

# **Greenhouse Gas Emission Reduction Study**

## **PHASE I REPORT**



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On Behalf of the  
Citywide Working Group on Environmental Sustainability

December 2007



## Greenhouse Gas Emission Reduction Study—Phase I Cover Memorandum

CITY OF SAN BRUNO  
PUBLIC WORKS DEPARTMENT  
ENGINEERING

DATE: November 26, 2007  
TO: Citywide Working Group on Environmental Sustainability  
**FROM: Jim Shannon, Management Analyst**  
SUBJECT: Greenhouse Gas Emission Reduction Study—Phase I

Attached is a draft of the first phase of analyzing various programs to increase environmental sustainability within the City of San Bruno. At our meeting held on November 7, 2007 the working group identified several potential policies and programs that merited further study, including:

- Switching to a blend of biodiesel for all diesel fueling needs
- Installing a photovoltaic array on city property
- Instituting a food waste collection program
- Advocating the purchase of more hybrid-electric and electric vehicles
- Altering work hours to allow City Hall to close down twice a month

The working group will also look to improve some existing policies such as the Street Tree Program and the use of electronic record keeping. While not specifically tasked with its development, any policies researched by the working group may be included in the Green Building Code currently being written by Community Development.

This report, Phase I, provides analysis and recommendations for action on the first three topics listed above. Please review the report and send any comments or suggestions for improvement my way. This will also be discussed at our December meeting. A finalized version will be sent to the City Manager. Thank you once again for your time in this effort.

# TABLE OF CONENTS

Executive Summary.....	i
Problem Identification.....	1
Criteria of Evaluation.....	2
Alternatives.....	4
Evaluation of Alternatives.....	7
Comparison of Results and Recommendations.....	10
Appendix A: Framework for Evaluation	
Appendix B: Evaluation: Converting to a Biodiesel Blend (B20)	
Appendix C: Evaluation: Installing a Photovoltaic Array	
Appendix D: Evaluation: Residential Curbside Food Waste Pickup	
References Cited	

## **Executive Summary**

In its first of several reports, the newly established Citywide Working Group on Environmental Sustainability recommends that the City of San Bruno begin negotiations with Norcal Waste Systems to initiate residential curbside collection of vegetable food waste for a potential savings in greenhouse gases (GHG) over a six-year period equivalent to 6,584 tons of carbon dioxide (CO<sub>2</sub>E). As these negotiations proceed, the working group recommends that the City replace its diesel fuel with a blend of 20% biodiesel and 80% regular diesel (a mixture known as B20) for a six-year GHG reduction of 275 tons CO<sub>2</sub>E. Converting to biodiesel requires minimal staff effort and could lead to greater reductions in emissions over the long-term. The working group does not, at this point, recommend further action on installing a photovoltaic array on city property to offset electricity purchased from Pacific Gas & Electric, as implementation requires a relatively novel approach for a minimal GHG reduction of 875 tons CO<sub>2</sub>E over the same six-year period.

Since the passage of AB 32, the Global Warming Solutions Act of 2006 that requires a 20% reduction in the gases created by California that cause global warming, the state and local governments have searched for appropriate government actions to reduce greenhouse gas emissions. At a recent workshop sponsored by the Bay Area Air Quality Management District and the International Coalition for Local Environmental Initiatives, it was learned that the jurisdiction of the City of San Bruno is responsible for an annual 140,836 metric tons of greenhouse gases—of which 1,706 came directly from City operations. The Citywide Working Group on Environmental Sustainability has been formed to identify and study various policies or programs that will reduce the annual amount of greenhouse gas emitted within San Bruno.

This report, *Phase I*, is the first of what will be a series of reports analyzing the various potential impacts various policies might have on GHG. Conversion to biodiesel, solar power and food waste recycling are considered here due to their growing popularity among local governments and their potential to reduce GHG. Factors influencing the final recommendation are, among other criteria, the costs to implement the policy, the amount of total GHG reduced and difficulty of implementation.

Curbside food waste recycling reduces the most GHG primarily because it has the widest scope of influence. With a population of 40,000, any program or policy that affects residents will have a greater impact than those that only affect City operations. Unfortunately, wide-ranging policies often have a longer and more difficult implementation window. Given this, future reports will analyze a mix of internal policy alternatives that only affect City operations and external policies that affect the wider residential and business communities. Each report will produce a set of recommendations for action so that the City can take advantage of staff's limited time, and institute the appropriate policies necessary to reduce greenhouse gas emissions.

## **1.0 Problem Identification**

In the fall of 2006, the California legislature passed, and the governor signed, AB 32 the Global Warming Solutions Act. This landmark piece of legislation required the state of California to reduce its emission of green house gases (GHG) to the levels existing in 1990 by the year 2020—a 20% reduction from today's levels (California Air Resource Board [CARB], 2007a). A variety of gases contribute to global warming, including carbon dioxide, water vapor, methane, nitrous oxide and others. Each of these gases affects the degree of climate warming differently; therefore, the warming effect of each gas is translated into a carbon dioxide equivalent. In 1990, that the equivalent amount of carbon dioxide emitted by all sources within the state is estimated at 427 million metric tonnes (CARB, 2007a).

The California Air Resources Board (CARB) has been tasked to develop recommendations to meet the requirements imposed by AB 32. CARB recently issued a list of Early Action Measures, or steps that can be taken now to reduce GHG emissions. On that list is a recommendation that local governments develop policies and protocols to reduce GHG emissions from their own operations as well as from their jurisdiction (CARB, 2007b). In addition, many residents in the San Francisco Bay Area are demanding that local governments take responsibility for addressing the issue of climate change. Due to these developments, staff recently attended a workshop sponsored by the International Coalition for Environmental Initiatives (ICLEI) where it was determined that the geographic area comprising the City of San Bruno was responsible for emitting approximately 140,836 metric tonnes of CO<sub>2</sub>E—1,706 due to operations of City forces and facilities (ICLEI sponsored workshop attended by Jim Shannon on September 7, 2007). One of the missions of the Citywide Working Group on Environmental

Sustainability is to determine the most effective methods to reduce GHG stemming from both City operations and the community at large.

Due to staff time constraints and the need to act, the working group has decided against drawing up a wide ranging, comprehensive set of policy alternatives and evaluating the potential applicability of each before recommending a course of action to the City Manager and City Council. Instead, the working group will break down the evaluation into phases, with each phase resulting in a recommendation for action. In this *Phase I*, we look at three alternatives that demand attention due to their probable impact on GHG reduction and their relative popularity with other jurisdictions and agencies: 1) Converting to a blend of biodiesel for the City's diesel fuel needs; 2) Installing photovoltaic cells on City property to generate solar power; and 3) Add the collection of vegetable food waste to the items collected by curbside recycling pickup.

## **2.0 Criteria of Evaluation**

On November 7, 2007, the working group amended a framework defining the criteria to evaluate policy alternatives and their measures (see Appendix A). When recommending an alternative, the working group will apply the entire framework to determine how favorable a given policy appears based on its suite of measures.

- Cost: The amount of money, both in capital and ongoing maintenance expenditures required to implement the policy, acquire needed equipment or construct new facilities.
- Savings: The amount of money the City might realize in operational or capital savings due to policy implementation

- Implementation: A broad criteria, implementation attempts to realize the degree of difficulty to make the policy a reality.
  - *Number of staff/departments:* The greater the number of departments or staff necessary to implement a particular policy or program, the more complex coordination of the process will be.
  - *Lead Department:* A short-staffed department, or one with limited expertise in a given area, may have difficulty getting a new program off the ground.
  - *Project Phaseability:* A policy or program that can be accomplished piecemeal or phased in over time will be preferred over those that would require an abrupt change from the status quo and might entail unforeseen consequences.
  - *General Degree of Difficulty:* A collective subjective determination by the working group of how difficult implementation will be.
- Reduction in Natural Resource Consumption: While this could refer to any particular resource the policy attempts to conserve or produce, all alternatives considered herein are measured in metric tones reduced of CO<sub>2</sub>E (carbon dioxide equivalents). *This criterion is the primary measure of policy effectiveness.*
- Target of Alternative: Does this policy attempt to change the behavior of City operations, or is it targeted to change the behavior of residents and business within jurisdictional limits? While neither option is considered good or bad, the working group believes that this categorization will help aide decision-makers consider any political ramifications of their preferred alternatives.

- Type of Policy: Will a policy need to be incorporated into the Municipal Code before it can go into effect, or will it simply take an administrative action? Policies requiring less formal methods of adoption are preferred.

### **3.0 Alternatives**

Discussed below are three policy alternatives to the status quo aimed at reducing greenhouse gas emissions from the City of San Bruno jurisdiction. The evaluations of these alternatives will be compared to the status quo of current GHG emissions in the analyses discussed in section 5.0.

#### **3.1 Biodiesel**

Given that transportation accounts for 40% of all GHG emissions within city limits (ICLEI workshop, September 7, 2007), tackling fossil fuel consumption in automobiles and other equipment serves as a logical starting place. Though state law does not allow municipal governments to impose any fuel efficiency standards for automobiles owned by residents or local businesses, the City can regulate its own fleet; as well as serve an example for the rest of the community to follow.

The City of San Bruno currently owns three electric vehicles, recently purchased two gasoline/electric hybrid vehicles and has future plans to purchase additional hybrids as current vehicles come up for replacement. Little improvement can be made, then, on the existing fleet of gasoline-powered vehicles until they are actually replaced. However, the City of does operate twenty vehicles and utilizes energy from 12 back-up generators that run on diesel fuel. In fact, internal records indicate that nearly 27,500 gallons of fuel were consumed in FY 2006-07.

A growing trend in the environmental movement and among fleet managers is the utilization of biodiesel. Biodiesel is a fuel that has properties extremely similar to that of regular diesel fuel, but its combustion results in the release of significantly fewer greenhouse gases. Not only have recent studies shown that the creation of biodiesel directly from plants such as soy beans yields 93% more energy than required for its production, “relative to the fossil fuels they replace, greenhouse gas emissions of production and combustion of biodiesel are reduced by 41%” (Hill, Nelson, Tilman, Polasky & Tiffany, 2006).

Because the City purchases its fuel in bulk from a wholesale supplier, the possibility exists that the City could offset GHG from its operations by switching to a blend of biodiesel for equipment utilizing diesel combustion. Indeed, San Bruno’s garbage collector, Norcal Waste Systems, recently switched over to a blend of biodiesel and the City and County of San Francisco recently announced a new project to recycle used cooking oils from its restaurants and have it reprocessed by an outside vendor into biodiesel to fuel MUNI buses (Burres, 2007).

### **3.2 Solar Power (Photovoltaics)**

Since the gas crisis of the 1970s, solar power has been an option considered as an alternative to fossil fuels for home and business electricity use. With the threat of global climate change, solar has become more widely used throughout California. As a renewable energy source with zero GHG emissions, and its growing economic competitiveness with traditional energy production methods, the working group has expressed an interest in developing sources of solar power.

The most widely used option to convert sunlight into useful energy utilizes photovoltaic cells—hardware that transforms energy from the sun into electricity. A growing number of

individuals and businesses install photovoltaics on their buildings and then use the energy generated to offset the amount of electricity required from the grid; thus after a number of years, the amount of electricity generated from the photovoltaics will end up paying for the cost of installation. Unfortunately, power output for an individual photovoltaic cell is quite low, so it takes a large solar array to make a significant power impact for a given user. For example, Public Works determined that the amount of solar panels that could be installed on a newly planned water pump station would not provide nearly enough electricity to power its high-capacity pumps (M. Reinhardt, personal communication, November 7, 2007).

Because the City has little in the way of capital funding to cover the cost of installation for a larger solar array, this analysis will evaluate the feasibility of entering into a solar power purchase agreement (SPPA) with a third party to offset the amount of electricity purchased from PG&E. With an SPPA, the City would contract with another vendor to build a large photovoltaic array on its property. After installation, the City would then enter into a long-term agreement with the vendor to purchase power from that solar array. Payments for the power from the City to the vendor cover not only the amount of solar-generated electricity purchases, but also the cost of installation (see Solar Power Partners [2007] for additional description of an SSPA). Using a SPPA, the City can gain access to solar power without fronting a large outlay in capital to acquire and install the necessary hardware.

### ***3.3 Residential Food Waste Collection***

In landfills, organic matter such as yard and food waste breaks down in a way that produces large amounts of methane—a gas with 23 times the warming potential of carbon

dioxide. If organic matter can be diverted from landfills into composting programs, a large reduction greenhouse gases could be realized.

Currently, San Bruno has a curbside yard waste recycling program, but not a food waste curbside collection program, whereby residents deposit their vegetable food scraps into a specially designated bin. Communities that do have this service direct the food waste to composting or mulching centers. Norcal Waste Systems, the City's current garbage hauling contractor, has the ability to offer this service. The potential exists, then, for the City to negotiate a new rate structure with Norcal Waste and offer the service to residents, thereby redirecting tons of compostable food waste from landfills into compost.

## **4.0 Evaluation of Alternatives**

### ***4.1 Biodiesel***

The alternative evaluated here involves replacing regular diesel fuel with a blend of 20% biodiesel and 80% regular diesel, also known as B20. B20 is the most widely used ratio of biodiesel to diesel as it avoids many of the cold weather handling issues and slight power losses reported with the use of 100% pure biodiesel (Department of Energy, n.d.). A review of available data suggests that the price of biodiesel compared to regular diesel has been falling. However, based on conversations with Norcal Waste (M. Puccinelli, personal communication, November 21, 2007) and Bluesky Bio-Fuels (L. Hasset, personal communication, November 21, 2007), a 10% premium serves as a useful assumption for biodiesel prices in the near future.

Because the worldwide demand in vehicle fuel has resulted in escalating prices, and because the growing use biofuels such as biodiesel and ethanol has also raised the value of its antecedent crops, estimating the long-term future price of regular diesel and biodiesel would be

of little value. Additionally, the creation of recycling program for fats, oils and grease from City restaurants such as the one piloted by the City and County of San Francisco could create a cheaper source for biodiesel production (Burress, 2007). Present cost for the analysis is based on a six-year use of B20.

The analysis assumes that the combustion of one gallon of regular diesel fuel results in a carbon dioxide equivalent release of 22.2 lbs (Environmental Protection Agency [EPA], 2005). Combustion of a gallon of B20 results in a 15% GHG reduction. See Appendix B for the full analysis.

#### **4.2 Solar Power (Photovoltaics)**

As noted above, the most effective application of solar technology for the City would be the installation of a large photovoltaic array. While City-owned buildings provide some space for solar panel installation, the parking lot adjacent to City Hall and Fire Station 51 offers the greatest amount of surface area with virtually shade-free exposure to sunlight. This analysis assumes that the City would enter into a solar power purchase agreement with a vendor to construct photovoltaic panels that would serve as overhead shading for the parking lot.

The lot itself sits on an area of 18,125 SF. Given constraints of the site, a total of three rows of roofing could likely be installed for a total area of 14,500 SF. Surveying available sources, power output per square foot of photovoltaic ranges from 11-25 watts depending on the quality of photovoltaic used—though the greater the power output, the more expensive the cost and the longer the return on investment. For this analysis, a conservative 15 watts per square foot is used. Energy saved is measured against total energy consumption of City Hall and Fire Station 51 offset by the solar array.

Because this analysis assumes that a solar power purchase agreement with a third party vendor would be used to acquire the array and purchase power from it at a cost less than what is commonly purchased through Pacific Gas and Electric, measuring present costs does not apply. Further, due to the complexity of such purchase agreements, it is impossible to quantify any potential financial savings from acquiring and purchasing power from the solar array without actually negotiating the agreement itself. Measuring of present savings does not apply as well.

A projection on GHG reduction is based on kilowatt hours of electricity consumed by City Hall and Fire Station 51 in FY 2006-07. PG&E provides a coefficient of 0.000223 for the conversion of electricity purchased into a GHG equivalent (ICLEI workshop, September 7, 2007). GHG reduction is calculated, then, by simply subtracting the energy used from photovoltaics from the total power purchased from PG&E in FY 2006-07 and multiplying the amount by the above coefficient to determine that amount of GHG reduced. While electricity consumed by City Hall and Fire Station 51 will vary year to year (a 1% annual increase assumed for analysis), the amount of electricity generated from photovoltaic cells will remain constant assuming that the level of sunlight remains unchanged. Additionally, the conversion coefficient will change only slightly from year to year depending on the variety of sources PG&E utilizes for its electricity generation. To keep in line with the analysis of biodiesel conversion, the same six-year time span is used. See Appendix C for the full analysis.

#### ***4.3 Residential Food Waste Collection***

The amount of food waste generated by the City of San Bruno is based on information from the California Integrated Waste Management Board and the Statewide Waste Characterization Study as presented by the International Council for Local Environmental

Initiatives at a workshop held on September 7, 2007. As San Bruno does not have the potential to add large numbers of new residents, a very modest growth in food waste of 1% per year is assumed. The amount of GHG reduced from composting is based from the Environmental Protection Agency’s online WASTE Reduction Model (WARM). Aside from the San Bruno specific food waste input tonnage, other parameters of the model were left at their default value.

Again, cost to City operations does not apply, as residents will bear any burden in increased garbage collection fees. To keep in line with the analysis of other alternatives, the same six-year time span is used. See Appendix D for the full analysis.

## 5.0 Comparison of Results and Recommendations

The results of the analysis of the three policy alternatives described in Appendices B-D are summarized below in Table 1. The status quo is not listed, but would have a null value for each criterion.

Table 1. Policy alternative comparison matrix. Comparisons based over a 6-year period.

<i>Criteria</i>	<i>Biodiesel Conversion</i>	<i>Photovoltaic Array</i>	<i>Food Waste Collection</i>
<i>Present Cost</i>	-\$46,295, 5% discount rate	Unknown, likely zero	No cost to budget, unknown cost to residents
<i>Present Savings</i>	None.	Possibly very slight savings	None.
<i>Number of Departments</i>	Finance, Fire and Public Works (3)	Finance, Parks & Facilities, Public Works, City Attorney (4)	Finance, City Attorney (2)
<i>Lead Department</i>	Public Works	Public Works/Parks and Facilities	Finance
<i>Time to Implement</i>	3 months	8-12 months	3-9 months
<i>Ability to Phase In</i>	Nonexistent	Moderate	Nonexistent
<i>Degree of Difficulty</i>	Low	Moderate	Moderate
<i>Reduction in GHG CO2 equivalent</i>	275	875	6,584
<i>Target of Alternative</i>	Internal City operations	Internal City operations	Regulation of residents
<i>Type of Policy</i>	Administrative, requiring Council approval	Administrative, requiring Council approval	Administrative, requiring rate adoption by Council

Clearly instituting a curbside food waste collection program yields the greatest reduction in GHG by far. The figure of 6,584 tons of CO<sub>2</sub>E is likely a conservative number; an aggressive promotional campaign might move that amount even higher. The most serious drawback to this alternative is the political component of increasing garbage collection fees. Residents recently voted down a measure that would have raised the local sales tax by a half-cent, and the City will soon need to raise water and sewer fees for needed capital improvement projects. Moreover, garbage rates were recently adjusted when Norcal Systems switched to a single-stream recycling collection (where residents put all recyclable materials into one bin instead of splitting of paper and aluminum, for example). Asking for another rate increase may encounter hostility from the City Council and residents. Another drawback to this option, Finance and the City Attorney play the lead roles in implementing this policy. Already understaffed divisions, without additional support this alternative may be delayed or lost altogether in the crush of other items requiring immediate attention.

Installing a photovoltaic array and supplementing energy consumption with its resulting electricity generation yields a much less 875 CO<sub>2</sub>E reduced over a six-year period. Given the relatively complexity and novelty of the project, this does not appear to give a very large environmental payback. Additionally, Parks and Recreation is also another understaffed department that needs to play a major role for timely implementation. To this alternative's credit, though, embarking on such a high-visibility project should create a perception in the community that the City is serious about addressing its environmental sustainability. Such goodwill might drive forward future, more difficult projects that could create greater GHG reductions. Given the probable low costs to the City, a solar array covering the parking lot at

City Hall could also serve as a beginning to the installation of additional arrays at other city-owned sites.

Converting to from diesel to B20, a blend of 20% biodiesel and 80% regular diesel saves only 275 tons of CO<sub>2</sub>E and results in a present cost of approximately \$46,000 over a six-year period. However, even given these disadvantages, this alternative merits serious consideration. With only three months for complete implementation, this is a project that can provide immediate benefits. Personnel in Public Works have the time and ability to implement the project. If a longer horizon is considered, additional advantages could be realized. The blend of biodiesel can increase as maintenance issues and horsepower concerns are settled, yielding greater reductions in GHG. San Francisco's pilot program of collecting waste cooking oil and grease from restaurants should be followed carefully so that efforts might be made to replicate the program here. Such a program would lower the price of diesel, provide a bigger GHG reduction since recycled biodiesel production requires less energy input than virgin biodiesel production, and eliminate a large percentage of the fats, oils and grease that often clog the City's sanitary sewer system. It should also be noted that predicting the future price of diesel and biodiesel is nearly a random guess. Increasing shifts in demand for biodiesel blends will likely increase the number of suppliers and manufacturers, thereby lowering price. This alternative, then, becomes more attractive over the long term—assuming that the City retains the enterprising staff necessary to improve upon the initial program.

This analysis recommends that the City begin a dialogue with Norcal Waste Systems to begin a curbside collection program of vegetable food waste. As the revised rate structure and timetable for implementation become more defined, staff can evaluate its political feasibility relative to its importance as a GHG reduction strategy. Staff should also move to convert from

diesel to B20. Providing an immediate GHG reduction benefit, this policy has the potential to develop further even after implementation. At this time, staff should only investigate installing a photovoltaic array if there exists strong outside pressure or key personnel have the time to begin developing an RFP and coordinate with the various parties. Since City operations require large power demands and space to house an appropriately sized array does not exist, explorations should instead be made into how the City can encourage residential and business utilization of solar technology. As shown with the curbside collection of food waste, engaging in policy that affects a greater proportion of the jurisdiction will yield greater savings in GHG.

## Appendix A

### **Framework to Evaluate Policy/Program/Project Alternatives to Increase Environmental Sustainability in San Bruno**

The table below represents a framework with which this working group can evaluate the variety of policy and program options our group will discuss. Ideally, we will eventually list all of our options in a matrix and compare them to one another using the criteria and measures outlined below.

<i>Criteria</i>	<i>Measure</i>
Cost (capital and/or ongoing maintenance)	(\$) Dollars
Savings (reduction in expenditures due to implementation)	(\$) Dollars
Implementation	Number of staff/departments needed to implement.
	Lead department
	Amount of time
	To what extent can the project/policy be phased in over time?
	General degree of difficulty (e.g. easy, moderate, difficult, unfeasible)
Reduction in Natural Resource Consumption	Number of KWH saved, Tons of equivalent CO2 reduced, gallons of fuel reduced, million gallons of water saved, etc.
Target of Alternative	Does the policy focus on internal City operations, or does it attempt to influence, regulate or promote actions by residents and businesses?
Type of Policy	Administrative policy, included into Municipal Code or voluntary target?

*Amended 11/7/2007*

## Appendix B

### Evaluation of Converting to Biodiesel Blend B20

#### Cost

Annual diesel consumption in FY 2006-07: 27,500 gallons  
(Unlikely to change significantly in the next five years)

<i>Year</i>	<i>Retail Price of Diesel</i>	<i>Wholesale Purchase Discount</i>	<i>Annual Diesel Cost</i>	<i>B20 Premium</i>	<i>Additional Cost to City</i>
0	3	-0.12	72600	0.1	-\$7,260
1	3.25	-0.12	78650	0.1	-\$7,865
2	3.5	-0.12	84700	0.1	-\$8,470
3	3.75	-0.12	90750	0.1	-\$9,075
4	4	-0.12	96800	0.1	-\$9,680
5	4.25	-0.12	102850	0.1	-\$10,285

Present Cost to City to Purchase B20

<i>Discount Rate</i>	<i>NPV</i>
3%	-\$48,657
<b>5%</b>	<b>-\$46,295</b>
7%	-\$44,134
10%	-\$41,226

#### Greenhouse Gas Reduction

- Annual diesel consumption in FY 2006-07: 27,500 gallons  
(Unlikely to change significantly in the next five years)
- 22.2 lbs CO2 equivalent emitted per gallon of regular diesel combusted (EPA, 2005).
- GHG reduced by 15% through use of B20 (EPA, 2002)

<i>Year</i>	<i>Diesel GHG Emissions (lb)</i>	<i>B20 GHG Emissions (lb)</i>	<i>GHG Reduced (lb)</i>
0	610,500	518,925	91,575
1	610,500	518,925	91,575
2	610,500	518,925	91,575
3	610,500	518,925	91,575
4	610,500	518,925	91,575
5	610,500	518,925	91,575
		<b>Total GHG Reduced (lb)</b>	<b>549,450</b>
		<b>Total GHG Reduced (tons)</b>	<b>275</b>

## Appendix B

### Implementation

*Number of Departments and Staff.* Finance, Fire and Public Works would be the primary players. Fire needs to be assured that the B20 transition will not affect fire engine performance or maintenance issues (which it should not; M. Puccinelli, personal communication, 2007), the Central Garage Manager from Public Works should be aware of when the transition occurs and monitor any potential maintenance issues. The Public Works Management Analyst will serve as project coordinator during the transition and set up negotiations with the appropriate vendor. The Finance Director oversees all purchasing and would need to grant approval before a contract is forwarded to the City Manager.

*Lead Department:* Public Works

*Amount of time:* If given approval from the City Manager or the City Council, it will take approximately three months to coordinate the parties and secure a supply contract.

*Degree of phaseability:* Nonexistent. Once the diesel tank receives B20, all diesel-combustion vehicles will shift to B20.

*General degree of difficulty:* Low. Research indicates that the most trouble this alternative offers is the negotiation of a new contract with a B20 supplier.

### Target of Alternative

Internal City operations.

### Type of Policy

Administrative policy, but the dollar amount of a new fueling contract will require approval of City Council.

## Appendix C

### Evaluation of Installing a Photovoltaic Array

#### Cost

The cost for installation and maintenance of the photovoltaic array is inclusive in the price paid for the electricity it produces as detailed in the negotiated solar power purchase agreement. It is likely that the cost to the City for purchasing electricity from the array will not be any greater than the cost to purchase electricity from PG&E. The actual price will depend on the cost of array installation, length of agreement and the vendor the City chooses to contract with.

#### Greenhouse Gas Reduction

- Area of parking cover photovoltaic array: 14,500 SF
- Power generated per square foot of array: 15 watts
- Total power generated from array: 217.5 kilowatts
- Average number of hours of available sunlight: 8 hours
- Annual electricity generated from array: 635,100 kwh
- Power consumed by City Hall and Fire Station 51 in FY 2006-07: 1,068,431 kwh (assumed to increase by 1% per year)
- GHG electricity conversion coefficient for 2006: 0.00023 (assumed to remain the same in the medium term)

<i>Year</i>	<i>Annual Electricity Demand (kwh)</i>	<i>Annual Equivalent GHG Emitted (ton)</i>	<i>Annual Photovoltaic Electricity (kwh)</i>	<i>Remaining Electricity Demand (kwh)</i>	<i>Revised GHG Emitted (ton)</i>	<i>GHG Reduced (ton)</i>
0	1,068,431	245	635,100	433,331	99	146
1	1,079,115	248	635,100	444,015	102	146
2	1,089,906	250	635,100	454,806	104	146
3	1,100,806	253	635,100	465,706	107	146
4	1,111,814	255	635,100	476,714	109	146
5	1,122,932	258	635,100	487,832	112	146
					<b>Total GHG (lb)</b>	1,749,065
					<b>Total GHG (tons)</b>	875

#### Implementation

*Number of Departments and Staff:* A representative from Parks and Facilities familiar with the City's PG&E accounts will be required for this alternative as well as either the Assistant Director or Finance Director. The Management Analyst from Public Works will likely coordinate efforts, draft the RFP for the SPPA and support negotiations with the chosen vendor. Any resulting agreement will require approval from the City Attorney. An associate engineer from Public Works will need to manage the construction of the array itself.

*Lead Department:* Public Works / Parks and Facilities

## Appendix C

*Amount of time:* 2 months to research solar power purchase agreements and issue a Request for Proposal; 1 month to review proposals and interview top candidates; 1 month to negotiate agreement; 1 month for approval by City Attorney and City Council; and a 3 month construction window. Total time of 8 to 12 months.

*Degree of phaseability:* Moderate. While the array itself has to be installed all at once, the City can opt to install arrays on other city-owned property as facilities as usage and staff time allows.

*General degree of difficulty:* Moderate to difficult. Requires coordination of several departments on a novel project of large scope.

### Target of Alternative

Internal City operations.

### Type of Policy

Administrative policy, but the dollar amount of a new fueling contract will require approval of City Council.

## Appendix D

### **Evaluation of Residential Curbside Food Waste Pickup**

#### Cost

This alternative does not place a direct cost upon City operations; instead, a garbage collection fee increase for residents would have to be negotiated between the City and Norcal Waste Systems.

#### Greenhouse Gas Reduction

- Year 0 food waste from the California Integrated Waste Management Board and the Statewide Waste Characterization Study as provided by International Council for Local Environmental Initiatives at the September 7, 2007 GHG inventory workshop. Minimal growth of 1% assumed for subsequent years.
- Analysis assumes that Norcal Waste System's efforts to publicize the collection program will yield a growing percentage of diverted food waste.
- GHG reduction based on the Waste Reduction Model (WARM) developed by the EPA. Aside from San Bruno specific tonnage, other figures based on default model national averages.

<b>Year</b>	<b>Food Waste Created (tons)</b>	<b>% Diverted to Compost</b>	<b>CO2E GHG Reduced (ton)</b>
0	4,645	10	473
1	4,691	15	716
2	4,738	20	964
3	4,786	25	1,218
4	4,834	30	1,475
5	4,882	35	1,738

**Total GHG (lb)** 13,168,000  
**Total GHG (tons)** 6,584

#### Implementation

*Number of Departments and Staff:* This new program primarily involves Finance and the City Attorney. Personnel from these departments would negotiate the appropriate rate schedule for residents. Finance would also need to train line staff to answer questions the first few months following the changeover regarding the new charge appearing on customers' bill.

*Lead Department:* Finance.

*Amount of time:* 3-9 months depending on the pace of negotiations, availability of staff and Norcal Waste Systems' readiness to deploy the new service.

## **Appendix D**

*Degree of phaseability:* Non-existent. All residents would need to pay the same fee, so all neighborhoods citywide would receive the service at the same time.

*General degree of difficulty:* Moderate. While no special skills are needed, developing a new agreement would take significant staff time and raising garbage collection fees may encounter political resistance from council members or residents.

### **Target of Alternative**

Regulation of residents.

### **Type of Policy**

Administrative policy requiring the adoption of a new rate by the City Council. Additionally, the City could alter the municipal code mandating that food waste go only in the appropriate curbside containers.

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