

## 2009 Greenhouse Gas Emission Inventory for the Gulf of Farallones National Marine Sanctuary

Gulf of the Farallones National Marine Sanctuary (GFNMS) used the National Park Service's (NPS) [Climate Leadership In Parks \(CLIP\) Tool](#) to complete an inventory of 2009 greenhouse gas emissions resulting from facility use, operations, and transportation activities at the sanctuary's headquarters. These 2009 data were compared to the 2008 baseline inventory to measure performance in meeting emission reduction goals.

Data were gathered from utility statements, internal records, and an employee transportation survey. The Greenhouse Gas (GHG) inventory includes totals for stationary combustion fuel (natural gas for heating), purchased electricity, mobile combustion (auto, public, boat and air transportation), wastewater treatment, and municipal solid waste and disposal.

For the purpose of this audit, emissions were measured only for internal staff at the headquarters facility on Crissy Field, and not for visitors to the sanctuary. Each input is described in greater detail below, with a per capita emission estimate provided at the end of this document.

### General Information:

Unit Evaluated: GFNMS Crissy Field Headquarters, San Francisco, CA

Year Inventoried: 2009

Inventory completed by: Brian Johnson, Deputy Superintendent

Inventoried Operations: Stationary Combustion, Purchased Electricity, Mobile Combustion, Wastewater Treatment, Municipal Solid Waste and Disposal

Number of buildings: 2

Number of Full-Time Staff Equivalents: 23 (12.3-GFNMS, 6.7-FMSA, 4-IFR)

### 2009 Highlights

- Staff remained level
- Sanctuary acquired an additional building that was included in this inventory (Residence/Officer in Charge Quarters)
- Emissions will rise with Residence occupancy in Oct 2010
- Met all reduction targets in 2009 except energy; specifically:
  - Natural gas and electricity usage rose 7% (~4% attributed to new building)
  - Transportation emissions declined 16%
    - Auto and boat was the same level
    - Air travel declined 42% (budget driven?)
    - Public transportation declined 50% (greatest decline, Muni#29?)
  - Water usage declined 10%
  - Refuse collection declined 50%

*Per capita emissions declined .83 Metric Tons Carbon Dioxide Equivalent (MTCO2E)*

### **Stationary Combustion:**

The stationary combustion (natural gas used for heat and hot water) numbers were derived from Pacific Gas & Electric statements. PG&E is the local utility provider.

Natural Gas: 3866 Therms of natural gas used in 2009

Conversion: 1Therm = 100 cubic feet.

Input: 386,550 cubic feet. (7% increase)

### **Purchased Electricity:**

The stationary combustion numbers were derived from Presidio Trust statements

Electricity: GFNMS paid \$7727.26 in 2009

The Presidio Trust utility rate is \$0.141 per kWh.

Input: 54,803 kWh.(7% increase)

### **Mobile Combustion/Ground & Sea Transportation:**

A survey was conducted of all staff to determine the method in which they commuted to work. They could choose from car, carpool, bus, train, bicycle, or walk. All travel to and from the Crissy Field Headquarters office was counted, including use of two government vehicles. This estimate also accounts for the use of the R/V FULMAR, the sanctuary's research vessel, for 37 days each year.

Total staff: 23

Primary transportation: 19.3 auto, 1.9 bike, 1.8 bus (Autos went up as primary)

Government vehicles on-site: 2 (1-Van,1-Hybrid; assumed average 22mpg per auto)

Input: Autos, fueled with gasoline – 167,050 miles (negligible decrease)

Input: Buses, fueled by diesel – 7,800 miles (50% decrease)

Input: Boats – 4000 gallons of diesel

### **Mobile Combustion/Air Transportation**

The transportation survey also asked all staff to estimate the total miles they flew on work related travel in the past year.

Total airplane miles: 56,600 miles. (42% decrease)

Conversions: Greenhouse Gas Protocol Initiative calculation for long haul, economy class air travel = 0.1416 kg CO<sub>2</sub> per passenger mile; 1kg = 0.001 metric tons.

Input: 8.01 metric tons of CO<sub>2</sub> equivalent.

### **Wastewater Treatment:**

Sewer charges are derived from water consumption. Because GFNMS is located in a Mediterranean climate, rain is seasonal and predictable. It typically rains from October to March, and is dry from April to September. For this estimate we assumed no irrigation was required in wet months. These numbers were derived from Presidio Trust sewer charges to the sanctuary (via GGNRA) during wet and dry months. This estimate focused on both potable water consumed by the buildings tenants, and that used for irrigation.

Based on the 2009 NPS Utility Billing Summary, GFNMS paid \$2,552.82 for sewer. The Presidio Trust utility rate is \$9.37 per kgal. Conversion: 1 kgal = 1000 gal.  
 Total: 272,446 gallons.

Building-only: GFNMS paid \$577.66 in 2009 based on the sewage bills for wet months (Jan-Mar, Oct-Dec). The Presidio Trust utility rate is \$9.37 per kgal.  
 Conversion: 1 kgal = 1000 gal.  
 Building-only Total: 61,650 gallons for 6 months, or 123,300 for 12 months.  
 Input: Building only – 123,300 gallons (46%)

Irrigation-only: Subtract building-only sewer from total gallons sewer to determine  
 Irrigation-only total: 149,146 gallons (54%)

**Solid Waste:**

These numbers were derived from the on-site refuse collection bin.

GFNMS has one 1-cubic yard container for waste, picked up once a week. At pick up, the container is usually at 50% capacity.

Conversions: 1 cubic yard = 500 pounds; 1 pound = 0.0005 short tons.

Input: 6.5 short tons.

**EMISSION RESULTS**

After plugging in the above estimates, the NPS CLIP Tool derives the total Metric Tons Carbon Dioxide Equivalent (MTCO<sub>2</sub>E) based on each input. For long-term tracking purposes, this number was converted into a per capita total.

The final numbers were used to generate graphs and charts below. More detailed results are available in the CLIP Tool, such as emissions of each greenhouse gas CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and HFC. 2008 results are used as the baseline for all future analyses.

**Gross Emissions by Sector (MTCO<sub>2</sub>E)**

<b>GFNMS Operations</b>	<b>Stationary Combustion</b>	<b>Purchased Electricity</b>	<b>Mobile Combustion</b>	<b>Wastewater Treatment</b>	<b>Solid Waste</b>	<b>Gross Emissions</b>
<b>2008</b>	20	18	149	1	2	190
<b>2009</b>	21	19	128	1	1	171

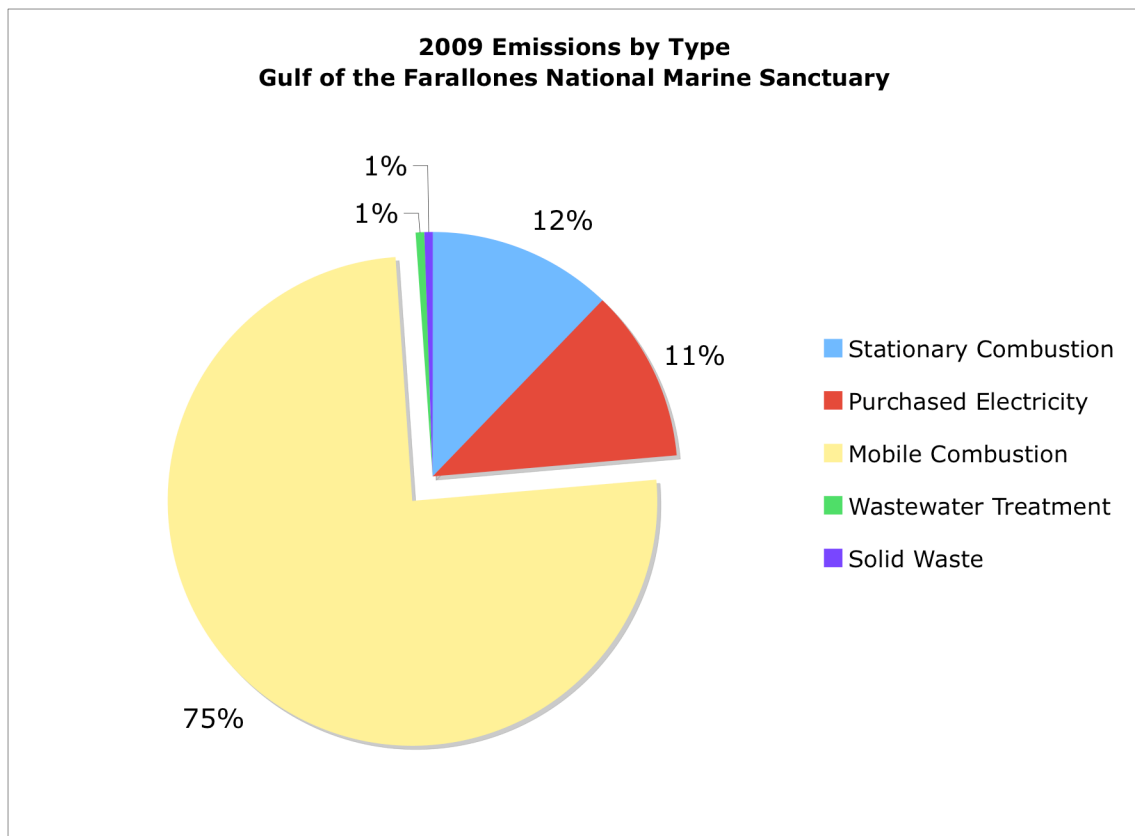
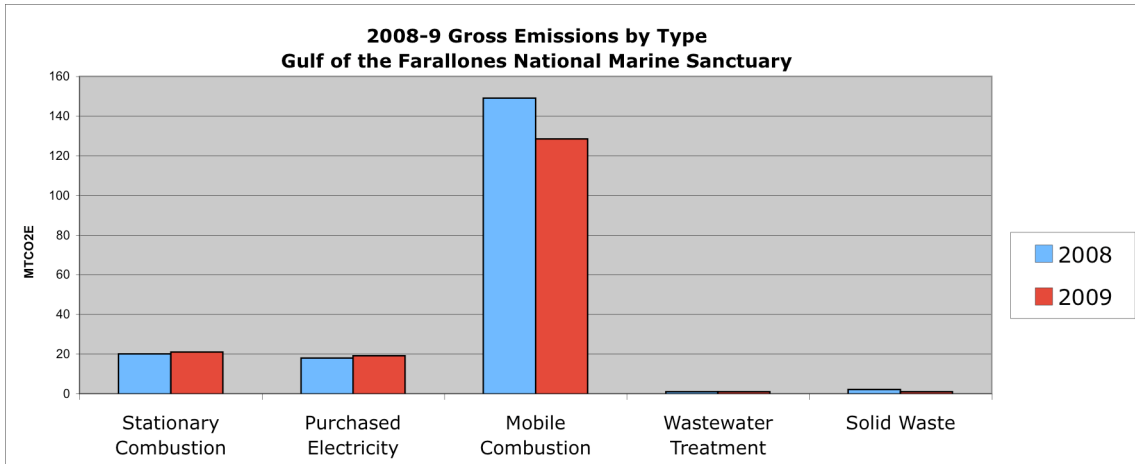
**Per Capita Emissions**

190 metric tons / 23 staff = 8.26 MTCO<sub>2</sub>E (2008)

171 metric tons / 23 staff = 7.43 MTCO<sub>2</sub>E (2009)

**REDUCED 0.83 MTCO<sub>2</sub>E per capita**

**Emission Results Tables**



**Mobile Combustion: Breakdown of Emissions (2009)**

