agency, new census data, modified growth rates, updated utility emission rates, and the impacts from recently passed state legislation including the Renewable Portfolio Standard (RPS), Low Carbon Fuel Standard, Title 24 building code, and Assembly Bill 32. Cap and Trade has not been included because local impacts, i.e. the amount of funding designated for local projects and the resulting emission reductions have not yet been modeled, but the City continues to advocate for revenues to be returned to local governments for implementation of GHG reducing projects. Further explanation of the above mentioned legislation is included in Chapter 1.
- b. The Business as Usual (BAU) forecast models emissions for 2020 and 2035 to determine projected emissions increases without implementing any reduction strategies. The BAU was completed separately (1) with, and (2) without large industrial emitters. As mentioned in the following section, large industrial emitters are

primarily regulated by State and Federal agencies, and the City has limited ability to influence these emissions. Therefore, modeling emissions excluding these emitters gives the City a clearer picture of where it should focus its reduction efforts moving forward.

- c. The Adjusted Business as Usual (ABAU) forecast also models emissions for 2020 and 2035 but takes into account the reductions in local emissions as a result of State legislation. Much of this legislation became effective after 2009 and therefore its impacts were not accounted for in the baseline ABAU forecast. For further discussion of emissions forecasts, see Chapter 2.

3. Organizing Inventory Data

- a. Utilized updated employee commute survey provided by ICLEI.
- b. Updated internal data collection methods to ensure transparency. The CAP Coordinator developed a centralized file sharing system that organizes data by sector and includes source information and relevant notes.
- c. Limited financial and staff resources have forced cities and counties to focus on reducing emissions from sources it can control. For example, refineries are largely regulated by the BAAQMD, the California Air Resources Board (CARB), and the U.S. Environmental Protection Agency (EPA). These entities issue rules and regulations that address process emissions and it is their responsibility to mandate technological changes and practices that reduce these emissions. Contra Costa County recently recognized this challenge and proposed, with BAAQMD support, that large industrial emitters should be inventoried and reported but excluded from total community-wide emissions. This exclusion will allow the City to focus its reduction efforts on those entities that it can affect, i.e. smaller commercial and industrial businesses, residents, transportation, and local government operations. This method may also help make the City's community reduction goals more attainable.

4. 2005 Interim Inventory Totals

In 2008, two inventories were completed: a baseline inventory for 2000 and an interim inventory for 2005. The 2005 inventory allowed the City to better understand emissions trends and develop strategies to specifically address Benicia's emissions sources so it could meet 2010 goals. According to the 2009 Benicia CAP, the City's 2005 community-wide emissions increased 5.6% to 4,250,000 metric tons of carbon dioxide equivalent (MTCO₂e)¹ from 4,000,000 MTCO₂e in 2000.

The 2005 interim inventory totals were calculated using older protocols and software as explained above. To remedy this inconsistency, the City updated the 2000 baseline inventory data to reflect the new protocols and assumed the same 5.6% increase between 2000 and 2005. The new 2005 community-wide total is estimated at 3,314,670 MTCO₂e (including large industrial emitters) and 514,309 MTCO₂e (excluding large industrial emitters). As mentioned in the previous section, the Sonoma State University Inventory Team continues to recommend that the City exclude large industrial emitters when measuring its progress toward meeting its reduction goals because the City has

¹ Carbon dioxide equivalency is a conversion method used to express the global warming potential (GWP) of multiple greenhouse gases using a consistent unit of measurement, carbon dioxide equivalent metric tons (MTCO₂e). The measurement is expressed in terms of the amount of carbon dioxide (CO₂) that would have the same GWP as the mixture. For example, methane is twenty-one times more potent than carbon dioxide, giving it a GWP of 21, expressed as 21 MTCO₂e. [21 is what it used in the IPCC and BAAQMD guidance, though scientists commonly use 21, 23, or 25].

limited control over these process related emissions and will achieve greater reductions by focusing its efforts on emissions sources it can affect.

5. **Transportation Emissions - Vehicle Miles Traveled (VMT) Data**

For the baseline inventory (2000), vehicle activity data was provided by the California Department of Transportation using the *Geographic Method* and that data was broken down into vehicle types by the Metropolitan Transportation Commission (MTC). For the interim inventory (2010), MTC generated all activity data using the *Origin Method* and still broke down the data by vehicle type using CARB's Emission Factor Model (EMFAC). Emissions were calculated in the Master Data Workbook by converting VMT to fuel use and fuel use was entered in CACP to generate emissions data. The methods for collecting vehicle activity are described below:

Geographical Boundary

This method captures all daily VMT on a roadway network within a specified geographic area. It includes local trips within the area plus interregional travel that does not have an origin and destination within the geographic area. This method only considers traffic within the physical limits of the study area and does not include the impact of vehicles once they travel outside the area limits.

Origin Destination

In 2010, ICLEI modified its protocols and recommended that cities utilize this method that tracks all the vehicle trips generated within a geographic area across the entire network to their ultimate destinations and isolates the daily VMT as follows:

1. Internal-internal (II): All daily trips made entirely within the study jurisdiction.
2. One-half of internal-external: One-half of daily trips with an origin within the study jurisdiction and a destination outside of this jurisdiction. This assumes that the study jurisdiction shares half the responsibility for trips traveling from other jurisdictions.
3. One-half of external-internal: One-half of daily trips with an origin outside the study jurisdiction and a destination within this jurisdiction. Similar to the IX trips, this assumes that the study jurisdiction shares the responsibility of trips traveling to other jurisdictions.
4. External-external: Trips through the study jurisdiction are not included because the study jurisdiction cannot implement policies that influence the trip-making behavior. Rather, through trips are assigned to other jurisdictions that can influence either the origin or destination side of the trip-making behavior.

2010 Reduction Goals

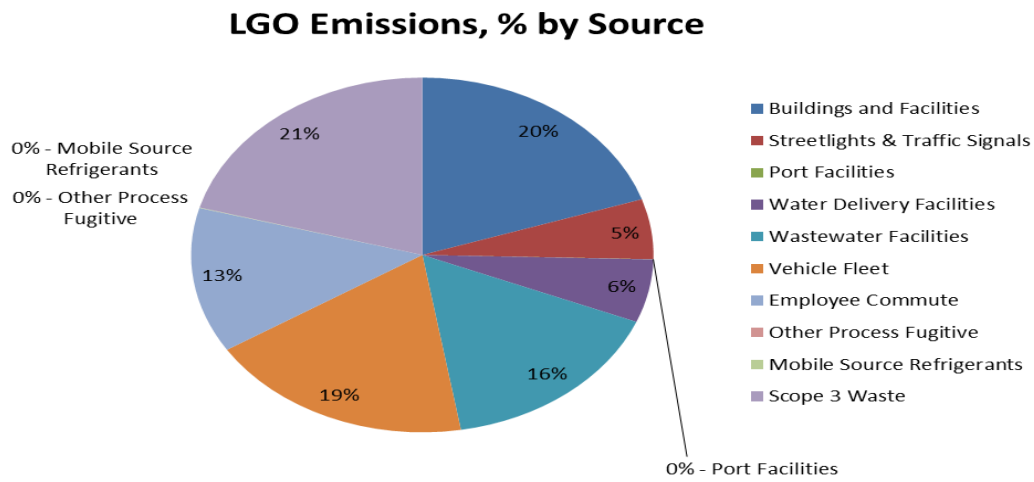
Emission reduction targets are a vital component of GHG reduction efforts. The City set reduction targets in 2009 to provide a goal toward which the community could strive to meet and measure its progress against in 2010 and again in 2020. This Inventory Update includes emissions from the residential, commercial/industrial, water, transportation, and waste sectors and compares these 2010 totals to the baseline to determine if the City has met its goals.

Local Government Operations

- **Reduce GHG emissions to 25 percent below 2000 levels by 2010**

In 2000, local government operations were 6,160 MTCO₂e. By 2010, emissions decreased to 4,800 MTCO₂e or a 21% decrease, and 42% below emissions projected in the 2009 CAP of 8,300 MTCO₂e. The City made substantial progress toward meeting its 2010 goal, and missed its reduction target by only 4%.

Below is a breakdown of 2010 local government operations emissions by source.



Community-wide Activities

- **Reduce GHG emissions to maintain 2005 levels by 2010**

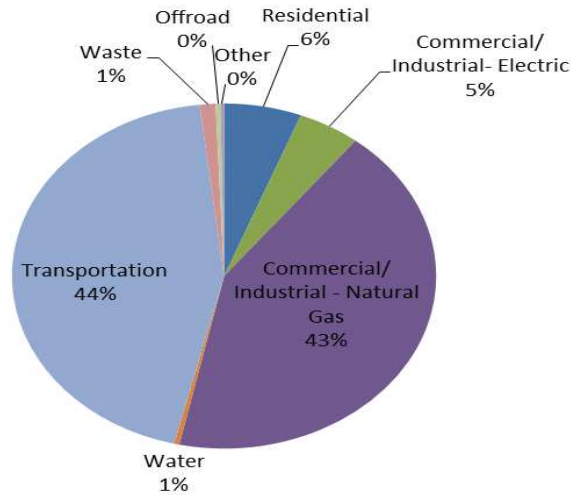
In 2000, community-wide emissions with large industrial emitters were 3,138,900 MTCO₂e. By 2010, emissions increased to 3,885,770 MTCO₂e, a 24% increase.² Community-wide emissions without large emitters were 487,040 MTCO₂e in 2000 and by 2010, emissions increased to 688,700 MTCO₂e, a 41% increase.

² Prior to 2009, large emitters reported emissions only to the Bay Area Air Quality Management District (BAAQMD). After passage of the California Global Warming Solutions Act (AB 32), the California Air Resources Board (CARB) developed new reporting protocols for major sources. In addition, beginning in 2009, the Environmental Protection Agency (EPA) required large facilities (those that emit at least 25,000MTCO₂e annually) to report all emissions on an annual basis (Mandatory Reporting Rule (MRR)). The only facility required to report under this rule is the Valero Refinery. After review of the ICLEI – Local Governments for Sustainability - Community-wide Protocol and consultation with the BAAQMD, the Inventory Team used 2010 EPA data for the Valero Refinery, and BAAQMD permit data for all other large emitters. Finally, it should be noted that the EPA MRR utilizes different reporting protocols than BAAQMD used prior to 2009. Therefore, one of the reasons emissions from large emitters increased between 2000 and 2010 may be because of how those emissions were reported by the Valero Refinery.

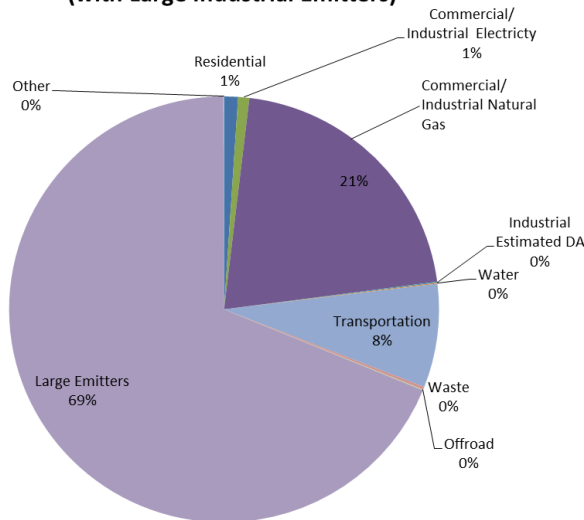
To achieve additional reductions in the community and meet its 2020 reduction goals (without large industrial emitters), the City may consider shifting its efforts to other emissions sources, such as the commercial/industrial and transportation sectors.

Below is a breakdown of total 2010 community-wide emissions with and without large industrial emitters.

**2010 Community-wide MTCO₂e
(without Large Industrial Emitters)**



**2010 Community-wide MTCO₂e
(with Large Industrial Emitters)**



Chapter 1

Introduction & Purpose

1.1 Climate Change: State and Local Context

State Context for Climate Change

California has long been a sustainability leader, as illustrated by Governor Schwarzenegger signing Executive Order (EO) S-3-05 in 2005. EO S-3-05 recognizes California's vulnerability to a reduced snowpack, exacerbation of air quality problems, and potential sea-level rise due to a changing climate. To address these concerns, the governor established targets to reduce statewide GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050.

Overview of Legislation

In 2006, California became the first State in the country to adopt a statewide GHG reduction target through AB 32. This law codifies the EO S-3-05 requirement to reduce statewide emissions to 1990 levels by 2020, but does not officially adopt the 2050 goal. AB 32 resulted in the 2008 adoption by the California Air Resources Board (CARB) of a *Climate Change Scoping Plan* (Scoping Plan), outlining the State's plan to achieve emission reductions through a mixture of direct regulations, alternative compliance mechanisms, incentives, voluntary actions, market based mechanisms, and funding. The Scoping Plan addresses similar areas to those contained in the Benicia CAP, including transportation, building energy efficiency, water conservation, waste reduction, and green infrastructure. The Plan also calls for the CARB to develop a mechanism by which Cap-and-Trade revenues will be allocated. The CARB has developed a Cap-and-Trade Auction Proceeds Investment Plan that evaluates statewide opportunities for GHG emission reductions and identifies priority investments that will help achieve those reductions.

AB 32 caused several companion pieces of legislation to be signed into law that require emission reductions that will help reduce community-wide GHG emissions locally. These legislative actions and regulations are referred to as statewide actions throughout this plan and represent a significant source of estimated GHG reductions. This Inventory Update estimates the GHG emission reductions that will result from the following:

- The Renewable Portfolio Standard (RPS)
- 2013 California Title 24 and AB 1109
- Low Carbon Fuel Standard (EO-S-1-07)
- Vehicle efficiency regulations
- SB 375

Renewable Portfolio Standard

EO-S-14-08 and SB X 1-2 have established increasingly stringent Renewable Portfolio Standard (RPS) requirements for California utilities. These laws require that major energy providers (such as PG&E) increase the share of non-GHG producing energy sources, such as wind, solar, geothermal, biomass, and small-scale hydro, over time.

- EO-S-14-08 increased the RPS from 20% by 2010 to 33% by 2020. PG&E, Benicia's electricity provider, delivered 12.1% of its electricity from renewable sources in 2005 and 19% in 2010.
- SB X1-2 codified the 33% RPS by 2020 requirement established by EO-S-14-08.

California Title 24

Title 24 of the California Code of Regulations dictates how new buildings and major remodels are constructed in California. Part 6 of Title 24 details energy efficiency standards for residential and non-residential development. It is updated on approximately a three-year cycle. The State will be increasing building energy conservation requirements through adoption of the 2013 Title 24 standards, which will go into effect beginning in 2014. It is estimated that these revisions to the current 2008 Title 24 standards will result in energy efficiency increases of 16% and 20% for electricity and natural gas statewide, respectively. The City's estimates used in the CAP are conservative to account for delayed adoption of the standards and homeowner behaviors.

The requirements of AB 1109, the California Lighting Efficiency and Toxics Reduction Act, signed into law in 2007, are included in the new Title 24 standards. AB 1109 requires the California Energy Commission to adopt energy efficiency standards for all general purpose lights, reducing lighting energy usage in indoor residences and State facilities by at least 50% by 2018, and a 25% reduction in lighting for commercial facilities by 2018. To achieve these efficiency levels, the California Energy Commission applied its existing appliance efficiency standards to lighting products, and required minimum lumen/watt standards for different categories of lighting products. In addition, the bill prohibits the manufacturing for sale or the sale of certain general purpose lights that contain hazardous substances.

SB 375 – Sustainable Communities and Climate Protection Act of 2008

SB 375 helps the State meet the emission reduction goals set in AB 32 by promoting regional planning and quantifying the environmental and health benefits associated with reduction in vehicle miles traveled (VMT) and increasing the share of pedestrian and bike trips as well as public transit use. The legislation requires the California Air Resources Board (CARB) to develop regional greenhouse gas emission reduction targets by reducing the number and length of passenger trips. Then, each of the 18 metropolitan planning organizations must prepare a "sustainable community strategy" (SCS) that demonstrates how each region will meet its GHG reduction target through integrated land use, housing, and transportation planning. CARB then reviews each SCS to determine whether, if implemented, the plan would achieve GHG emission reduction targets for the region. If the goals are not met, then the metropolitan planning organization (MPO) must prepare a separate "alternative planning strategy" (APS). The Metropolitan Transportation Commission's (MTC) One Bay Area Plan has been released, and an environmental impact report (EIR) was completed as of March 2013. This plan sets a regional policy framework that helps cities develop local strategies to reduce emissions.

Vehicle Efficiency Regulations

AB 1493 – Pavley I and II

AB 1493, California's mobile source GHG emissions regulations for passenger vehicles, or California Clean Car Standards, was signed into law in 2002. AB 1493 (also known as Pavley I and II after its author) requires CARB to develop and adopt regulations that reduce GHG emissions from passenger vehicles, light-duty trucks, and other non-commercial vehicles for personal transportation. In 2004, CARB approved amendments to the California Code of Regulations adding GHG emissions standards to California's existing standards for motor vehicle emissions.

EO-S-1-07 – The Low Carbon Fuel Standard

EO-S-01-07 requires reduction of the carbon intensity of California's transportation fuels by at least 10% by 2020. The Low Carbon Fuel Standard (LCFS) is a performance standard with flexible compliance mechanisms that incentivize the development of a diverse set of clean, low-carbon transportation fuel options to reduce GHG emissions.

SB 7x

SB 7x requires the state to achieve a 20% reduction in urban per capita water use by December 31, 2020. The state is required to make incremental progress toward this goal by reducing per capita water use by at least 10% on or before December 31, 2015. SB 7x requires each urban retail water supplier to develop both long-term urban water use targets and an interim urban water use target. SB 7x also creates a framework for future planning and actions for urban and agricultural users to reduce per capita water consumption 20% by 2020.

Local Context for Climate Change

Background

Benicia was the first city in Solano County to conduct GHG emissions inventories and to adopt a CAP. Beginning in 2012, the remaining Solano County cities (Dixon, Rio Vista, Suisun City, Vacaville, and Fairfield) began preparing GHG emissions inventories and in 2013 started to develop CAPs as part of a regional-effort funded by the PG&E Green Communities Program and a Strategic Growth Council Planning grant in partnership with the Solano Transportation Authority (STA). As part of its commitment outlined in the grant agreement, the City of Benicia reviewed preliminary documents for the other cities in the county in hopes of creating regional consistencies where possible.

Benicia is now the first city in Solano County to conduct a second inventory and measure and track the impacts of CAP program and measure implementation. It was also the first to request BAAQMD review to determine if the CAP has successfully been drafted in line with BAAQMD guidance. Feedback received from BAAQMD may be used to update the CAP.

Relationship to General Plan

This inventory process is also in line with the City's General Plan, which contains policies and programs to reduce GHG emissions. The City's policy commitment includes encouraging higher density, mixed-use and infill development in appropriate locations, and promoting resource conservation and on-site energy production in new and existing buildings. Inclusion of these types of programs is consistent with the following guidance:

- The California Office of Planning and Research (OPR) is preparing a 2013 update to the state's *General Plan Guidelines* that will include guidance for GHG emissions reduction and climate adaptation.
- The California Natural Resources Agency has released a Climate Adaptation Policy Guide for local governments.
- The California Department of Housing and Community Development has released a guidance document on general plan housing elements policies and programs addressing climate change with case study examples.
- OPR prepared a guidance document for addressing complete streets in general plans as required by AB 1358.

The Association of Bay Area Governments, BAAQMD, Bay Conservation and Development Commission (BCDC), and the Metropolitan Transportation Commission (MTC) developed the One Bay Area Plan that addresses GHG emissions. This effort, as required under SB 375, recommends various measures, policies, and programs for future general plans to address GHG emissions. As noted above, the EIR for this plan was released in March 2013.

1.2 Benicia

Located on the Carquinez Strait, Benicia has about 28,000 residents. Benicia thrives as an industry-rich, business-friendly city with an iconic, historic downtown district, and hundreds of acres of parks.

The City enjoys a moderate climate with warm summers and mild winters. With an average annual temperature of nearly 70 degrees, rainfall of about 20 inches per year and cool breezes, Benicia is one of the most climatically comfortable cities in the Bay Area.

Benicia's commitment to a healthy environment for its residents goes beyond the norm – the City is actively involved in environmental stewardship programs that seek a sustainable equilibrium for economic, ecological, and social health and well-being, both now and in the future. In addition to its commitment to reduce GHG emissions through its CAP, Benicia was designated as a tree City USA by the National Arbor Day Foundation in 2008, has installed hundreds of solar panels (1.67 MW) at government buildings, and has helped establish a “green academy” at Benicia High School that offers students valuable training in green technology fields.

Developing the Climate Action Plan (CAP)

In April 2008, the City accepted a Bay Area Air Quality Management (BAAQMD) grant (\$40k) to complete an emissions inventory and develop a Climate Action Plan. Following acceptance of that grant, the City hired California Polytechnic (CalPoly) University to develop the CAP. In April of 2009, CalPoly successfully completed the CAP and presented it to the City Council for review and approval in August 2009. Shortly thereafter, the City Council created the Community Sustainability Commission (CSC) to advise the Council on implementation of the CAP and make recommendations regarding funding allocations from the Good Neighbor Steering Committee (GNSC) Settlement Agreement.

Valero Good Neighbor Steering Committee Settlement Agreement

Valero and the Good Neighbor Steering Committee entered into the Valero GNSC Settlement Agreement in 2003 and 2008 and it was amended in 2010. The agreement designates funds for a variety of GHG reducing and sustainability projects in the City and reserves funds for future designation to community-based sustainability projects that reduce water and energy. Many of the existing and completed projects were funded with monies set aside in this agreement as recommended by the Community Sustainability Commission and approved by the City Council.

Benicia Community Sustainability Commission

The City's Community Sustainability Commission (CSC) was established in 2009 to educate, advocate, and provide oversight for City efforts to conserve energy and water and reduce GHGs. The 11 member commission (4 non-voting members and 1 student commissioner (currently vacant) evaluates and prioritizes the Benicia CAP strategies and makes recommendations to the City Council regarding implementation of the CAP. The CSC is also charged with providing a leadership and advisory role in implementing the CAP's measures and monitoring its effectiveness. This broad mandate includes recommendations for allocations of Valero/Good Neighbor Steering Committee Settlement Agreement funds for projects that meet criteria set forth in the Agreement.

1.3 Purpose of 2010 Inventory

This inventory measures local government operations (LGO) and community-wide emissions for 2010 and evaluates progress made towards the reduction goals set in the CAP. This update also includes new forecasts that will help the City estimate future emissions and determine the gap between its goals and anticipated emissions.

1.4 Emissions Sources

Emissions are divided into two categories. The first includes community-wide emissions, and the second category is for emissions related solely to LGO. LGO emissions are included as a subset of community-wide emissions, but are separated out for planning and implementation purposes. All emissions are categorized by type, and include the following sources.

Community-wide

- Residential, commercial, and industrial electricity and natural gas use
- Embedded energy in water supply and delivery
- Transportation emissions
- Waste entering a managed landfill
- Wastewater sludge waste
- Off-road construction, lawn, and garden equipment emissions
- BAAQMD-permitted reported emissions
- EPA-GHG emissions for Large Facilities (>25,000MTCO₂e annually)

Local Government Operations

- City facility electricity and natural gas use
- Park lighting, street lights, traffic signals and controllers
- Port facilities, including wharf lift pump

- Water delivery, including sprinkler and irrigation control, storm water management, and pumps
- Wastewater Facilities, including sewer pumps, wastewater treatment, and associated equipment
- City fleet including passenger vehicles, light trucks, transit vehicles, and heavy equipment
- City employee commute
- Fire extinguishers and suppressants
- Refrigerants

1.5 Emissions Forecast

A GHG emissions forecast is a projection of likely future GHG emissions levels for a given set of emissions sources. By creating a GHG emissions forecast in combination with a reduction target, the City can estimate the reductions needed through program and project implementation to achieve community-wide goals. The forecast is typically used only to estimate the scope of future emissions. The only way to measure actual emissions is to conduct additional GHG inventories.

Considering this, a GHG inventory should be conducted in 2015, halfway between 2010, the first year for which reduction goals were set, and 2020, the next reduction target year. This will help the City measure its progress toward meeting its next set of goals and allow it to adjust its focus if additional reductions are needed between 2015 and 2020.

1.6 Accomplishments, 2009-2013

The City has implemented many CAP strategies since adopting its reduction goals in 2009. The City has made substantial progress in the local government operations sector by focusing its resources on those areas it has the most control over. It has also implemented strategies to reduce community-wide emissions; some of these have a direct GHG reduction impact while others are considered supportive measures, i.e. those that raise awareness. These efforts include the following:

Strategy B-1.1: LEED Certification for Municipal Projects

The Community Center Retrofit and Upgrade Project utilized Valero/Good Neighbor Steering Committee Settlement Agreement Funds to retrofit the community center to LEED standards. The City has submitted an application to LEED received Gold level certification.

Strategy B-4.6: Energy Efficiency Demonstration Projects at City Hall

As part of the Small Communities Climate Action Partnership, Strategic Energy Innovations (a non-profit located in San Rafael, California) was awarded a PG&E Innovator Pilot Grant to reach out to six small cities to provide energy data collection assistance, energy management training and to develop an Energy Action Plan. Benicia was selected as a participant and has completed a baseline energy report, generated a potential future projects list, and is now utilizing Energy CAP Express, an online energy management platform to track energy use and cost trends (June 2013).

Strategy B-3.3: Home Energy and Water Audits

As part of a partnership with WattzOn of Mountain View, CA, more than 200 residential energy audits and about 200 water assessments have been performed in Benicia since 2010. The

residential program is still offered to qualifying Benicia residents. Since 2010, 215 residents have enrolled in the program, saving approximately 60,600kWh and 12MTCO₂e annually.

Strategy E-1.12: Demonstration Gardens

Strategy P-7.1: Community Gardens in City Parks and Underutilized Sites

Benicia Community Gardens (BCG), Inc. (an independently run non-profit) received Valero/Good Neighbor Steering Committee Settlement Agreement Funds to establish gardens. Two gardens are currently established, Avant Garden and Swenson Garden.

Strategy E-2.2: Property Assessed Clean Energy (PACE Program)

A PACE Program enables private residential (multi-family), commercial, and industrial property owners to install energy production and efficiency projects by financing the upfront capital through an additional property tax assessment. The City of Benicia has been actively pursuing two PACE funded financing options for the community, one of which is already available to commercial, industrial, and multi-family property owners city and county-wide. The County of Solano is currently in the process of forming an additional county-wide district that may include additional residential properties.

Strategy E-2.3: Renewable Energy for City Facilities

The City worked with Chevron Energy Solutions to locate the most feasible City-owned properties for the installation of photovoltaic (PV) solar arrays and for efficiency upgrades to facility lighting. Ten city locations were selected for solar installations and eight were selected for lighting retrofits. The solar sites are expected to save roughly 5.6 million kWh annually. In addition, the wastewater treatment plant continues to utilize methane re-capture systems to power boilers.

Strategy E-3.1: Encourage Parking Lot Solar Photovoltaic Arrays

The City worked with Chevron Energy Solutions to assess parking lots within the City. The City Hall, Community Center, Corporation Yard, and James Lemos Pool parking lots were chosen for the installation of solar arrays on parking canopies. All four sites are now interconnected to the grid and producing renewable energy. The other six City solar sites are ground mounted installations.

Strategy E-3.3: Promote California Solar Initiative and Other Applicable Incentive Programs

Between 2010 and 2011, the City granted GRID Alternatives \$30,000 of Valero/Good Neighbor funds, which was used to cover the difference between the overall cost of 5 installations and the California Solar Initiative incentive payments.

Strategy EO-1.1 Update and Maintain Sustainable Development Website

The City launched SustainableBenicia.org in June 2013. The site promotes and informs the community of a variety of sustainability initiatives.

Strategy EO-1.3: Educational Workshops

Dominican University and the Community Sustainability Commission presented a 3-part series of educational workshops on sustainability. In addition, the City and the CSC have hosted a variety of events where local vendors, organizations, and businesses educate the public about sustainability practices and environmental programs and products.

Strategy EO-1.8: Informational Kiosks and Info Displays at City Facilities

There are sustainability related informational displays at City Hall, the Community Center, and the Benicia Library that educate residents about the City solar project, energy and water conservation practices, and green building practices.

Strategy IC-1.1: Building Audit and Efficiency Program

In 2012, the City adopted a Business Development Action Plan, an Economic analysis and action plan for Benicia businesses, including guidelines for the implementation of a Sustainable Business Management Program. The CSC recommended and the City Council approved the allocation of \$625,000 of Valero/Good Neighbor Steering Committee Settlement Agreement Funds for sustainability assessments and grant/loan funding for the Business Resource Incentive Program (BRIP). Just fewer than 20 businesses are participating in the program. Businesses may also take advantage of Green Business seminars hosted by the CSC and Dominican University.

Strategy IC-4.1: Continue Implementing Capital Improvement Programs

Strategy IC-4.2: Investigate On-site Energy Production

The Valero Condensate Recovery Project, a cooperative project between Valero Energy Corporation and the City of Benicia, has completed its first phase of implementation. Phase I of this project is saving over 23.5 million gallons of water (71 acre feet) per year and reducing GHG emissions by over 2,300MTCO₂e per year. Phase II of the Valero Condensate Recovery Project is in the planning phase.

Strategy P-2.1 Replace Fossil Fuel-Powered Maintenance Tools with Electric Equipment

Strategy P-3.1 Replace Unnecessary City Trucks with Alternative-Fuel Vehicles

The City has replaced nine conventional vehicles with hybrid vehicles and received two additional plug-in hybrids as part of the Valero/Good Neighbor Steering Committee Settlement Agreement.

Strategy P-4.2: Increase the Number of City Trees

In 2009, the Benicia Tree Foundation was formed with Valero/Good Neighbor Steering Committee Settlement Agreement Funds. Since then, the foundation has formed a partnership with the Benicia Unified School District, worked to identify best practices for planting and maintaining urban trees, and created a program to support tree-planting and community-building efforts. In addition, Benicia was designated as a Tree City USA in 2009 through a partnership between the Rotary Club of Benicia and the City. Finally, the 2012-13 Express Bus Route 78 Support Project included the installation of new landscaping, including trees at a key gateway to the City's downtown.

Strategy T-2.2 LED Lighting for Intersection Walk Signals

In 2010, LED crosswalk signals were installed at 2nd and E. Military by the City. In 2012, additional solar powered walking signals were installed on 2nd street.

Strategy T-2.3: Recycled Content in Street Surfacing

Since the adoption of the CAP, several miles of City streets have been resurfaced. During this process, asphalt is ground up and recycled for reuse.

Strategy T-2.1: Increase the Efficiency of Streetlights

As part of the Renewable Energy and Energy Efficiency and Conservation Block Grant (EECBG) project, 2,239 streetlights were retrofitted from high pressure sodium lights to LED or induction lighting.

Strategy T-3.1: Increase Bicycle Infrastructure at City Facilities

A dozen bike racks with capacity for about 60 bikes have been installed since adoption of the CAP.

Strategy T-3.2: Bicycle Infrastructure for New Development

The Route 78 Bus Support project completed in 2013 resulted in additional bike lanes and re-striping, improved bus stops, and high visibility crosswalks using Regional Measure 2 funds from MTC. The same funding source is expected to result in completion of the similar Western Gateway Project later in 2013, which will include the installation of high visibility crosswalks, an improved bus stop environment, new pavement overlay, bicycle lockers, new bicycle lanes, and curb extensions.

Strategy T-3.3 Implement Bicycle and Pedestrian Safety Measures

More than 15 lane miles of resurfacing has occurred since 2009 throughout the City. The East 5th Street Project completed in 2009 constructed bulb outs, high visibility crosswalks, and Class 2 bike lanes on a 1/2-mile section of the street in support of this strategy. In 2010, the Rose Drive bike over-crossing (over Interstate-780), which includes a Class I bike lane, was constructed using Congestion Mitigation and Air Quality (CMAQ) Program funds and Caltrans Bike Transit Account funds. In addition, the Benicia High School Signal Project installed signals, sidewalks, a bus stop, bike lanes, bulb outs, and a pedestrian crossing, which were funded by the City's traffic impact fee fund. Finally, in 2012, bike sharrows and speed limit markers were added on West J Street leading to the Recreation Area and State Park.

Strategy WW-1.6: Incentivize Water Conservation

In its 2012 update to the Emergency Water Conservation Plan Ordinance, the City Council approved appropriate actions during times of water shortage including voluntary conservation efforts, water conservation alerts, and a fine structure for violations. In partnership with Solano County Water Agency, the City has distributed about 400 low-flow showerheads free of charge to residents since 2007. Finally, the City has upgraded 14 irrigation systems at City facilities to include programmable controllers that can be actively managed for water-use efficiency.

Objective WW-3: Reduce the Amount of Emissions Resulting from Water and Wastewater Plant Operations 95% by 2020

In an effort to reduce emissions, the City installed an odor scrubbing system at the wastewater treatment plant and has been capturing methane to power two boilers (reducing natural gas usage). The odor scrubbers reduce potentially harmful gases released into the air like nitrous oxide. Methane capture allows the City to continue to reduce energy use and therefore GHG emissions.

Chapter 2

2010 Greenhouse Gas Emissions Inventory

2.1 Emission Reduction Goals

As stated in Chapter 1, upon completion of the 2000 (baseline) greenhouse gas (GHG) inventory, the City set GHG reduction targets for local government operations (LGO) and community-wide emissions. The targets were set to be consistent with AB 32 and help shape future program and policy development and implementation by the City.

Local Government Operations

- Reduce GHG emissions to 25 percent below 2000 levels by 2010
- Reduce GHG emissions to 33 percent below 2000 levels by 2020

Community-wide Operations

- Reduce GHG emissions to maintain 2005 levels by 2010
- Reduce GHG emissions to 10 percent below 2000 levels by 2020

Relation to State Goals

AB 32 calls for statewide GHG emissions to return to 1990 levels by 2020. The AB 32 Scoping Plan identifies local governments as “essential partners” in achieving this target and identifies 15% below current (2005–2008) levels as the local government equivalent of 1990 GHG emissions levels. The State has not formally adopted GHG reduction targets for any year beyond 2020; however, Executive Order S-3-05, includes a goal to reduce GHG emissions to 1990 levels by 2020 and to 80% below 1990 levels by 2050.

The City forecasted emissions levels assuming that business would continue as usual and without taking into account the impacts of State legislation or local reduction efforts. The Business as Usual (BAU) forecast is typically used only to estimate the scope of future emissions and to determine how those projections measure against State and City reduction goals.

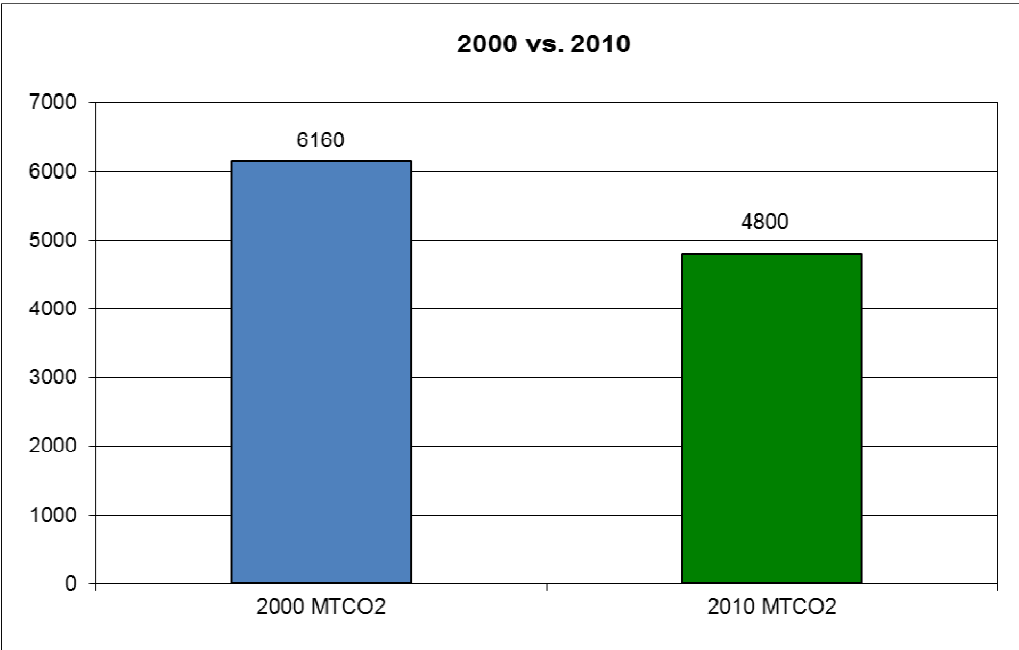
The Benicia CAP goals based on BAU are summarized below by both including and excluding large industrial emitters. As explained in Section 2.3.2, limited financial and staff resources have required cities and counties to focus on reducing emissions from sources within their control. Excluding large emitters will allow the City to focus its reduction efforts on those entities that it can affect, which renders the City’s community reduction goals more attainable.

Goal	Including Large Emitters (MTCO ₂ e)	Excluding Large Emitters (MTCO ₂ e)
2020 CA State Goal: 1990 Levels	2,790,360	526,580
2050 CA State Goal: 80% < 1990 Levels	558,070	105,320
2020 City Goal: 10% < 2000 Levels	2,825,000	438,330
2050 City Goal: 80% < 2005 Levels	662,930	102,860

To determine if the City will meet its emissions reduction goals, all emissions sources for LGO operations and Community-wide were inventoried for 2010 and compared to the baseline inventory for 2000. In addition, an Adjusted Business as Usual Forecast (ABAU) was completed to determine the how State legislation would assist the City in meeting its goals. The ABAU is explained in Section 2.3.5.

2.2 Local Government Operations Inventory and Analysis

In 2000, LGO emissions were 6,160 MTCO₂e. By 2010, emissions decreased to 4,800 MTCO₂e, a 21% decrease and 42% below emissions projected in the 2009 CAP of 8,300 MTCO₂e.



2.2.1 Emissions by Sector

The following is a summary of emissions from each sector measured in the LGO inventory.

Sector	% of total emissions 2010	2000 Total Emissions (MTCO ₂ e)	2010 Total Emissions (MTCO ₂ e)	Change between 2000 and 2010
Building Electricity and Natural Gas Use	20%	1,030	960	7% decrease
Streetlights and traffic signals	5%	520	260	49% decrease
Vehicle Fleet and Off-road Equipment	19%	1,270	900	29% decrease
Employee commute	13%	650	640	2% decrease
Water Treatment	16%	N/A	780	N/A
Water Delivery	6%	2,700*	280	90% decrease ³
Waste	21%	N/A	990	N/A
Other (Mobile Source Refrigerants in 2010)	Less than 1%	N/A	2	N/A

*Including water treatment and delivery (see Executive Summary, p.4) (Rounded Totals). In 2010, water treatment and delivery were separated.

2.2.2 Emissions Reducing Activities: 2008-2010

The above reductions are due in part to projects implemented by the City since 2009 when the baseline inventory was completed and the CAP adopted. Below are those activities for which there was data available to calculate emissions reductions.

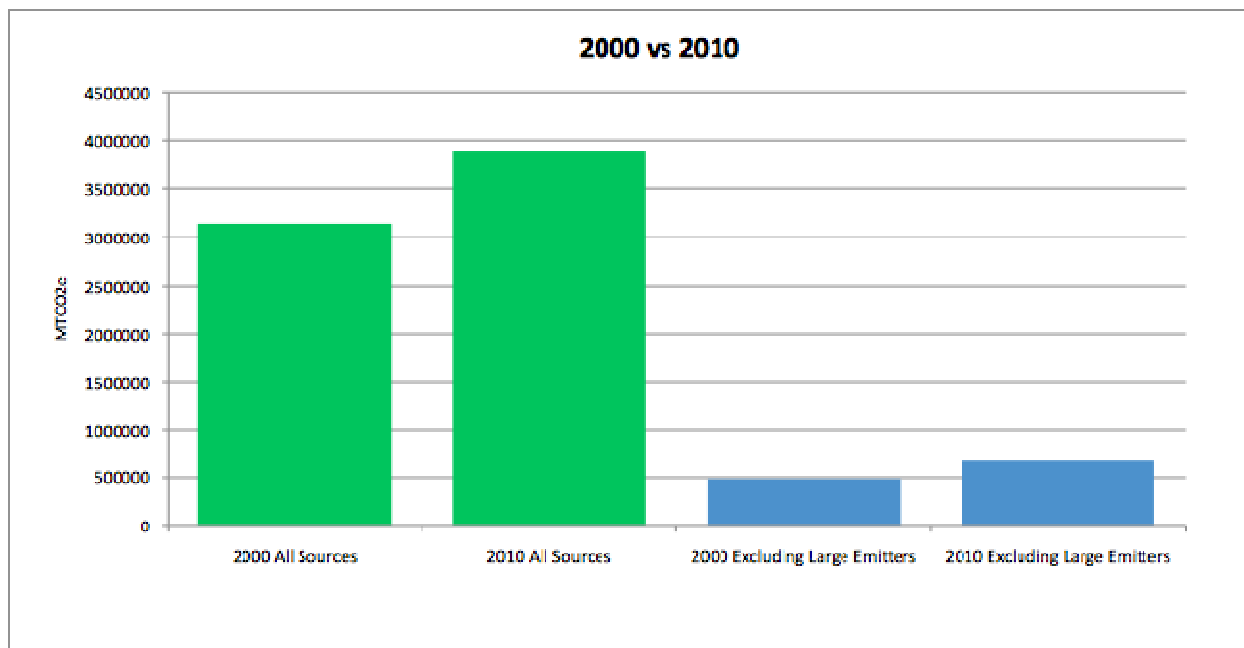
³ Water delivery emissions were included as part of Building and Facility energy use in 2000; when the 2000 data was updated to reflect new protocols, Water Delivery were calculated separately with available 2000 data; because the data was extrapolated from overall building and facility energy use, the 2000 numbers may not be exact. Also, in 2000, water delivery and treatment were included as one figure (2,700) and in 2000 they were separated, Water Treatment and Water Delivery. If treatment and delivery are combined, then 2010 emissions would be 1,060 or a 60% decrease from 2000. Here are some other potential reasons for the significant decrease:

- PG&E emission factor went down because its fuel mix got cleaner;
- More efficient equipment was installed (4 pumps were replaced with more efficient ones);
- Water-use efficiency programs implemented;
- Public infrastructure leak fixing that was part of State programs to reduce per capita consumption; and
- Slight possibility that in 2010 there was a decreased need to pump water long distances because of the high rainfall that year compared to prior years.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings	Cumulative MTCO ₂ e Savings (Implementation year to 2012)
1. City Fleet Upgrades	2009	5,460	gallons of gasoline	50	190
2. Irrigation Control System Upgrade	2005	18,700	kWh	5	30
3. Upgrade at Waste Water Treatment Plant	2009	Unknown	N ₂ O, CO ₂ , non-biogenic Methane	2,100	8,300
4. Lighting, HVAC, Appliance Retrofits	2008	2,594,760	kWh	520	520
Total (Rounded)				2,700	9,000

2.3 Community-wide Inventory and Analysis

In 2010, community-wide emissions with large industrial emitters had increased from 2005 by 24% while community-wide emissions without large industrial emitters increased by 41%. This may be in part to an increase in transportation related emissions, which are not attributed to large industrial emitters.



2.3.1 Emissions by Sector

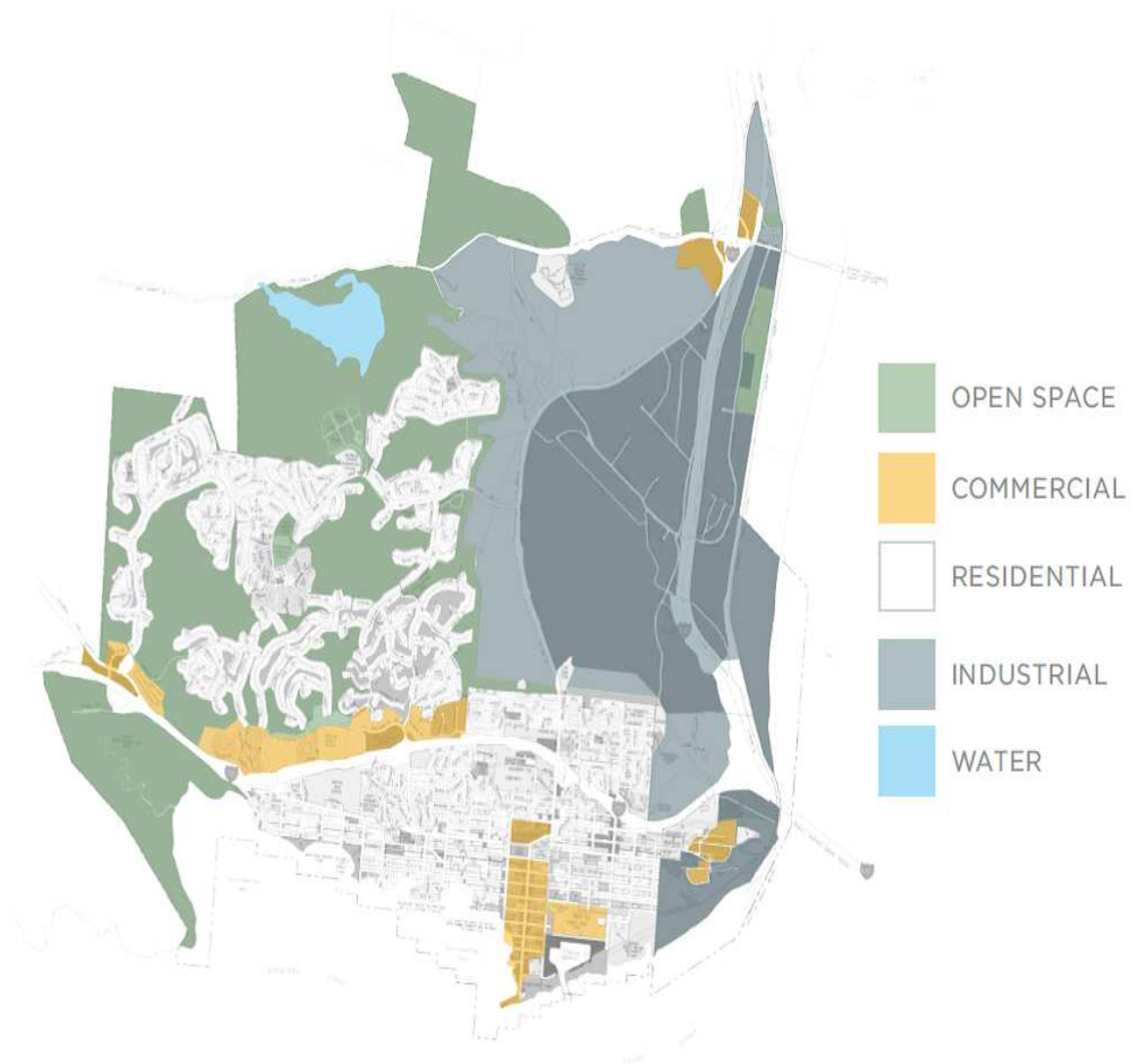
Below is a summary of emissions from each sector measured in the community-wide inventory.

Sector	2000 Total Emissions (MTCO ₂ e)	2010 Total Emissions (MTCO ₂ e)	% of total emissions 2010	Change between 2000 and 2010
Residential Electricity and Natural Gas Use	48,850	40,620	6%	17% decrease
Commercial/Industrial Electricity and Natural Gas Use	265,220	327,120	47%	23% increase
On Road Transportation	156,310	305,490	44%	95% increase*
Off Road Equipment	1,380	2,440	Less than 1%	77% increase**
Waste	6,690	8,360	1%	25% increase
Water Supply, Treatment, and Delivery (Rounded Totals)	7,870	2,760	Less than 1%	65% decrease

*Please note that vehicle miles traveled (VMT) growth between 2000 and 2010 was 62%, while emissions increased 95%. The % of total emissions from transportation is within the Bay Area average. The Metropolitan Transportation Commission (MTC) calculates VMT using a proprietary software model. MTC inputs traffic counts, vehicle speeds, vehicle make and model, and fuel data into its software. Below is an overview of the changes between 2000 and 2010:

	2000	2010	Increase or Decrease
VMT data	CA Public Road Data (CA Department of Transportation) provided vehicle activity data using Geographic Method and City Engineer estimated Benicia highway miles, Emissions Factor Model (EMFAC 2007) used to break down vehicle data by vehicle type	MTC provided all vehicle activity data using Origin Method; EMFAC 2011 used to break down activity data by vehicle type	
	VMT input into Clean Air Clean Protection (CACCP) emission software	VMT input into Clean Air Clean Protection (CACCP) emission software	
Annual VMT	226,817,246	368,428,874	62%
Data irregularities	Original VMT broken down by City streets and state highways; may not include county roads or 1/2 the trips that start/end in Benicia/elsewhere	Includes VMT from City streets, state highways, county roads, and 1/2 the trips that start/end in Benicia/elsewhere	
	Light duty trucks included in passenger vehicles	Light duty trucks are separate category	
In-City only passenger vehicle VMT (old method vs. new method)	77,233,596	99,419,101	29%
		85,659,421 (light duty trucks)	
		13,759,680 (passenger vehicles)	
In-City only passenger vehicle VMT (new method)	14,206,500 (passenger vehicles only)	13,759,680 (passenger vehicles only)	-3%
Emissions	156,312	305,490	95%
	(old method, updated coefficients in CACP)	(new method, updated coefficients in CACP)	

**The increase in off road emissions is due to construction permit projections for buildings, which may have never been built. However, estimating off road emissions using construction permit data is the recommended calculation method per ICLEI's protocol and guidance.



The map above illustrates where commercial, residential, and industrial emissions occur in the City's geographic boundaries. About half of total community-wide emissions come from the commercial/industrial sector.

2.3.2 Excluding Large Commercial & Industrial Sectors

Natural Gas Consumption

Petroleum and manufacturing facilities in Benicia use electricity and natural gas for processing and onsite energy production. These facilities are regulated primarily through the Bay Area Air Quality Management District (BAAQMD), U.S. Environmental Protection Agency (EPA), and the California Air Resources Board (CARB), not the City. Because permitting agencies do not track natural gas consumption used by these entities, California Energy Commission (CEC) Energy Consumption Data organized by North American Industry Classification System (NAICS) codes (the standard used by Federal statistical agencies to classify businesses for the purpose of publishing statistical data related to the U.S. business economy), was used to determine Solano County total natural gas delivered to non-residential customers in 2007 (the latest year for which data was available). Petroleum and Manufacturing NAICS codes rank number one and two in natural gas deliveries in the County or 64% of total natural gas use. The CAP Coordinator team assumed the same percentage (64%) of natural gas use in Benicia came from petroleum and manufacturing facilities. Excluding natural gas emissions from these facilities can be justified because these processes are not likely to be affected by City sponsored programs or reduction strategies.

In 2010, emissions from natural gas use in petroleum and manufacturing facilities in Benicia were approximately 215,500 MTCO₂e.

Air District Permitted Entities

The Bay Area Air Quality Management District provided air permit data for regulated entities in the City limits, including the City of Benicia (see Appendix B, Section B.5).

In 2010, total emissions from permitted facilities excluding Valero Refinery and Asphalt Plant and the City of Benicia were 1,930 MTCO₂e.

Environmental Protection Agency (EPA) Mandatory Reporting Rule

Beginning in 2009, the EPA required large facilities (those that emit at least 25,000MTCO₂e annually) to report all emissions on an annual basis (Mandatory Reporting Rule (MRR)). The only facility required to report under this rule is the Valero Refinery. After review of the ICLEI – Local Governments for Sustainability - Community-wide Protocol and consultation with the BAAQMD, the Inventory Team used 2010 EPA data for the Valero Refinery, and BAAQMD permit data for all other large emitters. Finally, it should be noted that the EPA MRR utilizes different reporting protocols than BAAQMD used prior to 2009. Therefore, differences in emissions levels may be due to reporting protocols and/or changes in facility activity.

In 2010, total emissions from the Valero Refinery were 2,670,500 MTCO₂e.

Percentage of Emissions from Commercial/Industrial Sector

Unlike most jurisdictions in the Bay Area, the commercial/industrial sector (not transportation) makes up the majority of community-wide emissions; this is true even when excluding large industrial emitters. This illustrates the importance of focusing reduction strategies on non-residential energy use as a means to achieve meaningful reductions. In addition, removing these sectors/entities makes existing reduction targets far more achievable.

In 2010, 48% of emissions came from the Commercial/Industrial sector (excluding large emitters).

Emissions Reductions Efforts – Large Industrial Emitters

Because 48% of community-wide emissions come from the commercial/industrial sector, it is important for these entities to implement emissions reducing programs. These programs are in addition to any City sponsored efforts. Examples of reduction programs are listed below.

Valero – Benicia Refinery

- Participated in the Solano Napa Commute Challenge; 24 people registered and 15 people completed the challenge. Valero earned a “Top 10” in the county for its participation.
- Nominated by the Solano Transportation Authority (STA) Board for *Business of the Year* (16th Annual STA Awards).
- Installed new heat exchanger that recovers heat from various processes and uses it to heat new crude oil. Nexant, the third-party company hired by PG&E to verify energy savings, reported that the exchanger will save 3,530 MTCO₂e annually.
- Changed shift cycles from 8 hours to 12 hours; 2 shifts per day instead of 3, reducing one round-trip commute for 275 people. In addition, employees travel during non-heavy commute times, reducing trip time and congestion during peak travel times.
- Installed Flue Gas Scrubber (FGS) unit at refinery. The FGS is designed to reduce SO₂ (sulfur dioxide) and NO_x (nitrogen oxide, a precursor to smog), and particulate matter (PM). Since startup in February 2011, the FGS has reduced emissions of SO₂ by over 6,000 tons (95% reduction), 750 tons of NO_x (55% reduction), and 60 tons of particulate matter per year. This project also allowed the refinery to retire older heaters in favor of new energy-efficient furnaces. Finally, this project also eliminates air emissions of ammonia that were previously used to control NO_x.⁴

2.3.3 Emissions Reducing Activities: 2008-2010

The community-wide reduction in the residential electricity and natural gas sector is due in part to lower PG&E emission factors because of an increasingly cleaner power mix. However, there are small reductions associated with the following projects.

⁴ As reported by Valero in the January 2014 Community Newsletter.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings	Cumulative MTCO ₂ e Savings (Implementation year to 2012)
1. WattzOn audits	2010	61,000	kWh	10	40
2. Solar installations	2006	17,800	kWh	5	40
Total (Rounded)				15	80

In addition, Condensate Recovery Phase I was completed in 2012. Valero reported (verified by third party) the following savings achieved inside the refinery. These are separate from savings realized by the City due to reduced pumping of untreated water to Valero.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings
Condensate Recovery Phase I (*Rounded)	2010	25	MGD	2,300*

2.3.4 Community-wide Forecast

As part of the inventory update process, the Business as Usual (BAU) and Adjusted Business as Usual (ABAU) forecasts were updated to reflect actual 2010 data as well as new modeling from the regional transportation agency, new census data, modified growth rates, updated utility emission rates, and the impacts from recently passed State legislation.

Business as Usual (BAU)

To aid the City in estimating the emissions over which they have influence, a BAU forecast was completed both with and without large industrial users. Although the City has limited authority over emissions from large facilities, the City will continue to work with large emitters to support their efforts to reduce emissions when possible. These emissions may overshadow other reductions achieved by other sectors in the community.

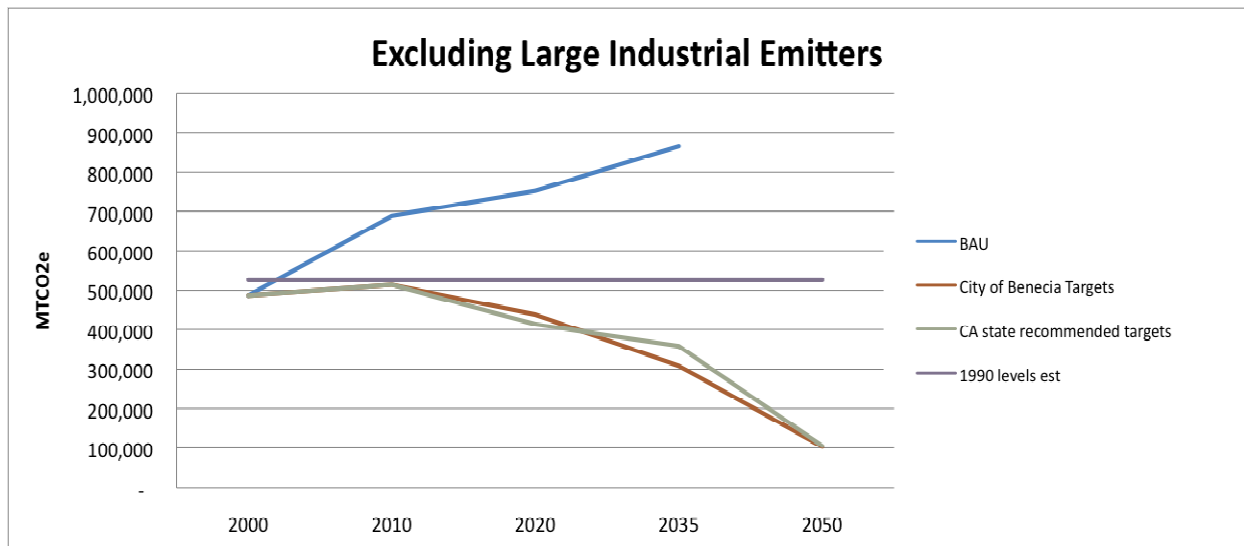
BAU Including Large Industrial Emitters

Under a forecasted BAU scenario, community-wide emissions will increase approximately 2.5% from 2010 by 2020 to 3,986,000 MTCO₂e and increase by 7% from 2010 levels by 2035 to 4,158,655 MTCO₂e.

BAU Excluding Large Industrial Emitters

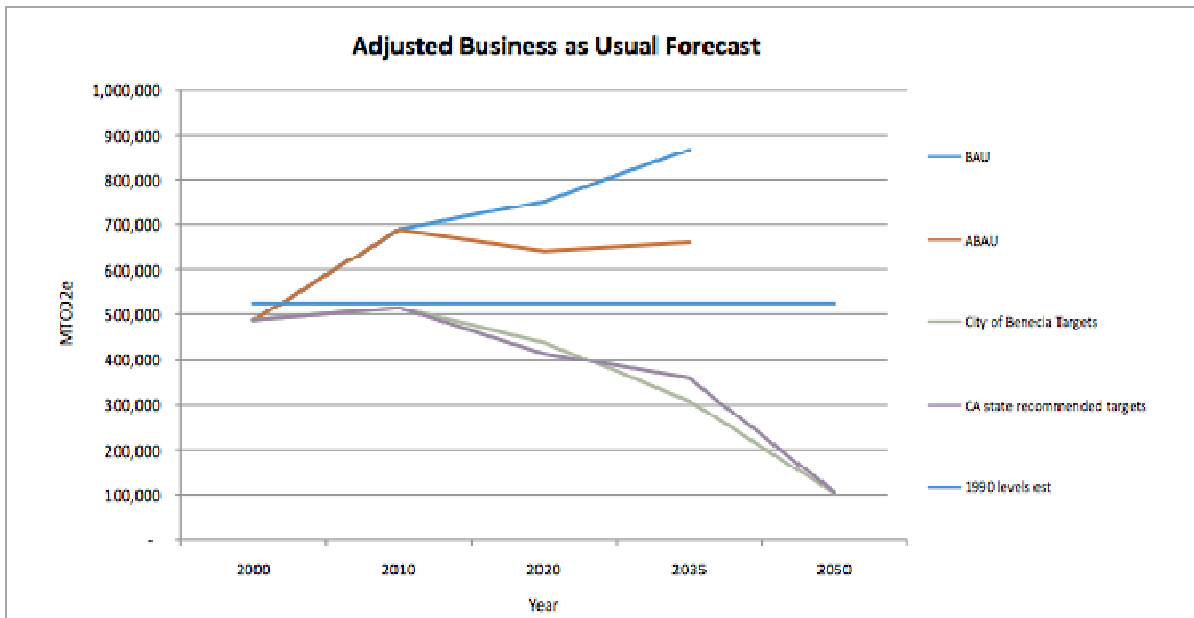
Under a forecasted BAU scenario, community-wide emissions in 2010 will increase 9% by 2020 to 752,870 MTCO₂e and 26% from 2010 levels by 2035 to 866,700 MTCO₂e.

The graph below illustrates the difference between the BAU forecast and the City's goals. Without any State legislative support, the City will have to reduce approximately 314,540 MTCO₂e between 2010 and 2020 to meet its 2020 goals (10% below 2000 levels). To meet its 2035 goals (40% below 2005 levels), the City will need to reduce 558,120 MTCO₂e.



Adjusted Businesses as Usual (ABAU)

The BAU Forecast projects emissions in 2020 and 2035, but does not take into account the positive impacts of the State legislation summarized in Section 1.1. Under an ABAU scenario, excluding large emitters, emissions will decrease 7% by 2020 to 642,330 MTCO₂e and 4% by 2035 to 661,510 MTCO₂e. These projections are then compared to the City's reduction goals to determine the reductions needed between now and 2020 and on to 2035. Statewide legislation accounts for a 110,000 MTCO₂e reduction between 2010 and 2020. To meet the 2020 goal, the community needs to reduce an additional 204,000 MTCO₂e annually. In the following Section, projects are proposed that would help the community to reduce emissions to meet 2020 targets. The reduction gap and proposed strategies may be revised in a future CAP Policy Analysis.



The chart below illustrates the difference between BAU, ABAU, City reduction targets, State targets, and 1990 emissions levels.

MTCO ₂ e Excluding large industrial emitters	2000	2010	2020	2035
ABAU	487,040	688,710	642,330	661,510
BAU	487,040	688,710	752,870	866,040
City Targets	487,040	514,310	438,330	308,590
State Targets	487,040	514,310	413,980	358,460
1990 levels	526,580	526,580	526,580	526,580

Chapter 3

Moving Forward

3.1 Meeting 2020 Reduction Targets

Benicia has demonstrated exceptional leadership in developing programs and projects to reduce local government operations (LGO) and community-wide GHG emissions and implement the CAP. After completing the 2010 inventory and assessing the impacts of individual projects, the City has a clearer picture of which programs are the most effective and efficient in helping to reach the 2020 goals. This is critical information as the City determines how to bridge the gap of 204,000 MTCO₂e annually between the 2020 ABAU forecasts and the City's goals.

The following programs will achieve annual reductions that will help the City meet its 2020 goal. When measuring its progress, the City must compare annual reductions to the 2020 annual total. Cumulative savings are included to show the potential for reductions year over year and can also be used to measure the cost per metric ton reduced from implementation year to 2020.

Assuming existing programs will continue through 2020 and the potential future projects listed below are implemented, the City can expect a total annual reduction of 16,520 MTCO₂e or 8% toward the annual reduction goal. This leaves approximately 187,480 MTCO₂e that need to be reduced annually to achieve the reduction goal. This is only an estimate and this reduction gap may be further defined during a future CAP Policy Analysis where all existing CAP policies and programs are quantified.

The following are the estimated reductions associated with Local Government Operations projects completed after 2010 but that will continue to reduce emissions through 2020.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings	Cumulative MTCO ₂ e Savings (Implementation year to 2020)
1. Renewable Energy & Conservation Project⁵	2012	2,600,000	kWh	525	4,000
2. City Fleet Upgrades	2009	4,200	gallons of gasoline	40	430
3. EECDBG Grant Project	2012	60,300	kWh	10	90
4. Irrigation Control System Upgrade	2005	18,700	kWh	5	55
5. Upgrade at Waste Water Treatment Plant	2009	n/a	Multiple GHGs	330	4,000
6. Small Cities Climate Action Partnership⁶	2006	748,000; 7,500	kWh; therms	230	3,000
Total (Rounded)				1,100	11,600

The following are the estimated reductions associated with Community-wide projects completed after 2010 but that will continue to reduce emissions through 2020.

⁵ This project includes 10 solar sites, energy efficiency upgrades at 7 facilities, and approximately 2,000 streetlight retrofits. This project was funded by \$13m bond issue.

⁶ This project allowed the City to collect data on prior retrofits and measure the kWh and GHG reduction. No additional projects were implemented.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings	Cumulative MTCO ₂ e Savings (Implementation year to 2020)
1. WattzOn	2010	61,000	kWh	10	120
2. Solar installations	2006	27,300	kWh	5	80
3. Bike rack installations	2008	0.10	VMT	0.000006	0.000072
4. Valero Condensate Recovery Phase I ⁷	2010	183,100	kWh	40	365
5. Distribution of low-flow showerheads	2007-2010	129,800	kWh	32	265
Total (Rounded)				90	830

In addition to the above projects, there are other community-wide projects that have been implemented, but whose reduction impacts cannot yet be modeled. For example, there are two functioning community gardens, which allow residents to locally produce food in Benicia. With increased participation rates, the Inventory Team may be able estimate emissions reductions associated with reduced vehicle miles traveled to purchase fresh produce and/or water savings if not already included in other CAP strategy reductions.

When determining what new projects should be funded and implemented moving forward, the Inventory Team recommends that the following factors be used:

1. Existing support (funding and City approval)
2. GHG reduction potential
3. Emissions sector addressed (in priority of % of total emissions)

Based on the factors above, the following projects appear promising for implementation between now and 2020. Again, the above factors and list of recommended strategies may be further refined during a future CAP Policy Analysis and different or additional strategies and/or projects may be selected by the CSC and recommended to the City Council for implementation.

⁷ The total reduction of CRP Phase 1 is 2,300 MTCO₂e as verified by Nexant, the third-party company hired by PG&E to verify savings. Community-wide emissions will be reduced by an additional 40 MTCO₂e per year as a result of the following: less energy is spent pumping the water from Lake Berryessa or the North Bay Aqueduct to the City and less energy is spent by the City pumping the untreated water to Valero. CRP Phase 1 will also save an estimated 23 million gallons (72 acre feet) of water annually and reduce hazardous waste by an estimated 6,000 pounds per year.

Program	Existing Support	GHG Reduction Potential (MTCO _{2e}) (Annual)	GHG Reduction Potential (MTCO _{2e}) (Implementation year-2020)	Emissions Sector (Ranked 1-6 based on % of total 2010 emissions) ⁸	CAP Strategy
Business Resource Incentive Program (BRIP)	\$625,000 allocated; Council Approved	540	2,700	Commercial/Industrial (1)	IC-1.1 Building Audit and Efficiency Program
Residential Solar Incentive Program	\$100,000 allocated; Council approved	570	2,300	Residential (3)	E-3.3. Promote California Solar Initiative and Other Applicable Incentive Programs
Residential Water Incentive Program	\$10,000 allocated; Council approved	30	160	Residential (3)	WW-1.5. Incentives for Residential Plumbing Fixture Upgrades
Community Choice Aggregation (CCA)	No money allocated; City Staff and CSC have expressed interest in joining Marin Clean Energy	680	3,200	Commercial/Industrial and Residential (1,3)	E-2.6. Community Choice Aggregation Feasibility Assessment
Reduce Reliance on Conventional Automobile Travel	Existing capital improvement budgets (City) and State grants; BRIP funding and State grants (Community)	90 (LGO); 10,775 (Community-wide) ⁹	360 (LGO); 43,100 (Community-wide)	Transportation (2)	T-8.1. Encourage Local Businesses to Use Alternative Fuel Vehicles; Objective T-1: Reduce Municipal Fleet Related Emissions 20% by 2020
Wind Energy Generation at Wastewater Treatment Plant	No upfront cost to City; estimated savings of \$70,000 annually; City Staff and Council have expressed interest	450	1,800	Local Government Operations (6)	E-2.3. Renewable Energy for City Facilities
Property Assessed Clean Energy (PACE) Program	No upfront cost required; existing CaliforniaFIRST district, City signed letter of support for Ygrene county-wide district; County opted into HERO Pace District (Aug. 2013)	760	3,000	Commercial/Industrial and Residential (1,3)	E-2.2. Property Assessed Clean Energy (PACE) Program

⁸ The following sectors are ranked in order of largest % of total 2010 emissions (excluding large industrial emitters): Commercial/Industrial (48%); Transportation (44%); Residential (6%); Waste (1%); Water (1%); Local Government Operations (less than 1%).

⁹ The CAP Coordinator team assumed 10% of each vehicle class will be converted to more efficient vehicles. A specific project will need to be identified to achieve this reduction; if 10% of each vehicle class is not converted then savings may be lower. A project by project savings estimate can be calculated in the future.

Program	Existing Support	GHG Reduction Potential (MTCO ₂ e) (Annual)	GHG Reduction Potential (MTCO ₂ e) (Implementation year-2020)	Emissions Sector (Ranked 1-6 based on % of total 2010 emissions) ¹⁰	CAP Strategy
Valero Condensate Recovery Phase 2 ¹¹	Clarification on project approval needed; Phase 2 is currently in the planning phase	32 (City); 1,400 (Valero)	190 (City); Valero savings depend on construction completion	Local Government Operations (6)	Objective WW-2: Reduce the Amount of Emissions Resulting from Pumps and Lift Stations; IC-4.2. Investigate On-site Energy Production
Total (Rounded)		15,330	56,810		

In addition to the projects and programs recommended for future implementation, Local Government emissions may be further reduced as a result of planned capital improvement projects. For example, the Public Works Department plans to replace all of the copper water services in one City development, which conveys treated water from the main in the street to the water meter for each house. This replacement will reduce leaks, which reduces overall gallons delivered and therefore less energy is expended to pump, treat, and deliver water and GHGs are subsequently reduced. The CAP Coordinator will track these types of projects and quantify them during a future CAP Policy Analysis.

Finally, the Community Sustainability Commission has made significant progress in increasing the level of awareness about various climate related topics. These efforts are critical to the continued successful implementation of the Climate Action Plan and future GHG reductions. Although these efforts do not translate directly into GHG reductions, the City can report on the successes of these efforts and the topics presented in the future.

Potential Next Steps

The above existing and proposed measures still leave 188,240 MTCO₂e annually that needs to be reduced to meet Community-wide reduction goals. To achieve additional reductions, the following activities should be completed:

1. CAP Policy Analysis and Implementation Strategies.
Conduct a policy audit to determine the impact of existing CAP and non-CAP policies and completed projects; identify strategies for implementation in the future. The results of this analysis will be presented to the CSC for consideration and recommendation to the City Council. These strategies will be included in the 2014-15 CAP Coordinator Work Plan.
2. Community Engagement.
Engage the community to determine what residents and business-owners are currently doing to reduce GHG emissions. This process will allow the Community Sustainability Commission to continue to reach out to the public and identify opportunities for additional efforts and also provide increased opportunities to interact with large emitters.

¹⁰ The following sectors are ranked in order of largest % of total 2010 emissions (excluding large industrial emitters): Commercial/Industrial (48%); Transportation (44%); Residential (6%); Waste (1%); Water (1%); Local Government Operations (less than 1%).

¹¹ The total estimated reduction of CRP Phase 2 is 1,400 MTCO₂e. Community-wide emissions will be reduced by an additional 32 MTCO₂e per year as a result of the following: less energy is spent pumping the water from Lake Berryessa or the North Bay Aqueduct to the City and less energy is spent by the City pumping the untreated water to Valero. CRP Phase 2 will also save an estimated 19 million gallons (58 acre feet) of water annually.

3. Cap and Trade.
Continue to advocate for the local allocation of Cap and Trade revenues and offsets for GHG emission reducing projects.
4. Continue to adjust assumptions for GHG reductions.
The Sonoma State University Inventory team has quantified some existing and proposed future measures for implementation and evaluated the GHG reduction impact. This analysis should be done again to determine if assumptions were correct or if the estimates were too conservative, either annually or as part of the next Inventory Update in 2015.

3.2 BAAQMD Comments

All BAAQMD questions and comments have been addressed and integrated into this report.

Appendices

Appendix A: Acknowledgements

The CAP Coordinator received assistance from others at the Sonoma State University (SSU) Center for Sustainable Communities. Brian Woodward, SSU student and Ayrin Zahner, Center Consultant, were instrumental in analyzing data, calculating emissions, drafting the report, and preparing for presentation of the results to the Community Sustainability Commission and Benicia City Council. The graphics were completed by Anne Marker.

In addition, the report could not have been possible without the continued support of Benicia City Staff.

Appendix B: Tools, Calculations, Data Collection Sources, and Notes

Tools & Resources

As a member of ICLEI, the City has access to numerous innovative tools and guidance documents to help it achieve its sustainability goals. Below is a brief overview of the tools used to complete the 2010 GHG Emissions Inventory.

1. Clean Air & Climate Protection (CACP) Software 2009

CACP 2009 is the primary tool used by cities in the United States to conduct greenhouse gas emission inventories, and has been established as the industry standard. CACP 2009 is an emissions management tool that calculates and tracks greenhouse gas emissions (carbon dioxide, methane, nitrous oxide) and criteria air pollutants (NO_x, SO_x, carbon monoxide, volatile organic compounds, PM₁₀, PM_{2.5}) associated with electricity, fuel use, and waste disposal. Energy and resource use data are tracked and conditioned using the Master Data Workbook, and then entered into CACP 2009 to calculate the greenhouse gas emissions associated with these uses.

2. Greenhouse Gas (GHG) Accounting Protocols

The U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) is designed to guide cities to account for and report on GHG emissions. The Community Protocol represents a national standard that establishes requirements and recommended best practices for developing community GHG emissions inventories. A consistent national standard allows cities to more easily develop high-quality GHG inventories and measure progress toward their emissions reduction goals and communicate results with their community members.

3. GHG Inventory Guidance

As a member of ICLEI- Local Governments for Sustainability, Benicia has access to a wide-range of support and guidance documents provided to cities in an attempt to ensure consistent inventory practices across the country. The guidance documents include:

- A. Quick-Start Guide to Conducting a Greenhouse Gas Emissions Inventory and Forecast, which gives an overview of how and why to conduct a GHG emissions inventory for local government operations and an entire community.
- B. The Local Government Operations Protocol, which sets the U.S. national standard for how to quantify and report local government GHG emissions.
- C. ICLEI Instructions on Data Gathering & Quality Control, which provides an overview of the data collection process and quality control for an inventory, including the Master Data Workbook.
- D. ICLEI Instructions on CACP 2009 Data Entry, which offer detailed guidance on how to enter inventory data into ICLEI's CACP 2009 software.

4. Master Data Workbook

The Master Data Workbook is the axis of all data collection and report preparation. The Master Data Workbook is the central resource for identifying the energy and activity data

that was gathered, for recording and organizing data, and for keeping notes on Benicia's progress.

Analysis and Data Collection Notes and Sources

A. Data Collection Methods

GHG emissions data was collected from many different sources ranging from City Staff to Federal agencies. This data is used to determine current emission levels and forecast future emission levels for 2020 and 2035. Below is a list of indicators (data points), the purpose of that data, and the data source.

Indicator	Purpose	Sources
Population (2000-2035)	Growth rates to estimate residential energy-use forecasting	Census Data 2010; ABAG RTP 2009
Households (2000-2035)	Emissions from lawn and garden maintenance; growth rates for forecasting; estimate reductions from measures	Census Data 2010; ABAG RTP 2009
Jobs (2000-2035)	Growth rates for service population (population + jobs) for on-road transportation, waste, water use forecasting, and commercial energy forecasting	Census Data 2010; ABAG RTP 2009
Commercial Square Footage (1999-2010)	Commercial energy measures estimated reductions	City Staff from Previous inventory
Commercial Establishments (2000-2010)	Commercial growth rates for energy forecasting	Census Data 2010
Transportation modes (drove alone, took public transportation, walked/biked)	Transportation measures estimated reductions	ACS 2010
kW of solar installed residential and	Energy measures estimated reductions	City staff; permits

commercial (2000, 2010)		
Acres of irrigated landscaping (2000, 2010, 2020, 2035)	Water measures estimated reductions	City Staff
Construction permits (1997-2011)	Off-road emissions from construction projects; growth rates for forecasting; estimate reductions from measures	HUD
VMT (2000, 2010, 2020, 2035)	On road emissions; on road emissions forecasting; transportation measures estimated reductions	MTC, EMFAC2011
City of Benicia Employees (2000, 2010, 2020, 2035)	Local government employee commute and energy forecasting; measures estimated reductions	City Staff
Government Facility Square Footage (2000, 2010, 2020, 2035)	Local government energy measures estimated reductions	City Staff
Government maintained irrigated landscaping (2000, 2010, 2020, 2035)	Local government water measures estimated reductions	City Staff
Vehicles in fleet (2000, 2010, 2020, 2035)	Local government vehicle fleet emissions forecasting and measures estimated reductions	City Staff
Number and type of public lights (2000, 2010, 2020, 2035)	Public Lighting measures estimated reductions	City Staff

kW solar installed on City facilities (2000-2035)	Energy measures estimated reductions	City Staff
MTCO₂e from large industrial emitters	Measure reported emissions from large industrial users; measure natural gas emissions related to process emissions	BAAQMD Permit Data; EPA Mandatory Reporting Rule GHG Data; California Energy Commission Energy Use Consumption Data
kWh used to pump untreated water	Measure additional kWh savings and emissions reductions associated with Valero Condensate Recovery Phase I and II	University of California Davis (kWh/acre foot of untreated water delivered to end user) ¹²

B. Notes

1. Units

The inventory covers the three main greenhouse gases: carbon dioxide (CO₂), methane (CH₄), and nitrogen oxides (NO_x). The unit of measure being used for GHG emissions throughout this narrative is metric tons of carbon dioxide equivalent (MTCO₂e). Using an equivalency factor allows all GHGs to be compared despite different global warming potential factors (potency of gas and ability to warm the earth).

2. Waste Data

In 2000, waste produced as a result of local government operations was considered “Scope 3” emissions, which are indirect emissions sources that happen outside of the City’s boundaries and are not included in total emissions. Therefore, City staff only reported wastewater sludge generated. Some other local governments elected to report waste from local government operations sent to landfills outside their jurisdictions in 2000. Exact procedures for reporting these types of wastes appear to have been unclear while the 2000 inventory was being conducted.

Updated protocols require that the City report all waste generated in the City as it does exert some control levels of waste, even though it is being sent outside the jurisdiction to a landfill. Despite this additional inclusion, waste emissions decreased in 2010.

3. Pacific Gas and Electric Company Emissions Factors

Benicia used the most current and updated emissions factor provided by Pacific Gas and Electric Company (PG&E) for its energy production. PG&E reduced its total CO₂ emissions from electricity production by about 25% to 15.6 million MTCO₂e in 2010 with renewable sources making up nearly 18% of its fuel portfolio. The emissions rate fell 23% to 445 pounds of CO₂e per megawatt-hour of electricity delivered to its customers. PG&E’s emissions rate was

¹² This report was the best source available, recommended by the California Energy Commission (CEC) for embedded kWh in water delivery for Northern California. It was also recommended by ICLEI and by BAAQMD.

35% below the California publicly owned utility average and only about one-third of the national utility average. PG&E's emissions factor takes into account emissions from both PG&E-owned power generation and power purchased from third parties.

PG&E is currently working to meet its 33% renewables for 2020 goal (290 lbs/mWh), but projects that it will exceed its goal. PG&E's renewable portfolio depends not only on existing production contracts, but on future contracts yet to be negotiated and other factors not controlled by the utility, like rainfall levels feeding the Hetch Hetchy reservoir. To be conservative, the Inventory Team adjusted the estimated renewables percentage down to reflect this reality and to avoid overestimating PG&E's role in reducing GHGs in Benicia. PG&E's estimated coefficients for 2018 and 2019 assume 29% (328 lbs/mWh) and 31% (307 lbs/mWh) of its portfolio will come from renewables, which are used as proxies for 2020 and 2035 estimates respectively.

4. Forecasting

BAU

The BAU forecast is based on a calculated compound annual growth rate (CAGR) that is applied to indicator data such as population, households, and jobs to determine expected growth in 2020 and 2035. The table below illustrates the indicators and resulting CAGR used to calculate the forecast year estimates. These CAGR are not applied to the baseline emissions, but to 2010 activity data to determine projected growth. Then, those data points are entered into CACP to calculate MTCO_{2e}. Some sectors use a combined "service-population" CAGR given that emissions from those sectors include energy used by people who work and live in Benicia. The Metropolitan Transportation Commission (MTC) provided forecasted vehicle miles traveled (VMT) data using their traffic engineering and VMT models.

Sector	Indicator	CAGR used for 2020	CAGR used for 2035
Residential Energy, Off-Road	Households	.48%	.31%
Commercial/Industrial	Jobs	.69%	.68%
On Road Transportation	VMT from MTC		
Water, Waste	Service Population (population+jobs)	.53%	.47%
Other/Large Emitters/ Direct Access	Held Constant		

ABAU

The following table outlines the legislation and resulting assumptions for adjusting the BAU forecast to produce an Adjusted Business as Usual (ABAU) forecast.

Piece of Legislation	Sector Affected	Assumptions
RPS	Electricity Use via the PG&E emission coefficient.	2020 coefficient: 328 lbs/mW 2035 coefficient: 307 lbs/mW assumption: 29% and 31% RPS
Title 24	Electricity and Natural Gas use; only applied to residential new construction as represented by average # of residential building permits.	Commercial energy use was not included due to the inconsistency of the indicator data used and the type of building efficiency modification. Household efficiency between 2000 and 2010 is a proxy for building efficiency applied only to new construction. After 2013 updates to Title 24 are implemented, the State expects a 25% increase in residential efficiency. However, human behavior affects efficacy of the updates so the assumption is 16% and 20% increases in efficiency for electricity and natural gas use.
Pavley and Low Carbon Fuel Standard (LCFS)	On road transportation/VMT.	From Harold Brazil, MTC: "The combined Pavley and LCFS percent reductions in CO ₂ emissions in the Solano County passenger vehicle fleet are: 27.2% in 2020 and 36.1% in 2035," applied to the 2010 interim VMT data. The factor 352.0743 was applied to daily numbers to get annual VMT estimates.
AB 341 (75% reduction in commercial waste)	Sludge and a proportion of total waste allocated to jobs divided by service population.	75% reduction applied directly to the commercial proportion of BAU waste for 2020 and 2035.
SB 7x (20% reduction of per capita water use)	Embedded energy in water; service population	Calculated million gallons of water delivered per capita based on BAU CAGR, then take a 20% reduction of that number and then re-calculated embedded energy: Assumptions (Bay Area): 60% = indoor water use; 40% = outdoor water use (not treated) 2,095 kWh/AF for supply and distribution 652 kWh/AF for treatment 1 AF = 325,851 gallons

5. BAAQMD Permit Data

The Sonoma State University Inventory Team included GHG emission data from all entities in Benicia that are required to obtain a Bay Area Air Quality Management District (BAAQMD) permit. Below is an overview of that data:

Facility	Address (within Benicia, CA)	Biogenic CO ₂	Non-biogenic CO ₂	Total MTCO ₂ e (2010)
Amports	1007 Bayshore Rd.	-	3.05	3.05
Amports	3800 Industrial Way	-	0.15	0.15
Anand Medical Office	1208 East 5th St.	-	1.02	1.02
AT&T Mobility / A T & T Services	1471 Park Rd.	-	4.05	4.05
Bay Area Coffee Inc.	4201 Industrial Way	-	195.55	195.55
Bio-Rad Laboratories	5500 East 2nd St.	-	0.31	0.31
CCL Organics LLC	1460 Goodyear Rd.	-	18.68	18.68
CCR Technologies Inc.	3400 East 2nd St.	-	854.11	854.11
City of Benicia	614 5th St.	2,344.24	126.20	2,470.44
City of Benicia Corp. Yard	2400 East 2nd St.	-	0.01	0.01
City of Benicia Fire Sta. #11	150 Military-West	-	0.85	0.85
City of Benicia Police Dept.	200 East L St.	-	0.25	0.25
City of Benicia Public Works Dept.	2600 East 2nd St.	-	0.88	0.88
City of Benicia Water Treatment Facility	100 Water Way	-	1.50	1.50
Delta Steel Erectors	325 West Channel St.	-	272.23	272.23
Duvall Coffee Roasting	129 1st St.	-	1.28	1.28

GEM Mobile Treatment Services	3001 Bayshore Rd., Suite 9	-	8.69	8.69
GEM Mobile Treatment Services	3400 2nd St.	-	258.18	258.18
Northgate Christian Fellowship	2201 Lake Herman Rd.	-	0.28	0.28
Onyx/Veolia ES Industrial Services	4501 California Court	-	90.73	90.73
Pacific Bell	935 East 2nd St.	-	2.92	2.92
Rix Industries	4900 Industrial Way	-	0.67	0.67
Rrags Café	1383 East 2nd St.	-	8.21	8.21
Sierra Process Systems Inc.	Valero Refinery	-	0.02	0.02
Simpkins Auto Care, Inc.	980 Adams St.	-	6.61	6.61
Suisun Bay Reserve Fleet	2595 Lake Herman Rd.	-	126.09	126.09
US Dept. of Transportation Maritime Administration	2595 Lake Herman Rd.	-	73.60	73.60
Valero Benicia Asphalt Plant	3001 Park Rd.	-	22,163.81	22,163.81
Verizon Business	Bayshore Rd. at SP R	-	0.51	0.51
Verizon Wireless	1100 Southampton Rd.	-	0.67	0.67
Verizon Wireless	2100 Goodyear Rd.	-	1.84	1.84
Verizon Wireless	635 Indiana St.	-	0.85	0.85

6. EPA Greenhouse Gas Emissions from Large Facilities

Beginning in 2009, the EPA required large facilities (those that emit at least 25,000MTCO₂e annually) to report all emissions on an annual basis (Mandatory Reporting Rule (MRR)). The only facility required to report under this rule is the Valero Refinery. After review of the ICLEI – Local Governments for Sustainability - Community-wide Protocol and consultation with the BAAQMD, the Inventory Team used 2010 EPA data for the Valero Refinery, and BAAQMD permit data for all other large emitters.

Facility	Address	Total Facility Emissions MTCO ₂ e (2010)
Valero Refining Comp. - California	3400 East 2nd St.	2,670,497

7. Emission Reducing Project Calculations

The Inventory team estimated the impacts of existing emission reduction programs implemented at the City and community-wide levels as well as the impacts of proposed future programs that would help bridge the gap between the ABAU forecast and the 2020 reduction goals. Below is a summary of those calculations, which may be further refined during a future CAP Policy Analysis.

Measure	Year Implemented	Annual Fuel Savings	Unit	Est. Annual MTCO ₂ e Savings *	Cumulative Savings MTCO ₂ e 2013-2020*
1. Business Resource Incentive Program	2012-2015	2,280,300	kWh	540	2,700
2. Residential Solar Incentive Program	2013-2016	3,208,980	kWh	570	2,300
3. Residential Water Savings Incentive Program	2014-2020	21,698,700	kWh	30	160
4. Community Choice Aggregation	2016	N/A	N/A	680	3,200
5. LGOP Alternative Fuel Vehicles	2016	9,795	gal	90	360
6. Alternative Fuel Vehicles	2013-2020	2,800	gal	10,775	43,100
7. Wind Energy Generation (Wastewater Treatment Plant)	2016	3,000,000	kWh	450	1,800

8. Property Assessed Clean Energy (PACE) Program	2016	N/A	N/A	760	3,000
9. Valero Condensate Recovery Phase II	Need clarification on approval of project.	145,000	kWh	32 (City); 1,400 (Valero)	190
Total (Rounded)				15,330	56,810

Methodologies and Assumptions for Emissions Reducing Projects

Business Resource Incentive Program: Calculation assumes 6% participation rate and an associated reduction in embedded water use. Water use per business was calculated as the standard GPD average for water use per household. Assumes solar installations for 30% of participants with a solar installation size of 160 kW based on average City installation sizes. Cumulative impacts were calculated from 2015, given that only 2 out of 30 projects were completed in 2012 through the second quarter of 2013.

Residential Solar Incentive Program: Assumes a 30% household participation rate; cumulative savings total calculated from a starting year of 2016.

Residential Water Savings Incentive Program: Assumes 100% household participation with a 2% reduction of water used per year per household.

Community Choice Aggregation: Savings calculation assumes a 95% household participation rate and Light Green product (GHG coefficient equivalent to PG&E 31% RPS coefficient of 307 lbs/mWh).

LGO Alternative Fuel Vehicles: Savings calculation assumes 12 diesel trucks converted to CNG, 6 gas passenger cars converted to hybrids, and 2 gas passenger cars converted to plugin hybrids. Assumed conversions will occur mainly in year 2016 per existing fleet replacement schedule.

Alternative Fuel Vehicles: Savings calculation assumes 10% of each vehicle class will be converted - 10% of diesel heavy trucks to CNG; 5% of gasoline passenger vehicles to hybrids; 5% of gasoline passenger vehicles to plug in hybrids. Savings estimated based on gallons of fuel used per year and average mile per gallon (mpg) and vehicle miles traveled (VMT) reported by the Metropolitan Transportation Commission (MTC) for 2010. VMT was converted to gallons of gasoline used. MTC data was used to determine proportion of vehicle types; 6% of total vehicles are diesel heavy trucks and 52% are gasoline passenger vehicles. Then, average mpg improvement between vehicle class and replacement vehicle was calculated.

Wind Energy Generation at the Wastewater Treatment Plant: Simply reported kWh produced by wind.

Property Assessed Clean Energy (PACE) Program: For kWh and therms; assumed 10% household and business participation and 20% energy savings as a result of participation of the program.

Valero Condensate Recovery Phase I & II: Savings calculation assumes (annual) 2,300 MTCO₂e/23 million gallons of water (71 acre feet) (Phase I) and 1,400 MTCO₂e/19 million gallons of water (58 acre feet) reduction (as reported by Valero) divided by acre feet multiplied by 2,095 kWh/AF embedded energy for delivery multiplied by PG&E coefficient for 2020 ABAU. kWh per acre foot of water pumped supplied by the California Energy Commission. The kWh/AF was taken from a report, *Methodology for Analysis of the Energy Intensity of California's Water Systems, and An Assessment of Multiple Potential Benefits Through Integrated Water-Energy Efficiency Measures* (see Works Cited below) because it was recommended by ICLEI and BAAQMD as the best source available for embedded energy in water delivery for Northern California.

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