City of Santa Clara

CLIMATE ACTION PLAN 2016 ANNUAL REPORT

JANUARY 2017

PREPARED FOR:
City of Santa Clara
1500 Warburton Avenue
Santa Clara, CA 95050

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INTRODUCTION

The City of Santa Clara adopted the Climate Action Plan (CAP) nearly three years ago and since then, the City has implemented a variety of programs and policies to reduce greenhouse gas (GHG) emissions and improve the health and quality of life for residents and businesses in Santa Clara. This report summarizes estimated changes in community-wide GHG emissions since 2008, CAP implementation progress, and recommended next steps to help the City meet its GHG emission reduction targets.

ABOUT THE CLIMATE ACTION PLAN

In December 2013, the Santa Clara City Council adopted the City of Santa Clara CAP. The CAP contains measures and implementation actions to reduce the community's GHG emissions 15% below the baseline year of 2008 by 2020, and 55% below baseline levels by 2035 (recommended target only) (**Figure 1**).

FIGURE 1 ADOPTED AND RECOMMENDED GHG REDUCTION TARGETS

IMPORTANCE OF MONITORING AND REPORTING EFFORTS

The CAP meets the criteria for a Qualified GHG Reduction Strategy, established by the California Environmental Quality Act (CEQA) Guidelines, which are supported by the Bay Area Air Quality Management District (BAAQMD). This status allows the City to use the CAP to streamline the environmental review process for new development if the proposed project demonstrates consistency with the CAP. The City must conduct regular and ongoing monitoring of CAP implementation to ensure that the CAP continues to be a Qualified GHG Reduction Strategy. CAP Implementation Program 1 *(Monitor and report progress toward target achievement)* requires the City to conduct annual monitoring activities to satisfy the Guidelines. Monitoring also allows the City to evaluate measure performance, highlight the benefits of coordinating with multiple agencies and departments to achieve the City's sustainable vision, and adjust implementation approaches based on performance to meet the adopted GHG reduction goal.

In April 2016, the City of Santa Clara completed the first progress report on CAP implementation. That report provided a narrative update on CAP implementation progress. This report expands on that qualitative update by providing a quantitative update on estimated GHG emissions reductions achieved. Additionally, the **CAP Actions to Date** section of this document has been updated to reflect activity between April 2016 and August 2016.

KEY TERMS

This report uses several key terms to explain CAP progress, including the following:

- **Greenhouse gas (GHG):** A gas capable of trapping heat inside the earth's atmosphere. These gases stop heat radiated out from the earth's surface and reflect it back, rather than allowing it to escape, not unlike the glass ceiling and walls of a greenhouse. Consistent with the US Community Protocol and the Local Government Operations Protocol (LGOP), the six GHGs assessed in Santa Clara's CAP are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). GHGs are often measured in units of carbon dioxide equivalent (CO_2e), so that GHGs can be measured and analyzed for their cumulative impact.
- **Activity:** Any action that results in GHG emissions, directly or indirectly. Activity data is used to measure how much of an action (possibly GHG emitting) occurs in any given year, such as how much natural gas was used in 2015. The measurement unit of activity data varies depending on the activity (e.g., kilowatt hours for electricity use).
- **Baseline year:** The year against which future emissions changes are measured, for purposes of progress tracking and reduction target setting. Consistent with Assembly Bill (AB) 32, many communities in California use a baseline year between 2005 and 2008. Santa Clara's baseline year is 2008.
- **Carbon dioxide equivalent (CO_2e):** A unit of measurement commonly used to measure GHGs, which accounts for the varying potency of different GHGs. GHGs in this report are shown in metric tons of carbon dioxide equivalent ($MTCO_2e$).
- **Emission factor:** The amount of GHGs released for each unit of an activity (e.g., GHGs per unit of natural gas used). Factors are provided by utility companies, state agencies, and guidance documents.
- **Sector:** A category of activities responsible for GHG emissions, such as transportation, water use, or energy use. Sectors may comprise multiple GHG sources and activities, called subsectors.

COMMUNITY GHG EMISSIONS SUMMARY

This section provides an overview of GHG emission monitoring methods, regulatory guidance, and assessment and comparison of GHG emissions in 2008 (the CAP's baseline year) to 2015.

GHG EMISSIONS MONITORING METHODS

The consultant developed and used a CAP Implementation and Monitoring Tool to quantify 2015 GHG emissions occurring in Santa Clara. This tool estimates GHG emissions for every year since 2008. Unlike the 5-year plan update, this annual status report does not reflect a complete update to the City's GHGs inventory. For example, the consultant did not collect activity data for the off-road sector. Instead, the team estimated GHG emissions by using demographic data in line with existing GHG inventory protocols. Other emissions estimates, such as vehicle miles traveled (VMT) and solid waste, were calculated using real activity data but with estimated emissions factors, which will be updated using best available science in the next complete GHG inventory. While this level of analysis is suitable for this annual status report, off-road activity data as well as activity data for all other sectors will need to be collected for the next full GHG emissions inventory. According to CAP Implementation Program 2 (*Update the baseline emissions inventory and Climate Action Plan every five years*) this must be completed no later than 2017.

REGULATORY SETTING

AB 4420 was the first California law to address climate change, by directing the state to prepare a GHG inventory and study the impacts of climate change. Since the bill's passage in 1988, California has adopted several laws to assess climate change, analyze and reduce GHG emissions and their effects, and prepare for the impacts of a warming planet. Local governments are affected by these laws and regulations, although only some include specific requirements for specific jurisdictions. These laws and regulations will lead to local reductions regardless of whether additional City action is taken. For example, the state mandates increased fuel efficiency in vehicles and an increase in the percentage of renewable power offered to electricity customers.

Executive Order S-3-05

In 2005, then-Governor Arnold Schwarzenegger signed Executive Order (EO) S-3-05, declaring that California is vulnerable to the impacts of climate change through reductions in the Sierra Nevada snowpack (a major source of water for the state), reduced air quality, and rising sea levels. EO S-3-05 also sets the following GHG reduction goals for the state:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions 80% below 1990 levels by 2050

The California Global Warming Solutions Act of 2006 (AB 32)

The California Global Warming Solutions Act of 2006, AB 32, codifies the goals set in EO S-3-05 and sets a target for the state to reduce its total GHG emissions to 1990 levels by 2020 through a series of market-based and regulatory mechanisms. These mechanisms are discussed in the AB 32 Scoping Plan, developed by the California Air Resources Board (CARB). The actions established in the Scoping Plan are included in Santa Clara's GHG inventory and provide additional credits for emissions reductions to help the City meet its targets. Actions in the

Scoping Plan include producing 33% of the state's electricity from renewable sources by 2020, implementing clean car standards, and developing a cap-and-trade program for major stationary sources of GHGs. The Scoping Plan identifies local governments as strategic partners to achieve the statewide reduction goal and establishes a GHG emissions reduction of 15% below existing levels (generally interpreted as emission levels between 2005 and 2008) as being comparable to a return to 1990 levels, which helped inform the City's reduction target. The Scoping Plan is currently in the process of being updated for the 2030 GHG reduction target identified in Executive Order B-30-15. This order establishes a mid-term GHG reduction target for the entire state of 40% below 1990 levels by 2030. California is currently on track to meet the 2020 target, and this 2030 goal ensures that climate action will continue to be a priority for all levels of government in California for the foreseeable future.

Pavley Vehicle Standards and Low Carbon Fuel Standard

AB 1493 (2002) regulations require manufacturers of new passenger vehicles to reduce tailpipe GHG emissions from 2009 to 2020. The emissions benefits from implementation of the Pavley standards are quantified using the CARB EMFAC emissions model. The Low Carbon Fuel Standard calls for a reduction of at least 10% in the carbon intensity of California's transportation fuels by 2020.

California Renewables Portfolio Standard

One of the most ambitious renewable energy standards in the country, the Renewables Portfolio Standard (RPS) mandates that 33% of electricity delivered by investor-owned utilities in California be generated by renewable sources like solar, wind, and geothermal by 2020. Senate Bill (SB) 1078 first codified the California RPS in 2002, requiring a 20% renewable electricity mix by 2010. SB X 1-2 further strengthened the RPS in April 2011, requiring a 33% renewable electricity mix by 2020. In 2015, SB 350 introduced a revision to the RPS that added an interim target of 50% of utility power coming from renewable energy sources by 2030, prior to Santa Clara's 2035 recommended reduction target. This enhances the ability of RPS to continue to help the City meet emission reduction targets in 2020 and 2035 by providing cleaner (therefore lower-emission) energy supply to all users. In 2015, 28.6% of power from Silicon Valley Power (SVP) was supplied by renewable sources.

Title 24, Energy Efficiency Standards

Title 24 of the California Code of Regulations is a statewide standard applied by local agencies through building permits. It includes requirements for the structural, plumbing, electrical, and mechanical systems of buildings and for fire and life safety, energy conservation, green design, and accessibility in and around buildings. Part 6 (the California Energy Code) and Part 11 (the California Green Building Standards Code) include prescriptive and performance-based standards to reduce electricity and natural gas use in every new building constructed in California.

In 2015, the California Energy Commission and the California Public Utilities Commission released the New Residential Zero Net Energy Action Plan 2015–2020, which is supported by Title 24 Part 6. This plan establishes a roadmap for 2020, when Title 24 will support the development of all new residential homes to be zero net energy (ZNE), meaning they produce as much energy (through solar or other renewable sources) as they use. When this Action Plan is implemented, Santa Clara is expected to see a decrease in emissions from new buildings, led by guidance in the new Title 24 and ZNE Action Plan.

BASELINE COMMUNITY GHG EMISSIONS

As part of the development of the 2013 CAP, the City adopted a baseline year of 2008 and measured GHG emissions resulting from activity occurring in the city during that year. **Table 1** reflects the community activity data for that year.

Table 2 and **Figure 2** reflect total 2008 emissions by sector. In 2008, nonresidential energy was the largest sector, comprising 60% (1,110,100 $MTCO_2e$) of all emissions in Santa Clara. Transportation emissions, from vehicles trips within and to/from the city, were the second largest source of emissions, 523,000 $MTCO_2e$, or 28%. All other sectors represented less than 10% of total emissions, with energy use from homes emitting 153,200 $MTCO_2e$ (8%), 31,300 $MTCO_2e$ from off-road equipment (2%), and 27,500 $MTCO_2e$ from solid waste disposal. Water and wastewater, which is made of emissions from the transmission and treatment of water and sewage, generated 9,200 $MTCO_2e$, less than 1% of total emissions.

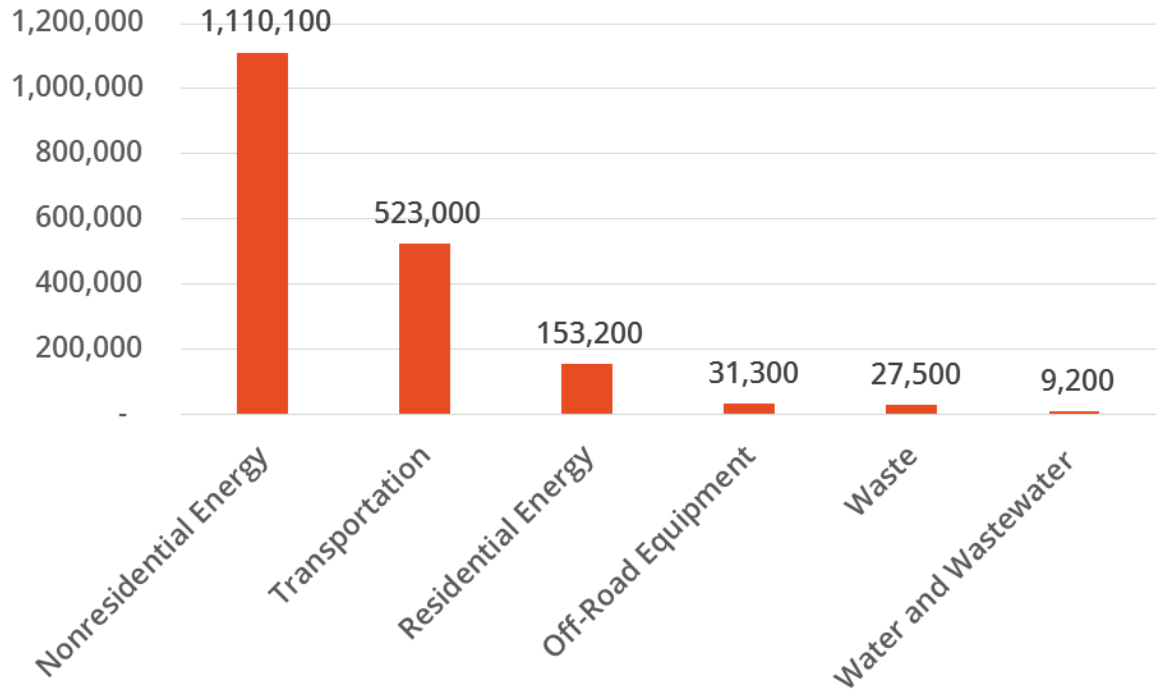
TABLE 1 2008 COMMUNITY-WIDE ACTIVITY DATA

SECTOR	SUBSECTOR	ACTIVITY DATA	METRIC
Residential Energy	Electricity	221,994,930	kWh
	Natural Gas	15,841,850	Therms
Nonresidential Energy	Electricity	2,597,934,040	kWh
	Natural Gas	57,176,860	Therms
Transportation	All	3,190	Daily VMT
Waste	Solid Waste	145,440	Tons
	Green	7,890	Tons
Off-Road	Lawn and Garden	2,300	$MTCO_2e$
	Construction	28,200	$MTCO_2e$
Water and Wastewater	Water	7,390	MG

TABLE 2 2008 BASELINE GHG EMISSIONS BY SECTOR ($MTCO_2E$)

SECTOR	EMISSIONS	% OF TOTAL
Nonresidential Energy	1,110,100	60%
Transportation	523,000	28%
Residential Energy	153,200	8%
Off-Road Equipment	31,300	2%
Waste	27,500	1%
Water and Wastewater	9,200	<1%
Total	1,854,300	100%

FIGURE 2 2008 BASELINE GHG EMISSIONS BY SECTOR ($MTCO_2E$)



2015 COMMUNITY GHG EMISSIONS

As described above, the consultant collected activity data and worked with staff to quantify the changes in emissions since 2008 (**Table 4**). Where 2015 data was not available, the most recent year available was used, as follows:

- 2015 jobs data was not available at time of development, so 2014 data was applied.
- 2015 VMT data has not been released by CalTrans. 2014 was used as a substitute.
- 2015 natural gas data obtained from PG&E excluded large commercial emitters, which caused a significant discrepancy from the 2008 baseline, and so 2013 data was used instead (see the Large Commercial Emitter Exclusion section below).

In 2015, sector proportions of GHG emissions largely remained the same (**Table 4** and **Figure 3**). Nonresidential energy remained the largest sector. With 1,020,900 $MTCO_2e$, nonresidential energy use represented over half (63%) of total emissions. Transportation (399,800 $MTCO_2e$), though much smaller than nonresidential energy emissions, was the second largest sector, 25% of all emissions. Residential energy (127,100 $MTCO_2e$), off-road equipment (33,000 $MTCO_2e$), waste (28,900 $MTCO_2e$), and water and wastewater (6,600 $MTCO_2e$) each represented less than 10% of total emissions.

As mentioned above, the assessment of emissions in this report does not reflect a complete update to the City's GHG inventory. This will be completed through detailed data requests and analysis as part of the next full GHG emissions inventory.

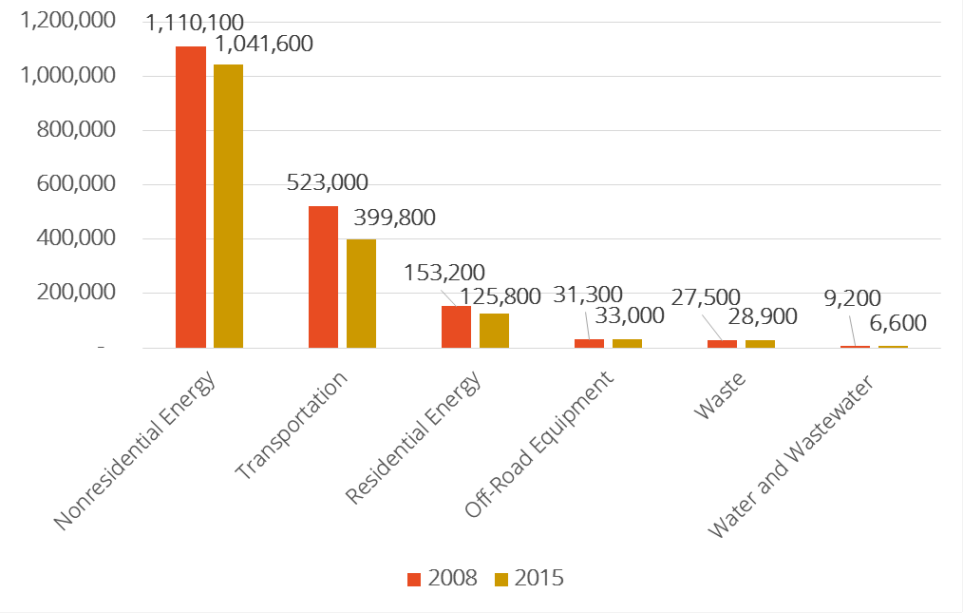
TABLE 3 ESTIMATED 2015 COMMUNITY-WIDE ACTIVITY DATA

SECTOR	SUBSECTOR	ACTIVITY DATA	METRIC
Residential Energy	Electricity	228,952,046	kWh
	Natural Gas	13,646,420	Therms
Nonresidential Energy	Electricity	2,972,722,887	kWh
	Natural Gas	58,910,460	Therms
Transportation	All	2,990	Daily VMT
Waste	Solid Waste	150,960	Tons
	Green	13,030	Tons
Off-Road	Lawn and Garden	3,800	$MTCO_2e$
	Construction	29,200	$MTCO_2e$
Water and Wastewater	Water	5,330	MG

TABLE 4 ESTIMATED 2015 GHG EMISSIONS BY SECTOR ($MTCO_2E$)

SECTOR	EMISSIONS	% OF TOTAL
Nonresidential Energy	1,020,853	63%
Transportation	399,800	25%
Residential Energy	127,076	8%
Off-Road Equipment	33,000	2%
Waste	28,900	2%
Water and Wastewater	6,600	0%
Total	1,616,229	100%

FIGURE 3 ESTIMATED COMMUNITY GHG EMISSIONS, 2008 TO 2015 ($MTCO_2E$)
(NONRESIDENTIAL NATURAL GAS HELD CONSTANT FROM 2013)



CHANGES FROM 2008 TO 2015

Tables 6 and 7 demonstrate the changes in activity data and emissions in Santa Clara from 2008 to 2015. Activity data for the year 2015 was complicated by the fact that natural gas data collected from PG&E excludes a large number of large commercial emitters, and was artificially lower than the 2008 baseline. To better represent 2015 activity, natural gas data from 2013, which does not exclude large commercial emitters, was used and held constant. The 2015 natural gas data is presented side by side with the 2008 and 2013 data in Table 8. Based on that data, combined residential and nonresidential emissions in the energy sector decreased by 115,000 MTCO2E, or 9% below 2008 levels. This decrease was due to the improved carbon efficiency of the electricity provided, because electricity usage increased substantially between 2008 and 2015.

Nonresidential energy emissions collected for the year 2015 are discussed in further detail below, under the heading *Large Commercial Emitter Exclusion*.

Santa Clara also saw a 6% decrease in total VMT, which led to a 24% decrease in transportation-related emissions. This is largely attributed to an estimated decrease in the emissions for each vehicle mile traveled, a result of state fuel efficiency regulations, which decreases the emissions factor, shown in **Table 5.**

Other, less significant contributors to the City's GHG emission totals included the following categories:

Off-road equipment increased approximately 5% (1,700 $MTCO_2e$), an estimated result of increased construction and landscaping activity, which correlates with the increase in development in Santa Clara in recent years.

The tonnage of **solid and greenwaste** disposed increased between 2008 and 2015, which led to a 5% increase in waste-related emissions (1,200 $MTCO_2e$). Both off-road and waste sectors

saw 65% increases in activity data. However, because there are estimated decreases in the intensity of the emissions released from these activities, such as cleaner construction fuels as a result of state regulations, the increase in activity didn't lead to a proportional increase in emissions.

Water and wastewater emissions saw the largest proportional decrease of any sector, reducing GHG emissions and million gallons consumed by 28% (a reduction of 2,600 $MTCO_2e$). This is most likely a result of the City's conservation efforts in the face of sustained drought conditions.

TABLE 5 CHANGES IN EMISSIONS FACTORS BY SECTOR, 2008 TO 2015

SECTOR	SUBSECTOR	2008	2015	UNIT	PERCENT CHANGE
Residential & Nonresidential Energy	Electricity	0.000308	0.000238	$MTCO_2e$/kWh	-23%
	Natural Gas	0.005319	0.005319	$MTCO_2e$/therm	0%
Transportation	On-road transportation	0.000472	0.000384	$MTCO_2e$/VMT	-19%
Solid Waste	Disposed Waste	0.186537	0.186537	$MTCO_2e$/ton	0%
	Alternative Daily Cover	0.050716	0.050716	$MTCO_2e$/ton	0%
Water and Wastewater	Water	0.995917	0.995917	$MTCO_2e$/MG	0%

TABLE 6 CHANGES IN ACTIVITY DATA BY SECTOR, 2008 TO 2015

SECTOR	SUBSECTOR	2008	2015	METRIC	% CHANGE
Residential Energy	Electricity	221,994,930	228,952,046	kWh	3%
	Natural Gas	15,841,850	13,646,420	Therms	-14%
Nonresidential Energy	Electricity	2,597,934,040	2,972,722,887	kWh	14%
	Natural Gas	57,176,860	58,910,460	Therms	3%
Transportation	All	3,190	2,990	Daily VMT	-6%
Waste	Solid Waste	145,440	150,960	Tons	4%
	Green	7,890	13,030	Tons	65%
Off-Road	Lawn and Garden	2,300	3,800	$MTCO_2e$	65%
	Construction	28,200	29,200	$MTCO_2e$	4%
Water and Wastewater	Water	7,390	5,330	MG	-28%

TABLE 7 CHANGES IN GHG EMISSIONS BY SECTOR, 2008 TO 2015 ($MTCO_2E$)

SECTOR	2008 EMISSIONS	2015 EMISSIONS	CHANGE IN EMISSIONS	% CHANGE
Nonresidential Energy	1,110,100	1,020,853	-89,247	-8%
Transportation	523,000	399,800	-123,200	-24%
Residential Energy	153,200	127,076	-26,124	-17%
Off-Road Equipment	31,300	33,000	1,700	5%
Waste	27,500	28,900	1,400	5%
Water and Wastewater	9,200	6,600	-2,600	-28%
Total	1,854,300	1,616,229	-238,071	-13%

Large Commercial Emitter Exclusion

Nonresidential (commercial and industrial) natural gas use decreased from 2008 to 2015 (**Table 8**). This reduction can be attributed to an exclusion of recent-year usage data by PG&E, as indicated by comparing the 2015 data to 2013, the last year commercial usage from large users was not excluded from gas data totals.

TABLE 8 COMPARISON OF 2008, 2013 AND 2015 NATURAL GAS DATA (THERMS)

SECTOR	2008	2013	2015
Non-Residential	57,176,860	58,910,460	27,095,740
Percentage change	--	+3%	-53%
Residential	15,841,850	n/a	13,646,420
Percentage change	--	n/a	-14%

The Climate Action Plan addresses community point source emissions and includes them as an informational item in the baseline, but not for the purpose of target setting. Point sources are fixed emitters of air pollutants, such as industrial manufacturing plants, stationary generators, petrochemical plants, and other heavy industrial sources. These point source emissions are influenced by market forces beyond the City's local influence and are regulated by BAAQMD or through federal and state programs. The emissions have been excluded from PG&E's reporting of commercial natural gas use for 2014 and 2015, as a result of triggering the 15/15 Rule.

The 15/15 Rule was adopted by the CPUC in the CPUC Decision 97-10-031 to protect customer confidentiality. The 15/15 Rule requires that any aggregated information provided by the utilities, such as the natural gas report PG&E provides to Santa Clara, must be made up of at least 15 customers. Additionally, a single customer's load must be less than 15 percent of an assigned category (such as commercial natural gas use). If the number of customers in the complied data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released. The rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened once, the customer be dropped from the information provided.

The consultant requested 2015 energy use data from PG&E, which, unlike the 2008 data, noted an exclusion of some commercial natural gas use data. This error occurred in data for other Bay Area communities as well. The exact amount of natural gas use attributable to this error cannot be determined since other factors may be in play, e.g., businesses using less energy. While the 53% reduction should be applauded, the City should still pursue projects and programs that will lead to further reductions in the nonresidential energy sector. The 8% increase in nonresidential electricity use from 2008 to 2015 indicates that commercial and industrial activity is growing, although at a slow pace, and the City should also consider programs that could help businesses reduce electricity use.

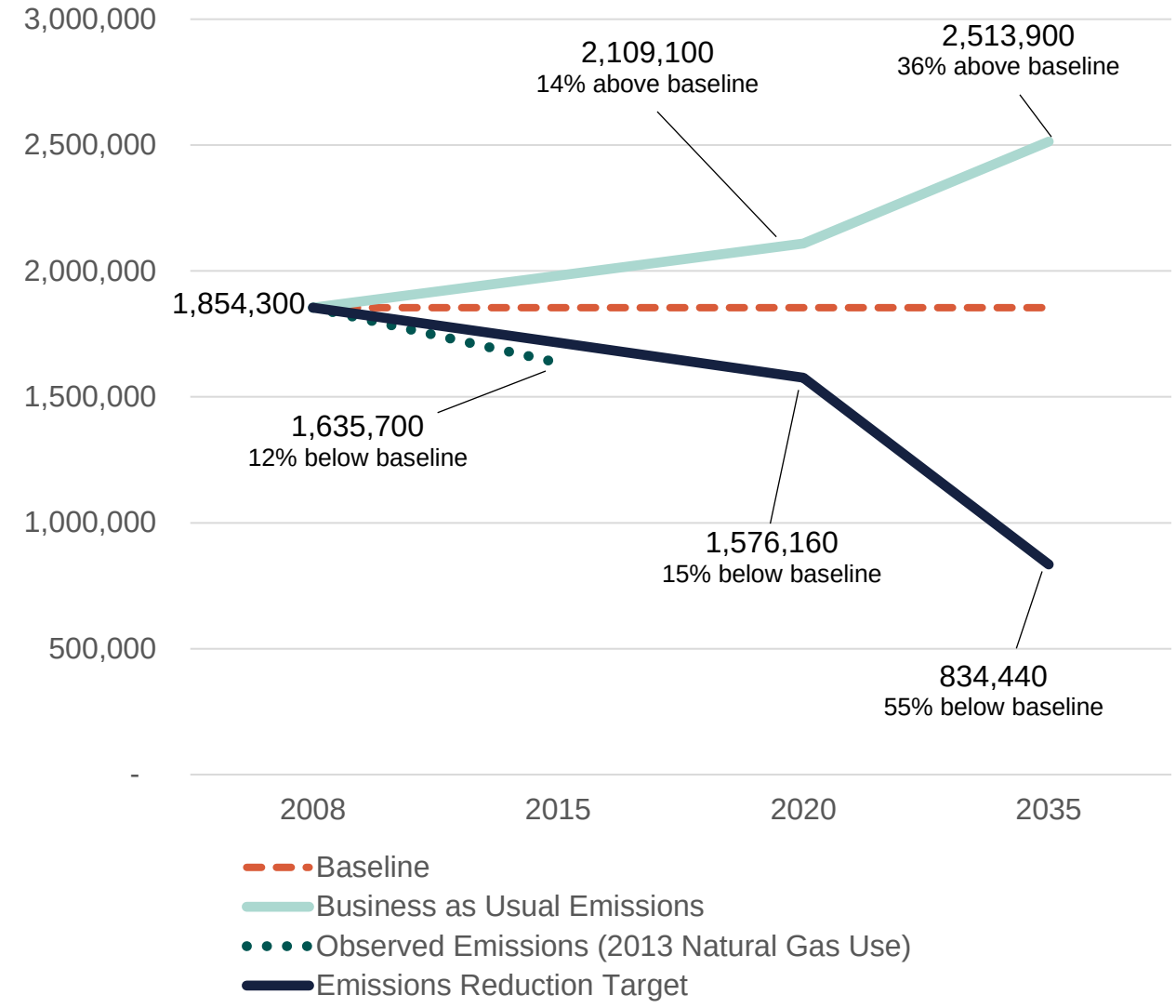
PROGRESS TO CAP TARGETS

As a product of the improvements in carbon efficiency in the production of electricity and the improved fuel efficiency of the vehicle fleet, the City has reduced emissions to 12% below baseline levels, leaving a 3%, or 59,540 $MTCO_2e$ gap that must be made up by 2020.

The recommended 2035 target of 35% below baseline has not yet been achieved (**Figure 4**). The City would need to reduce an additional 801,260 $MTCO_2e$ of emissions, using historical nonresidential natural gas consumption. Focusing on emissions reductions from the City's largest sectors, such as nonresidential energy and transportation, is critical to achieving CAP targets and community sustainability improvements.

A full GHG inventory will allow for a complete assessment of Santa Clara's progress toward its GHG reduction targets. This report only provides an estimate of 2015 GHG emissions in relation to 2020 targets. The complete inventory should include an in-depth analysis of commercial natural gas reductions observed between 2014 and 2015, and determine if targets or implementation efforts need to be changed or modified. A full GHG inventory would also include recent year activity data for off-road emissions, updated (not estimated) emissions factors for VMT and solid waste, and revised consideration of the latest climate science. As mentioned above, CAP Implementation Program 2 (*Update the baseline emissions inventory and Climate Action Plan every five years*) should be completed no later than 2017.

FIGURE 4 ESTIMATED AND PROJECTED EMISSIONS, 2008 TO 2035 ($MTCO_2E$)



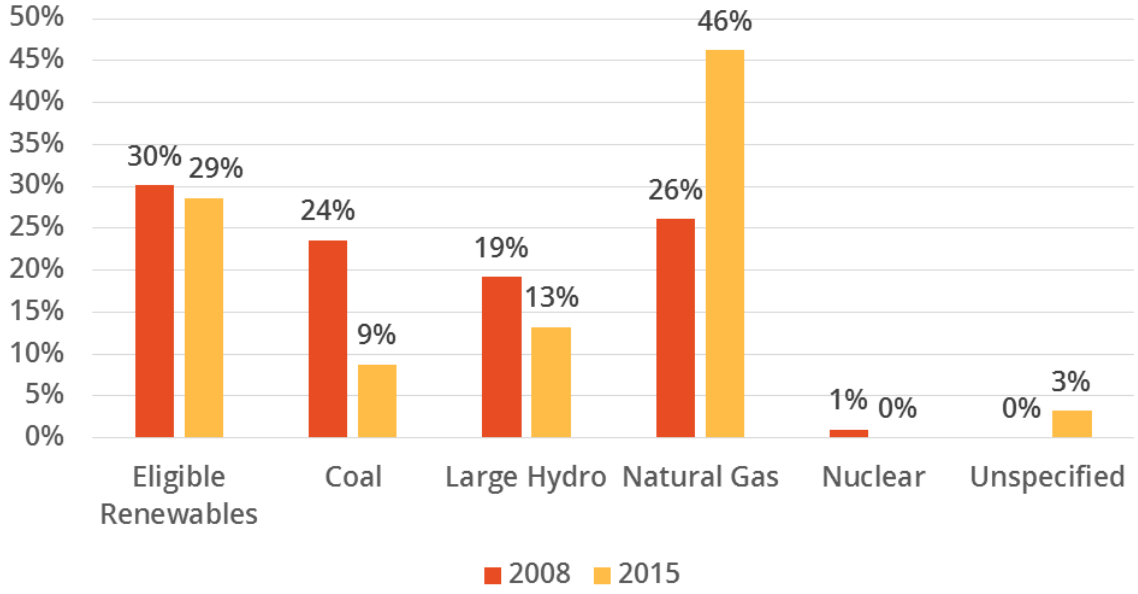
CAP ACTIONS TO DATE

The consultant worked with the City of Santa Clara and SVP staff to collect data on CAP implementation efforts to date. SVP is the City's municipal electric utility and is responsible for implementing some CAP measures. This report reflects implementation activities from April 2016 to August 2016. The following section provides an overview of community actions implemented in each sector, including estimates of GHG reductions and progress toward achieving measure goals, where data was available. Some measure did not have information available to complete an update, and should be investigated further during the next GHG emissions inventory. Where applicable, figures have been included to demonstrate progress toward targets since the baseline year.

Energy

Measure 1.1 (Coal-free by 2020) indicates that the City and SVP are to replace the use of coal in SVP's portfolio by 2020. This measure specifically anticipates that natural gas will replace coal as a cleaner source of power, and lead the way for a cleaner and more sustainable electricity portfolio for the City. Coal use has decreased from 24% of SVP's portfolio to 9%. An increase in natural gas use, from 26% to 46%, has replaced the demand for coal (**Figure 7**). This has led to a reduced emissions factor per megawatt hour (MWh) of electricity consumed, measured as pounds (lbs) of CO_2e per MWh. In 2008, SVP's power generated 680 lbs CO_2e per MWh, which has decreased in 2015 to 570 lbs CO_2e per MWh. The progress of this measure is estimated to have reduced **150,420 MTCO$_2$e** since 2008**.** If SVP achieves this goal by 2020, it is estimated that emissions from the utility's power will be 383 lbs. CO_2e per MWh through increased investment in renewable resources and/or natural gas.

FIGURE 5 CHANGES IN SVP PORTFOLIO, 2008 TO 2015



Measure 1.2 (Renewable energy resources) encourages the City and SVP to investigate use of lands outside of city limits to support large-scale renewable energy projects. SVP has been installing solar PV systems on City-owned sites outside Santa Clara. These installations include 20 MW of a wind power in the Altamont Pass area, expanding to 49.5 MW in 2018 (projected),

and a 20 MW solar installation in Kern County, completed in 2013. These installations add renewable energy SVP's base power mix that supplies all customers. In addition, SVP's Green Power Program provides customers with the option to pay an additional fee for 100% renewable energy to power their homes and businesses. The resources for this program are completely separate from the resources in SVP's base power mix and near 8% of customers are enrolled. Due to the purchases of Santa Clara Green Power by many of the city's largest electric customers (including the city and its facilities), Santa Clara is ranked 5th in the nation by the EPA for voluntary purchases of 100% renewable energy. The GHG benefits of this program will be added to the anticipated 2017 comprehensive update of the CAP.

Measure 1.3 (**Utility-installed renewables)** directs the City to develop 5 megawatts (MW), equivalent to 5,000 kilowatts (kW), of solar photovoltaic (PV) projects by 2020. To date, SVP has installed 515 kW of solar projects in Santa Clara, including a 100 kW system at Jenny Strand Park, a 370 kW system at the Tasman Parking Structure, and a 15 kW system at Henry Schmidt Park, which was funded by an Energy Efficiency and Conservation Block Grant from the US Department of Energy. These installations are estimated to have reduced **120 $MTCO_2e$** since 2008, and achieve just over 10% of the measure's 2020 target.

Measure 2.1 (Community electricity efficiency) encourages a reduction in community energy use by offering efficiency incentives, and implementing pilot energy efficiency projects and rebate programs. Each year, SVP reports electricity savings achieved through implementation of efficiency actions to the Northern California Power Agency. From 2008 to 2015, 132,736 MWh (80% of the 2020 target) has been reduced through various efficiency projects such as lighting retrofits, appliance rebates, and efficiency loan programs. The increases to electricity efficiency from this measure have saved an estimated **23,030 $MTCO_2e$** from 2008 to 2015.

Measure 2.3 (Data centers) seeks to reduce emissions ensuring efficiency in new data centers, a high energy commercial use in Santa Clara. This measure sets a goal of 10% of new data centers utilizing energy-efficient practices, such as liquid-cooled technology, by 2020, leading to an estimated 400 $MTCO_2e$ of energy savings. At the time of the writing of the City of Santa Clara's Climate Action Plan, data centers were more focused on speed to market than on energy efficiency. During that time, SVP offered substantial rebates and incentives through its Data Center Efficiency Program that targeted at data centers with IT server loads greater than 350 kW or IT cooling loads greater than 100 tons. Since the initial goal was set, the data center industry has become highly competitive and given that energy is one of the highest cost factors in achieving competitiveness, virtually all stand-alone data centers use the best efficiencies strategies available. Due to Santa Clara's mild weather and temperatures, economizers are used consistently in lieu of liquid-cooled technology; economizer technology is now a requirement by state regulation Title 24. Currently, 100% of standalone data centers utilized energy efficient technologies thereby surpassing the original goal.

Measure 2.4 (Customer-installed solar) directs Santa Clara to support the installation of commercial and residential solar PV projects with a goal of 6 MW (6,000 kW) of solar by 2020, and a "reach goal" of 10 MW (10,000 kW) by 2035. To date, 12,000 kW (1.5 MW residential and 10.5 MW commercial) of solar have been installed by SVP customers, exceeding both the 2020 and the 2035 target. These installations are estimated to have reduced **3,000 $MTCO_2e$** since 2008.

Water

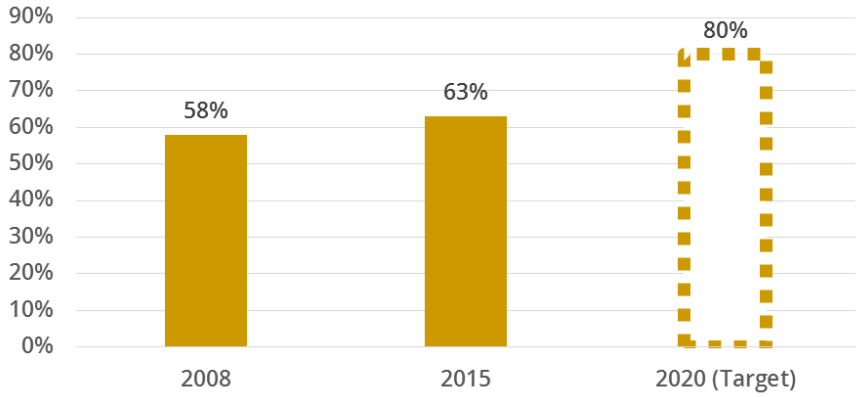
Measure 3.1 (Urban Water Management Plan targets) directs the City to meet the water conservation goals established in the City's Urban Water Management Plan (UWMP). The latest version of this plan was adopted by Santa Clara in 2010, and establishes a goal of saving 443 million gallons (1,362 acre-feet) of water by 2020. Implementation of the UWMP, supported by this CAP measure and other conservation programs such as water-wise house calls and appliance rebates, has led to a reduction of 2,060 million gallons (6,328 acre-feet) of water since 2008, saving an estimated **210 $MTCO_2e$** since the baseline year.

Waste

Measure 4.1 (Food waste collection) aims to expand food waste and composting collection routes so Santa Clara restaurants can increase their diversion of compostable materials, such as food scraps. The City is currently identifying opportunities to expand composting pickup routes and partner with restaurants. As of July 2016, five Santa Clara businesses (Santa Clara University, Levi's Stadium, Hyatt, Marriott, and Fish Market) were participating in the commercial food waste composting program, leading to an estimated **10 $MTCO_2e$** total reduction in emissions from 2008 to present.

Measure 4.2 (Increased waste diversion) encourages the City to work with regional partners to increase solid waste diversion to 80% by 2020 through increased recycling efforts, curbside food waste pickup, and construction and demolition waste programs. In 2008, 145,435 tons of solid waste was disposed from Santa Clara homes and businesses. In 2015, that number rose to 163,992 tons of solid waste. The community also increased disposal rates of greenwaste, which help get Santa Clara closer to CAP-established waste diversion goals. Greenwaste disposal rose from 7,890 tons in 2008 to 13,030 tons in 2015. These things combined led to an increase in the overall diversion rate from 2008 to 2015, from 58% to 63% (**Figure 7**). Starting in April 2016, businesses that generated 8 cubic yards or more of compostable material were required to compost, which likely leads to an increased diversion rate in the future. To meet the measure goal, the City must increase its diversion rate by an additional 17% by 2020. The increase in diversion rate since 2008 has led to an estimated **4,660 $MTCO_2e$** reduction in emissions.

FIGURE 6 SOLID WASTE DIVERSION RATE



Alternative Fuels

Measure 5.1 (Lawn and garden equipment) supports the transition of residential and commercial diesel-powered lawn and garden equipment, such as lawn mowers and leaf blowers,

to electric equipment. Representatives from BAAQMD indicated that past programs to support trade-ins have had moderate success. Only three Santa Clara residents traded in conventional lawn mowers for electric mowers and GHG emissions reductions from these conversions are too small to estimate. BAAQMD's residential trade-in program is no longer active, but the limited interest may indicate that Santa Clara would have more success with a more local, strongly advertised program.

Measure 5.2 (Alternative construction fuels) encourages the City to consider biodiesel, electricity, gasoline hybrid, or compressed natural gas alternative fuel technologies for its fleet and equipment. As of July 2016, 12% of construction equipment (defined as forklifts, backhoes, loaders, rollers, chippers, stump grinders, cranes, concrete saws, and mowers) has been upgraded to use alternative fuel technologies, nearly halfway to the 30% conversion target established in the CAP. It is estimated that this measure has led to an emission reduction of **2,440 MTCO$_2$e** from 2008 to 2015**.**

Measures 6.1 & 6.2 (Community and Municipal TDM) seek to reduce emissions from the commute of employees to and from local employers, including the City of Santa Clara. Because the CAP was approved in late 2013, no projects approved under the CAP have been built and occupied. The City will continue to condition development projects to comply with VMT/TDM reductions, as applicable, and will monitor the progress of development projects towards the completion of construction and building occupancy. The City also continues to monitor opportunities to develop TDM programs for its employees.

Measure 6.3 (Electric vehicle parking) promotes the installation of charging stations for electric vehicles (EV) in Santa Clara, increasing the likelihood of EV adoption and reducing local GHG emissions and other harmful pollutants associated with gasoline use. This measure establishes a goal of installing 430 EV charging stations in new commercial, industrial, and multi-family developments. Currently, there are more than 376 publicly available charging stations located within the city limits (~90% of the 2020 measure target), with 64 of those publicly available EV charging stations installed at City of Santa Clara facilities, as shown in **Table 7**. This has led to an estimated **1116 MTCO$_2$e** in emissions reductions in the time between 2008 and 2015.

TABLE 9 EV CHARGING STATIONS AT CITY OF SANTA CLARA FACILITIES, 2016

LOCATION	LEVEL 2 EV CHARGERS	LEVEL 3 DC FAST CHARGERS
Central Park Library	1	1
Santa Clara Convention Center	5	1
City Hall	7	0
Tasman Garage	48 (24 dual-port charging stations)	1

Urban Heat Island

Measure 7.1 (Urban forestry) directs the City to create a tree-planting standard for new development and conduct a citywide tree inventory every five years to track progress related to the implementation of the standards. Since 2008, 3,792 trees have been planted or are slated for planting across new 13 development projects in Santa Clara, in large part due to the City's 2:1

replacement rule. This rule requires all new projects to not only replace but double the number of trees that are removed in the development process. These efforts exceed the 2020 target of 2,500 trees planted. The cumulative emissions reduction from this measure from 2008 to 2015 is estimated to be **110 $MTCO_2e$**.

NEXT STEPS

This section uses the GHG emissions and CAP implementation findings presented in this report and programs and projects (tied to existing CAP strategies) to further examine how the City can achieve its GHG reduction targets.

CAP WORK PLAN

The 2013 CAP includes a work plan for all measures, which includes estimated and budgeted costs, lead departments, and estimated time frames. Based on this table, called an implementation matrix, the City should have started or should soon be starting all of the mid-term measures, which are intended to be completed by 2020 (**Table 8**).

TABLE 10 STATUS OF CAP IMPLEMENTATION MEASURES

MEASURE	IMPLEMENTATION TIME FRAME	ESTIMATED 2020 GHG REDUCTIONS	LEAD DEPARTMENT	STATUS
1.1 Coal Free by 2020	Mid-Term	388,800	Silicon Valley Power	In Progress
1.2 Renewable Energy Resources	Long-Term	Supportive	Silicon Valley Power	In Progress
1.3 Utility-Installed Renewables	Mid-Term	1,200	Silicon Valley Power	In Progress
2.1 Community Electricity Efficiency	Near-Term	27,600	Silicon Valley Power	In Progress
2.2 Community Natural Gas Efficiency	Near-Term	12,100	Silicon Valley Power (in coordination with PG&E)	Unknown
2.3 Data Centers	Near-Term	400	Planning & Inspection	Unknown
2.4 Customer-Installed Solar	Near-Term	1,500	Silicon Valley Power, Planning & Inspection	Completed
2.5 Municipal Energy Efficiency	Mid-Term	600	Public Works	In Progress
2.6 Municipal Renewables	Mid-Term	300	Public Works	In Progress
3.1 Urban Water Management Plan targets	Mid-Term	140	Water & Sewer Utilities, Planning & Inspection	Completed
4.1 Food Waste	Near-Term	150	Public Works	In Progress

MEASURE	IMPLEMENTATION TIME FRAME	ESTIMATED 2020 GHG REDUCTIONS	LEAD DEPARTMENT	STATUS
4.2 Increased Waste Diversion	Mid-Term	20,500	Public Works	In Progress
5.1 Lawn and Garden Equipment	Mid-Term	100	Planning & Inspection	In Progress
5.2 Alternative Construction Fuels	Near-Term	6,100	Planning & Inspection	In Progress
6.1 TDM Program	Near-Term	4,240	Planning & Inspection	In Progress
6.2 Municipal TDM	Ongoing	400	Planning & Inspection	Ongoing
6.3 Electric Vehicle Parking	Near-Term	1,400	Planning & Inspection	In Progress
7.1 Urban Forestry	Mid-Term	70	Planning & Inspection	Completed
7.2 Urban Cooling	Near-Term	10	Planning & Inspection	Not Started

Prior to the development of this report, City staff requested that the consultant develop criteria so the City could evaluate all CAP measures and to determine what strategies should be implemented in the near term. Based on the team's experience developing CAP implementation plans in other jurisdictions, the consultant suggests the following criteria:

- Measures that have the largest remaining GHG reduction potential
- Measures targeting sectors that have seen a rise in emissions since the baseline year
- Measures that build on efforts occurring at a regional level, leveraging funding, planning, technology, and partnerships
- Measures that are consistent with and build on other projects or existing planning efforts
- Measures that support council goals

Using these criteria, as well as data gathered as part of the development of this report, the following measures are recommended for implementation in the next year. This list may be reduced or expanded in consultation with City staff. The recommendations below may already be included in the CAP, but have been identified as important next steps to further the progress of these measures.

Measure 2.2 Community Natural Gas Efficiency

Recommendation: Implementing this measure would target commercial and residential emissions related to natural gas use in Santa Clara. Although the City has observed decreases in both commercial and residential natural gas use since 2008, ongoing efforts to minimize gas use can help ensure year-over-year reductions. Before designing a program, e.g. a boiler incentive program or fuel-switching program, the City should work with PG&E and BayREN to identify the largest natural gas users and identify how existing programs can be leveraged or improved to achieve reductions.

Measure 2.3 Data Centers

Recommendation: Operator-installed efficiency measures in new data centers have led to GHG reductions in the nonresidential energy sector, Santa Clara's largest emissions sector. The City should work to quantify the GHG impact of widespread use of efficiency technologies in this sector, which no longer require utility incentives to improve outcomes.

Measure 4.1 Food Waste and Measure 4.2 Increased Waste Diversion

Recommendation: Due to an increase in total solid waste disposed of in Santa Clara since 2008, the City should explore opportunities to encourage recycling and composting in homes and businesses in Santa Clara. Doing so would achieve reductions in emissions from the solid waste sector. For example, the City could partner with its waste hauler to conduct outreach and education at restaurants to promote the commercial composting program.

Measure 5.2 Alternative Construction Fuels

Recommendation: To address the estimated increase in off-road equipment emissions, the Public Works department could survey existing construction equipment, estimated phase-out year, and potential alternative fuel equipment that could replace it. This analysis would be supported by BAAQMD, which provides grant funding to upgrade off-road vehicles. The City could highlight its efforts and create a case study for local developers explaining the benefits of alternative fuels use. The City could then update its website to include a description of any research or conversion projects.

CREDIT

Prepared by

Michael Baker
INTERNATIONAL

One Kaiser Plaza, Suite 1150

Oakland, CA 94612