

SFO Climate Action Plan

March 2014



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Executive Summary

The Mayor and the Board of Supervisors of the City and County of San Francisco have been in the forefront of the U.S. movement for addressing climate change issues by reducing greenhouse gas emissions. In 2008 as a result of this commitment the Board of Supervisors adopted and the Mayor signed into law Ordinance No. 81-08 Climate Change Goals and Action Plan, which mandates the achievement of the following greenhouse gas (GHG) emission targets by each City Department:

- 25% below the 1990 emission level by 2017
- 40% below the 1990 emission level by 2025
- 80% below the 1990 emission level by 2050

The Airport Commission has vigorously supported the City's climate change initiatives and has established the total mitigation of the carbon footprint of SFO controlled operations by 2015 as an additional goal for the Airport. SFO management developed a Departmental Climate Action Plan (DCAP) in FY 2008 as the blueprint for meeting the Ordinance 81-08 objectives and achieving total mitigation of the carbon footprint of SFO controlled operations. The current revisions to the DCAP incorporate information related to Airport operations in FY 2013, as well as more detailed data for the GHG emissions of airlines, tenants, concessionaires, and from the commute by airport passengers.

In FY 2013, we were able to reduce our gross baseline carbon footprint to 25.7% below the 1990 emission level for Airport controlled operations. In addition we achieved a GHG emission offset equivalent to 6.3% of the 1990 emission level for a total reduction of 32.1%, exceeding the Ordinance No. 88-01 goal of 25% emission reduction from the 1990 base level by 2017. SFO also voluntarily mitigated 200% of our FY 2013 net carbon footprint by enabling other SFO enterprises to reduce their own GHG emissions. More information on our achievements is provided in this DCAP and is summarized below:

- In 1990 SFO generated an estimated GHG emission of 49,780 metric tons (tons) from operations that were under the control of the Airport Commission. Accordingly, Ordinance No. 81-08 mandates the following maximum future GHG emission levels for SFO:
 - by 2017 not to exceed a GHG emission of 37,335 tons per year,
 - by 2025 not to exceed a GHG emission of 29,8681 tons per year, and
 - by 2050 not to exceed a GHG emission of 9,956 tons per year.
- **Emission Reduction Measures.** In FY 2013 the gross GHG emission from SFO controlled operations was 33,784 tons. This emission level was achieved by implementing a number of emission reduction measures which in FY 2013 reduced the GHG emissions at SFO by 15,958 tons, as itemized below:
 - General reduction in the GHG emission factor for electricity supplied by SFPUC to SFO in FY 2013, and implementation of energy efficiency measures resulted in a GHG emission reduction of 9,263 tons in comparison with the corresponding 1990 emission level

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- GHG emission from SFO Fleet declined by 607 tons from the 1990 level due to improved fuel efficiency of the fleet vehicles and the use of alternate fuels which compensated for the rise in the number of vehicles
- Reducing the quantity of landfilled solid waste from 6,000 tons in 1990 to 2,072 tons in FY 2013 reduced the GHG emissions for landfilling operations by 1,493 tons
- Reducing the emission of fugitive refrigerant gases and using more climate friendly refrigerant gases resulted in an emission reduction of 4,595 tons compared to 1990 emission level.

The above emission reductions were balanced by growth induced increases in consumption of various fuels resulting in a net GHG emission reduction of 12,814 tons from 1990 to FY 2013 or a reduction of 25.7%.

- **Emission Offset Measures.** These measures relate to Airport operations or actions that yield a direct reduction in the GHG emissions to the atmosphere. In FY 2013 the following offsets were achieved by SFO:
 - SFO recycled about 78.2% of the general solid waste collected at the Airport yielding an emission offset of 3,061 tons.
 - SFO has planted 2,020 trees of various species around the Airport which sequester about 121 tons of carbon dioxide from the air per year.

As the result of the above offset measures SFO's Category 1 carbon footprint was reduced by an additional 3,182 tons in FY 2013, thereby yielding an additional 6.3% reduction from the 1990 emission level. The combined emission reduction and offset measures implemented at SFO reduced the GHG emissions from SFO controlled operations to 33,784 tons in FY 2013, indicating a reduction of 32.1% from the 1990 emission level.

- **Voluntary Emission Mitigation Measures.** These measures relate to direct or indirect actions taken voluntarily by SFO to reduce the GHG emissions from the operations of airlines, car rental agencies, passengers' travel to and from SFO, etc. We believe that SFO is entitled to claiming the emission mitigation resulting from the expenditure of funds and other resources to enable other entities to save money and reduce their own GHG emissions. In FY 2013 these measures mitigated the GHG emissions at SFO by 67,737 tons or 200% of the net GHG emissions from SFO controlled operations, as itemized below:
 - In FY 2013, the Preconditioned Air supply system mitigated the GHG emissions from aircraft auxiliary engines at SFO by 53,704 tons. The significant increase in the PC Air emission mitigation since FY 2010 was due to the installation of dedicated PC Air units at 12 jet bridges in Boarding Areas C and F, and also the installation of 14 PC Air units at the jet bridges during the Terminal 2 renovation. The Boarding Area E renovation, completed in January 2014 equipped all gates with PC Air and 400 Hz power units.
 - In 2009 SFO initiated a three year Pilot Green Car Rental Incentive Program (GCRIP) in conjunction with the rental car companies operating at the Airport.

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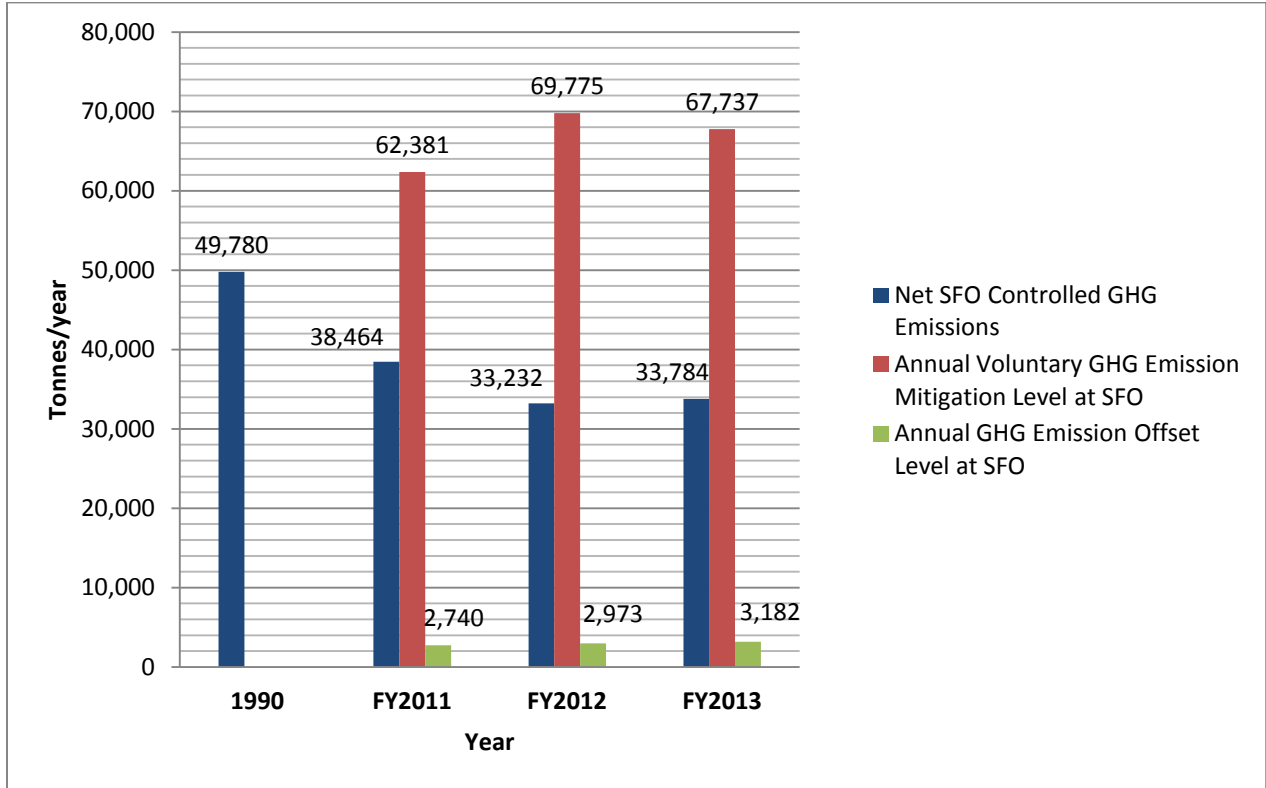
This program provided financial incentives to the rental car companies to increase the number of fuel efficient cars with an EPA score of 17 or higher to 15% of their rental vehicle inventory. The program also provided a \$15 discount to the customers who rented a Green Car. On January 1, 2012, SFO discontinued the customer discount, while the financial incentives for the rental car companies remained in effect until January 1, 2013. In first half of FY 2013, the net emission mitigation from the GCRIP was estimated at 4,562 tons, which was higher on an annual basis than 8,049 tons of mitigation that was achieved in FY 2012. These data indicate that the rental of fuel efficient cars has not been affected by the termination of financial incentives program.

- The GHG emission mitigation associated with construction & demolition (C&D) waste recycling operations at SFO are estimated to be 4,722 tons in FY 2013. In previous years when varying levels of construction activity occurred, the annual GHG emission mitigation level reached as high as 13,096 tons. The variations in the magnitude of these mitigations are associated with the composition of recycled waste and variations in the quantity of construction and demolition waste. Due to the significant variation in the level of GHG emission reduction associated with the construction activities SFO has chosen to classify these reductions as emission mitigation rather than emission offset to avoid reporting wide fluctuations in the annual GHG emissions from Commission controlled operations.
- SFO provided partial funding for BART extension to SFO which in FY 2013 resulted in a reduction of about 84 million miles of travel by airline passengers based on monthly BART passenger data at SFO station. SFO shares approximately 9.1% of this mitigation based on the SFO contribution of 200 million dollars to the capital cost for extending BART from Colma to SFO and Millbrae. In FY 2013, it is estimated that BART service mitigated SFO's GHG emissions by 2,551 tons.
- In 2003 SFO completed the construction of AirTrain system which has eliminated the need for the use of shuttle buses by all on-Airport Rental Car Agencies. In FY 2013, the AirTrain system mitigated SFO's GHG emissions by 2,198 tons.

In order to meet Ordinance 88-01 goal of achieving 40% GHG emission reduction by 2025, SFO is currently developing a number of new and expanded GHG emission reduction and offset measures. These planned measures are estimated to yield a combined GHG emission reduction and offset level of 1,364 tons per year by 2017. The planned GHG emission reduction / offset measures include energy efficiency projects, enhanced solid waste recycling, fleet vehicle upgrades, and improved employee commute travel. Additionally, SFO is implementing a number of major facility improvements that would in all probability further improve our energy efficiency.

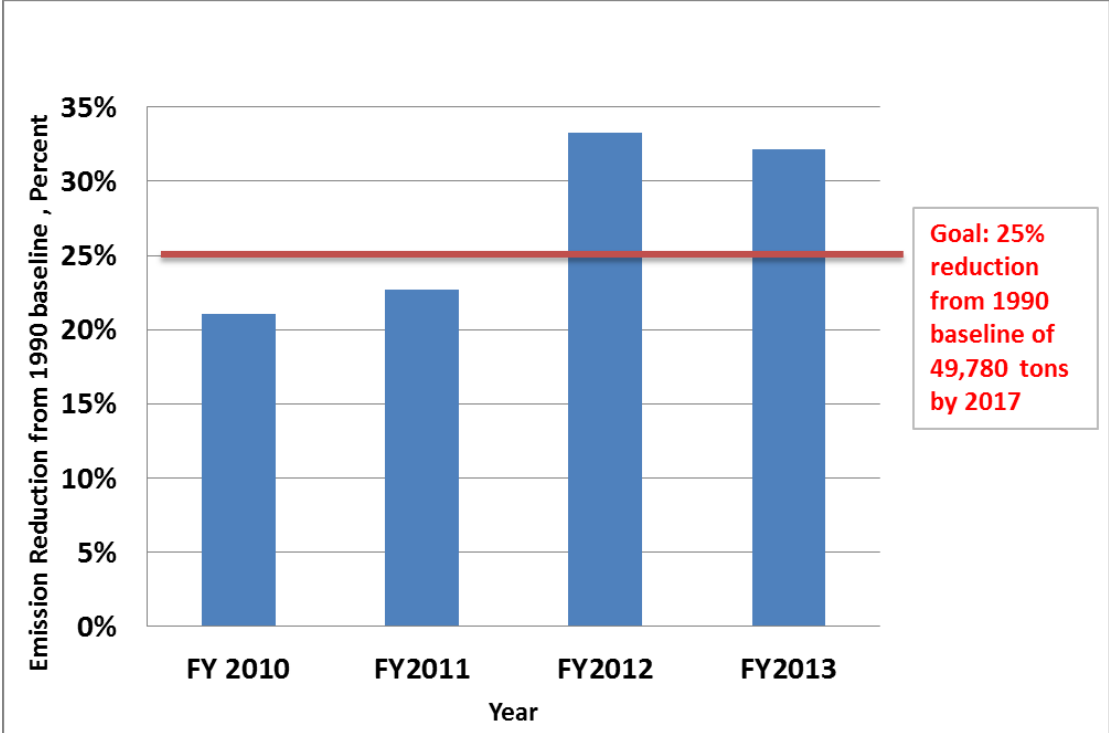
SFO has also compiled estimated data for GHG emissions from the operations of airlines, airline support services, concessionaires, and other activities at the Airport. Reduction / mitigation of GHG emissions from these operations will be addressed in cooperation with all of the stakeholders as a part of SFO's future climate action initiatives.

Annual GHG Emissions and GHG Mitigation/Offset Levels at SFO



GHG Emission Reduction Levels from 1990 Baseline Emission at SFO

Executive Summary



Expanded Summary

Background

The Board of Supervisors enacted Ordinance No. 81-08 in 2008 entitled Climate Change Goals and Action Plan to establish City greenhouse gas emission (GHG) targets and guidelines for development of departmental climate action plans, and to authorize the Department of Environment (SFE) to coordinate efforts to meet these targets, and to make environmental findings. Ordinance No. 81-08 establishes the following greenhouse gas emission limits for the City and County of San Francisco:

- By 2008, the Commission on the Environment shall determine the 1990 greenhouse gas emission levels within the City and County of San Francisco, including private enterprise activity;
- By 2017, City shall reduce the greenhouse gas emissions by 25% below 1990 levels;
- By 2025, City shall reduce the greenhouse gas emissions by 40% below 1990 levels; and
- By 2050, City shall reduce the greenhouse gas emissions by 80% below 1990 levels.

The Ordinance requires that all City departments shall consider the effect of all decisions and activities within their jurisdiction on greenhouse gas emissions and undertake their responsibilities to the end that the City achieves greenhouse gas emission limits described above.

Section 903 (c) of the Ordinance further states that “On or before January 30, 2009 all City departments shall assess GHG emissions associated with their activities and submit in a format specified by the Department of Environment a written action plan that identifies and makes recommendations on GHG emission reduction / offset measures applicable to:

- Operations of the department and other city greenhouse gas emission sources within its jurisdiction, and
- Private sector greenhouse gas emission sources regulated by the department.

Such plan shall identify potential costs of identified measures and the estimated potential benefits of elements in the plan for reducing greenhouse gases, and may also identify other economic and non-economic impacts to the City’s economy and environment.”

Section 904 of the Ordinance states that “Beginning at the Close of fiscal year 2008-2009, no later than 90 days after the close of each fiscal year, all City departments shall submit to SFE, in a format specified by the Department of the Environment, a written update of the plans, status of any recommendations required by Section 903, and the GHG emission reductions achieved due to actions taken by the department. Such updates are to provide, to the extent feasible, adequate information to enable the Department of the Environment to calculate the City’s progress toward meeting the GHG emission reductions set forth in the Ordinance.”

This updated Climate Action Plan for SFO has been developed in the format prescribed by SFE and in compliance with the provisions of Ordinance No. 81-08 of the City and County of San Francisco. A copy of the Climate Change Goals and Action Plan Ordinance is included in Attachment A.

Expanded Summary

An expanded summary of the first two sections of the Climate Action Plan is provided below, followed by a brief summary of the remaining sections of the Plan.

Section 1 - Profile of SFO

San Francisco International Airport (SFO) is Northern California's premiere airport serving hundreds of destinations throughout the United States and abroad. SFO is consistently rated as one of the top airports in the world for the efficiency and quality of service rendered to the travelers.

Located on the shore of San Francisco Bay, 14 miles south of San Francisco, SFO covers approximately 5,200 acres with 2,400 acres developed for Airport use and approximately 2,800 acres remaining as natural tidelands and wetlands. In FY 2013, SFO served 44.7 million passengers with 417,430 takeoffs and landings on 56 airlines. Additionally, 329,571 metric tons of cargo was shipped to and from SFO during the same period. Also, more than 180 vendors operated at SFO to serve the travelers, including restaurants, shops and various services.

SFO is served by the Bay Area Rapid Transit (BART) system and travelers are using BART at an ever increasing rate to travel to and from the Airport. SFO's new AirTrain system provides a seamless connection to BART and rental car facilities for access to all Airport terminals.

SFO is governed by the Airport Commission, a five-member body appointed to four-year terms by the Mayor of San Francisco. The Commission appoints the Airport Director. The Airport personnel are organized in several divisions with each division serving specific needs of the Airport, the travelers, and/or the enterprises operating at SFO.

Section 2 - SFO's Carbon Footprint

SFO's carbon footprint can be defined by the following three categories of greenhouse gas (GHG) emissions in the context of Ordinance 81-08 requirements:

Category 1 - SFO Controlled Emissions - GHG emissions from operations that are under the control of SFO, including SFO employees' commute emissions, and emissions from all modes of travel on SFO controlled roads.

Category 2 - Airlines, Concessionaires, and Airline Support Services Emissions - GHG emissions, within the physical boundaries of SFO; by airline operations, including landing and take-off (LTO) cycles; ground service equipment (GSE) and other support services; and by various concessionaires and other tenants.

Category 3 - Optional Emissions - U.S. Environmental Protection Agency (EPA) defines optional emissions as those emissions that are not directly emitted by but are connected with the reporting enterprise's operations. Examples include GHG emissions from: 1) passengers' travel, on public roads or by public transit, to and from SFO, 2) outbound cruising aircraft, 3) delivery trucks, 4) construction equipment, and 5) commute travel by employees of airlines, concessionaires, and airline support services.

Expanded Summary

Estimated GHG emissions for the categories listed above are summarized in Table 1. SFO has developed fairly complete and detailed data for Category 1 emissions, whereas some data gaps remain in the estimates of GHG emissions for the remaining two categories.

The focus of the current Climate Action Plan is on the assessment and reduction of Category 1 GHG emissions. Reduction measures for Category 2 and 3 GHG emissions will be evaluated in cooperation with the various stakeholders as a part of SFO's ongoing Environmental Sustainability Program.

Table 1. Summary of Estimated GHG Emissions for 1990 and FY 2011 through FY 2013 at SFO

WRI Emission Category	SFO Emission Category	GHG Emission (Tonnes)			
		1990	FY 2011	FY 2012	FY 2013
Scopes 1, 2, and 3	Category 1- SFO Controlled Emissions	49,780	38,464	33,232	33,784
Scopes 1, 2, and 3	Category 2- Airlines, concessionaires, and Airline Support Services Emissions	839,000	749,398	898,403	908,247
Scope 3	Category 3. Optional Emissions	7,127,543	8,487,665	9,570,521	8,414,155
	Total	8,016,323	9,275,526	10,507,085	9,356,187

Components of Category 1 SFO Controlled GHG Emissions. The net Category 1 GHG emissions in FY 2013 were estimated at 33,784 metric tons indicating a 32.1% reduction from the 1990 baseline and exceeding the 2017 emission reduction goal of 25% established in Ordinance 81-08. The GHG emissions at SFO are generated mainly as the result energy and fuel consumption and to a lesser extent from the release of fugitive refrigerant gases, waste disposal, and wastewater treatment operations. These emissions reflect the impact of GHG reduction strategies used throughout the year, as well as the impact from offset measures such as solid waste recycling and tree planting at SFO. SFO also mitigated over 180% of its net GHG emissions. The details of GHG emission calculations are provided in Section 2 of this report.

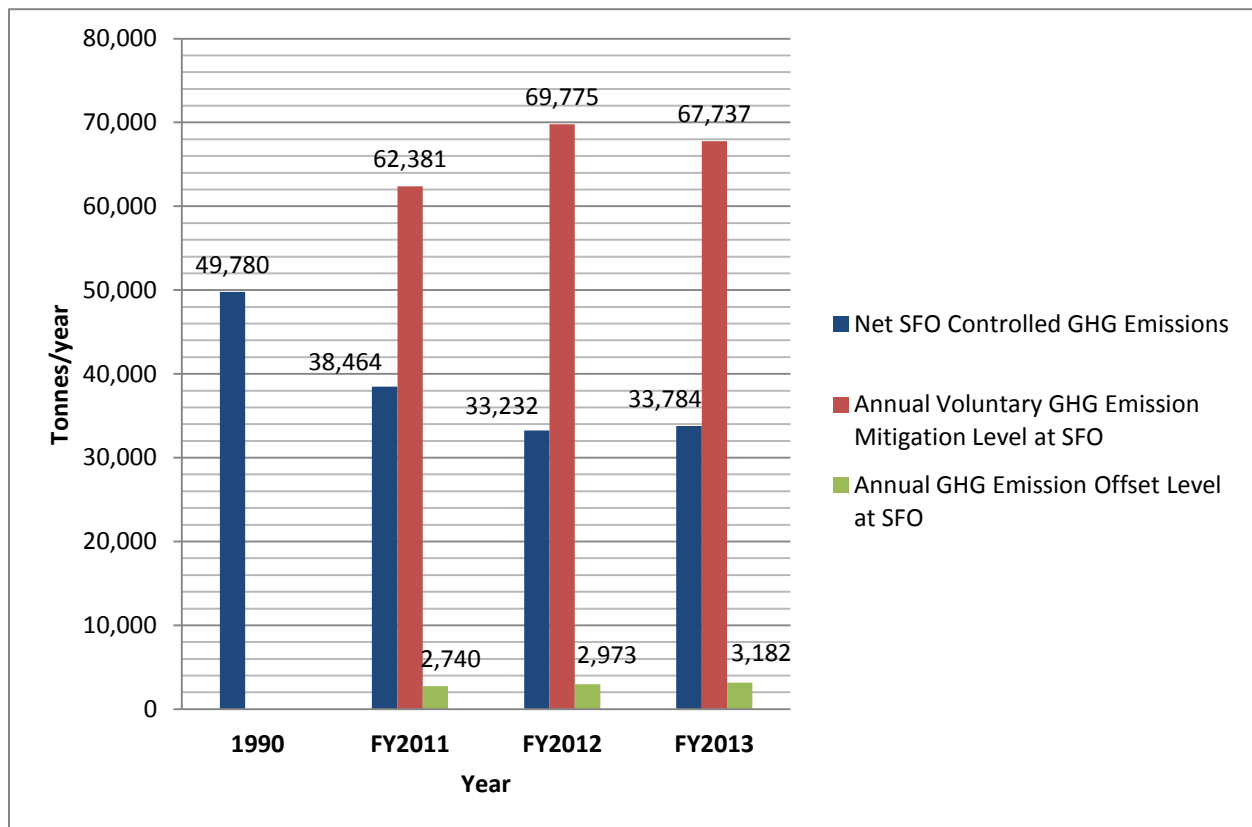
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Table 2. Summary of Historical and Current Category 1 GHG Emissions, Emission Offset and Emission Mitigation Levels at SFO

Activity	Category 1 SFO Controlled GHG Emissions (tonnes per year)			
	1990	FY 2011	FY 2012	FY 2013
GHG Emission Levels				
Electric Energy and Natural Gas Consumption^a	29,269	25,013	19,367	20,006
Fuel Consumption	13,155	14,290	15,002	15,556
Fugitive Refrigerant Gas Emissions	4,875	740	649	279
Solid Waste Disposal	2,246	788	753	753
Wastewater Treatment	235	373	410	372
Total Gross Baseline Category 1 GHG Emission	49,780	41,204	36,180	36,966
GHG Emission Offset Levels				
Solid Waste Recycling Offset	0	-2,619	-2,827	-3,061
Tree Sequestration Offset	0	-121	-121	-121
Total GHG Emission Offsets	0	-2,740	-2,948	-3,182
Net Category 1 GHG Emission	49,780	38,464	33,232	33,784
GHG Emission Mitigation Level				
Total GHG Emission Mitigation	0	-62,381	-69,775	-67,737

^a A GHG emission factor of 0.00 was used for all electric energy consumption at SFO in FY 2013 per California Air Resources Board's designation of SFPUC as a zero GHG emission Electric Utility

Figure 1. Annual GHG Emissions and GHG Mitigation/Offset Levels at SFO



Category 1 GHG Emission Reduction, Offset, and Mitigation (ROM) Measures

SFO has implemented a number of GHG ROM measures in the past several years. Additional emission ROM measures have also been planned for future implementation. The implemented and planned GHG emission ROM measures are summarized below.

Implemented GHG Emission ROM Measures. A number of GHG emission reduction measures have been implemented in the past several years including various energy efficiency measures, fleet vehicle upgrade using hybrid/electric and compressed natural gas (CNG) cars, conversion of buses and trucks to biofuel and CNG, etc. The impacts of these emission reduction measures are incorporated in the calculated baseline emission values shown in Table 2. The GHG emission offset and mitigation measures that have been implemented by SFO over the past several years are summarized in Table 3.

The data indicate that in FY 2013, a total GHG emission mitigation of 67,759 tons was achieved at SFO, a decrease of 2.98% from FY 2012 levels. The mitigation measures included supplying preconditioned air and 400 Htz power to aircraft parked at the gates, providing incentive for rental of green cars, recycling of construction and demolition waste, partial funding for extension of BART to SFO, and construction of AirTrain facility.

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In FY 2013, the GHG emission offset increased from FY 2012 levels by 7% to 3,182 tons. The offset measures included solid waste recycling and carbon sequestration by SFO landscaping trees. Even though SFO has deployed 52,000 square feet of photovoltaic panels at the Airport we do not claim an offset or mitigation for the solar power generated by these panels because the funding for the solar power system was provided by San Francisco Public Utilities Commission.

Table 3. Summary of Implemented GHG Emission Mitigation and Offset Measures at SFO

Type of mitigation Measure	Resources Saved			GHG Emission Mitigation or Offset (tonnes per year)		
	FY 2011	FY 2012	FY 2013	FY 2011	FY 2012	FY 2013
GHG Emission Mitigation Measures						
PC Air and 400 Hz Power Supply Installation at International and Domestic Terminals, gallons jet fuel	4,912,280	5,736,092	5,519,282	-48,295	-57,192	-53,704
Green Car Rental Incentive Program, gallons gasoline	1,118,473	904,787	1,163,480	-9,946	-8,049	-4,562
Construction & Demolition Waste Recycling, tons	0	0	30,666	0	0	-4,722
SFO's Share of GHG Mitigation for BART Extension to SFO, gallons gasoline	241,262	267,206	282,465	-2,180	-2,415	-2,551
AirTrain Facility, gallons diesel fuel	193,281	208,740	216,483	-1960	-2,120	-2,198
Subtotal Emission Mitigation				-62,381	-69,775	-67,737
GHG Emission Offset Measures						
Solid Waste Recycling, tons	6,560	6,961	7,960	-2,619	-2,852	-3,061
Tree Planting Operations	2020	2,020	2,020	-121	-121	-121
Total GHG Emission Offset				-2,740	-2,973	-3,182

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Planned GHG Emission Reduction, Offset, and Mitigation Measures. SFO has planned and developed a number of additional initiatives to further reduce the direct GHG emissions from Airport operations and to offset or mitigate the remaining emissions by reducing the emissions from other sources at or off the Airport. GHG reduction and offset measures are expected to be carried out by 2017. The estimated impacts of planned GHG emission ROM measures are summarized in Table 4. These data indicate that about 1,364 tons of GHG emissions per year could be reduced /offset after all of the currently planned measures have been implemented.

In addition to these measures, SFO will undertake significant facility improvement projects as described in Section 7. The new facilities would enhance energy efficiency at the Airport and could potentially reduce the baseline GHG emissions.

Table 4. Summary of Planned GHG Emission Reduction, Offset, and Mitigation Measures at SFO

Activity	Planned GHG Emission Reduction/Offset /Mitigation Measures, tonnes per year
GHG Emission Reduction Measures	
Natural Gas Use Reduction	791
Electric Energy Efficiency Measures	0
Fuel Consumption	348
Subtotal Emission Reductions	1,139
GHG Emission Offset Measures	
Enhanced Solid Waste Recycling	225
Subtotal Offset Measures	225
GHG Emission Mitigation Measures	
PC Air and 400 Hz Power Supply System at B/A E	5,136
Subtotal Mitigation Measures	5,136

Projected Category 1 GHG Emissions. Ordinance 81-08 requires the development of estimates for future GHG emissions. In the past, estimates of future GHG emissions at SFO were based on a direct correlation to enplaned passenger growth. This approach, however, overestimated future emissions as baseline GHG emissions have remained fairly stable over the past five years. In this report projected GHG emissions for 2017 and 2025 were based on lower bound estimates reflecting the recent past trend in GHG emissions at the Airport. The projections shown in Table 5 indicate that net GHG emission could potentially

Expanded Summary

reach 36,477 tons per year by 2017 and 39,833 tons per year by 2025, assuming the implementation of planned emission reduction/offset measures yielding 1,364 tons of emission savings. Based on the current projections SFO could be required to implement additional emission reduction/offset measures yielding 7,413 tons by 2025.

It is expected that major new construction and renovation projects, described in Section 7, would also generate some GHG emission reductions. However, assessment of the impact of the planned renovation projects on the overall GHG emissions would require additional details on the scope of these projects.

Table 5. Projected 2017 and 2025 Category 1 GHG Emission and Emission Reduction Targets for SFO (Tons per Year)

Item	2017	2025
Allowable GHG Emission Level (Ordinance 81-08)	38,027	30,421
Projected GHG Emissions (Lower Bound)	35,627	39,189
Planned Emission Reduction	-1,139	-1,139
Planned Emission Offset	-225	-225
Potential Reductions from Major Renovation	TBD	TBD
Total GHG Emission Level	34,263	37,825
Required Additional GHG Emission Reduction / Offset Level under Ordinance 81-08		7,413
Projected GHG Emission Mitigation Measures	-68,325	-68,325

Summary of Other Climate Action Plan Elements

A brief summary of the topics covered in the remaining sections of the Climate Action Plan is provided below:

- **Section 3 - SFO Energy Use.** Information on various initiatives for reducing electrical energy and natural gas use at SFO are provided in Section 3 along with a detailed investment grade level estimate of the costs and benefits of energy efficiency measures that would be implemented at SFO over the next several years.

Expanded Summary

- **Section 4 - Fleet Vehicle Replacement.** Information on fuel consumption level for SFO fleet is provided in this section. The planned fleet improvement program would replace 234 out of the total 354 old vehicles with new hybrid, CNG powered or more energy efficient biodiesel powered vehicles. This program would reduce the GHG emissions from the fleet vehicles by an estimated 122 tons per year.
- **Section 5 – Zero Waste Plan.** Information for SFO's Zero Waste Plan is included in this section. In FY 2013, SFO generated an estimated 9,509 tons of general solid waste, with a recycling rate of 78.2%. SFO is continuing to enhance the source separation operations with the aim of achieving the City's recycling goals of 85% by 2017 and 100% by 2020.
- **Section 6 – Employee Commute.** Information on SFO Employee commute patterns and transit initiatives are included in this section. SFO is continually working on expanding transit initiatives to increase employee ridership on public transit. The GHG emissions from all modes of commute by SFO's 1,872 employees were estimated to be about 2,719 tons in FY 2013.
- **Section 7 – Other Measures.** This section covers the miscellaneous sustainability activities undertaken at SFO as follows:
 - Obtaining LEED GOLD certification for all new construction and major renovation projects
 - Achieving Net Zero Energy at the new Airfield Security Building
 - Enhancement of water conservation practice in new and existing buildings.
 - Continued compliance with Precautionary Purchasing Ordinance and Executive Order 08-02 by purchasing the required items from the SF Approved Catalogue to the maximum extent possible.
- **Section 8 – Community-Wide Impacts.** SFO operations and travel by SFO employees, air passengers, taxis, shuttle buses, delivery trucks, BART, SamTrans, etc. to and from the Airport impact the regional and local air quality and contribute to the regional emissions of greenhouse gases. The community-wide impact of SFO operations in the context of GHG emissions are summarized in this section.
- **Section 9 – Measuring Progress.** The vision of SFO is to mitigate its carbon footprint by employing environmentally sound and economic measures. As discussed in this section, SFO has instituted a systematic approach for assessing the GHG emission rates and for quantifying the impact of the various planned emission reduction / offset / mitigation measures.

SFO's Profile

Summary

San Francisco International Airport (SFO) is Northern California's premiere airport serving hundreds of destinations throughout the United States and abroad. SFO is consistently rated as one of the top airports in the world for the efficiency and quality of service rendered to the travelers.

Located on the San Francisco Bay, 14 miles south of San Francisco, SFO covers approximately 5,200 acres with 2,700 acres developed for Airport use and approximately 2,500 acres remaining as natural tidelands and wetlands. In FY 2013, SFO served 44.7 million passengers with 420,462 takeoffs and landings on 56 airlines. Additionally, 329,571 metric tons of cargo was shipped to and from SFO during the same period. Also, more than 160 vendors operated at SFO to serve the travelers, including restaurants, shops and various services.

SFO is served by Bay Area Rapid Transit (BART) system and in FY 2013 travelers avoided over 84 million miles of driving by using BART to travel to and from the Airport. SFO's new AirTrain system provides a seamless connection to BART and to rental car facilities for access to all Airport terminals.

SFO is governed by an Airport Commission, a five-member body appointed to four-year terms by the Mayor of San Francisco. The Commission appoints the Airport Director. The Airport personnel are organized in several divisions with each division serving specific needs of the Airport, the travelers, and/or the enterprises operating at SFO. The Commission employees numbered 1842 in FY 2013.

Major Tenant Operations at SFO are as follows:

- Airlines (56 carriers, including domestic, international, and cargo carriers)
- Aviation Support Services
- Concessionaires (160)
- Federal Government Agencies (FAA, Department of Home- land Security, TSA, USPS, US DOA and U.S. DOJ)
- State and Local Government Agencies (BART, CCSF Aviation school, San Mateo County)

SFO's Environmental Goals

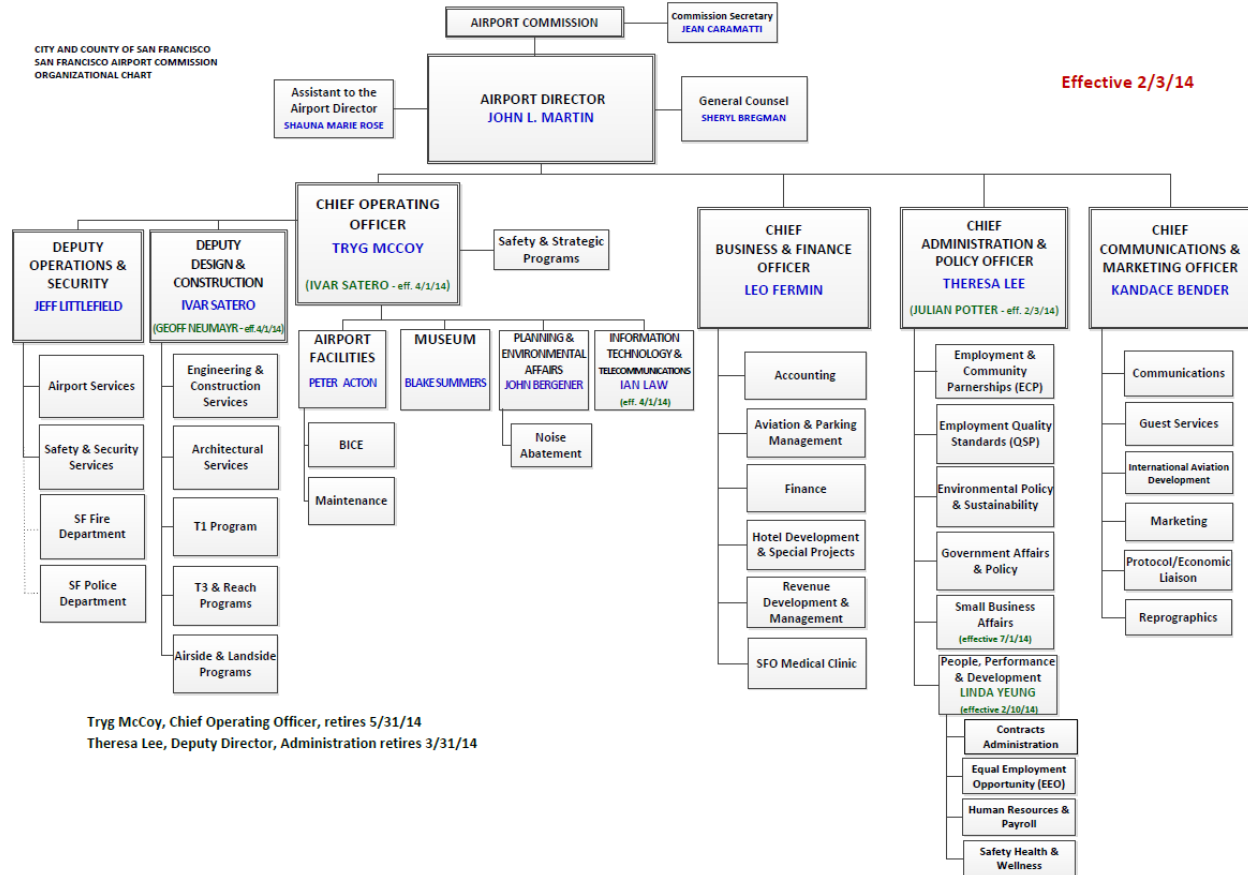
SFO's Strategic Plan for 2011-2016 establishes the following environmental sustainability goals and objectives:

1. Maintain 100% carbon mitigation and achieve 40% reduction in baseline GHG emissions, below 1990 emission level, from SFO – controlled operations by 2025
2. Achieve LEED Gold certification in all new and renovated buildings.
3. Increase the solid waste recycling rate to 85% by 2017
4. Reduce energy usage year over year
5. Devise and implement other sustainability initiatives.

Airport Commission Organization

SFO's Profile

There are two major types of operations at SFO i.e. landside operations and airside operations. Both of these operations are carried out within the following organizational structure at SFO.



Land Use

Land uses at SFO are broadly categorized as either airside or landside facilities. Airside facilities consist of approximately 1,700 acres of runways, taxiways, and ramp systems. Landside facilities consist of approximately 1,000 acres and are divided into the following functional classes: terminal complex; airport administration; offices and facilities complex; non-terminal airline support; airline support; airline maintenance; general aviation; air freight; airport transport; commercial; transportation; miscellaneous facilities; parking facilities; and roads.

Airside Land Use	Landside Land Uses
Runways 28R/10L (11,870 feet) 28L/10R (10,600 feet) 1R/19L (9,500 feet) 1L/19R (7,100 feet)	Passenger Terminals AirTrain BART Station Rental Car Facility Parking Garages Air Cargo Facilities Off-site facilities (Engineering building, Business Center, Maintenance Facilities, Emergency Response Facilities, Airport Police Bureau, Fire Department, GTU) Aircraft Tank Farm CNG Fueling Station Industrial and Sanitary Waste Treatment Plant Major Transportation Roadways

Activity Levels

Airport activity levels can be measured by a number of parameters such as aircraft operations, annual passenger count, and annual cargo shipments. The number of Airport and private enterprise employees is another indication of the activity level.

Aircraft Operations, Passenger Activity Levels and Cargo Shipment

In 1997, aircraft operations (aircraft landings and takeoffs) peaked at SFO at 447,000 and remained fairly stable for the following four years, Figure 1-1. The number of operations dropped to as low as 298,000 after the events of September 11, 2001 but recovered in subsequent years. In FY 2013 there were 420,262 flight operations at SFO.

The number of passengers flying to or from SFO peaked at 40.3 million in 2000 and then declined to 28.8 million in 2003. In FY 2013 the passenger traffic at SFO rose up to 44.7 million, as shown in Figure 1-2. Aircraft load factors have continued to increase in response to high fuel costs and other economic factors, and most airlines are flying their aircrafts at the highest historical load factors.

Cargo shipments at SFO peaked at 853,000 metric tons in 2000 and have ranged near 400,000 metric tons beginning in 2009, as shown in Figure 1-3. The tonnage of cargo shipments declined further to 329,571 tons in FY 2013.

In 1990 SFO served 29,939,835 passengers and processed 558,078 metric tons of cargo with 427,475 aircraft operations (SFO Master Plan, Final Environmental Impact Report, May 1992).

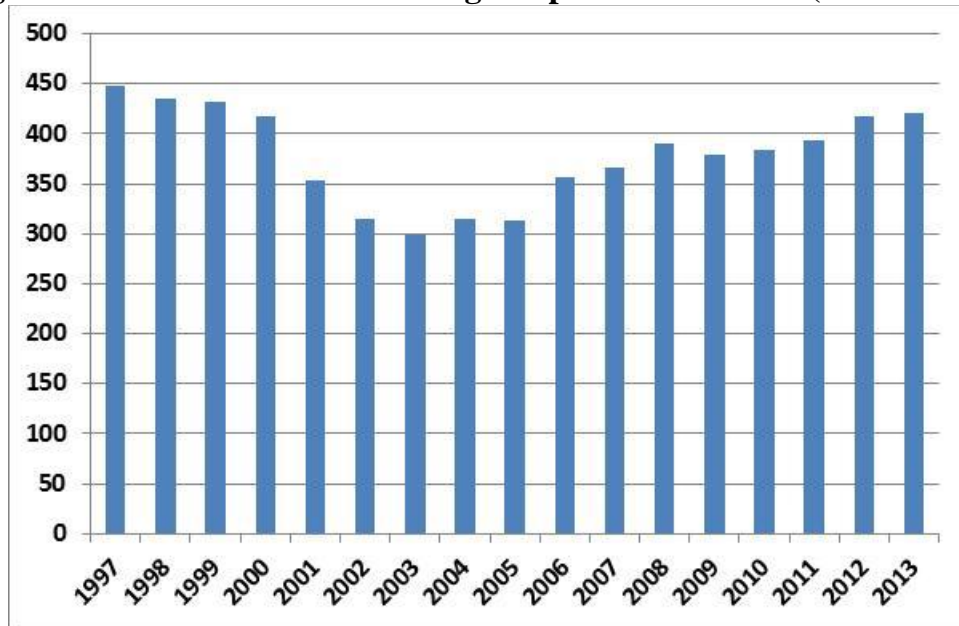
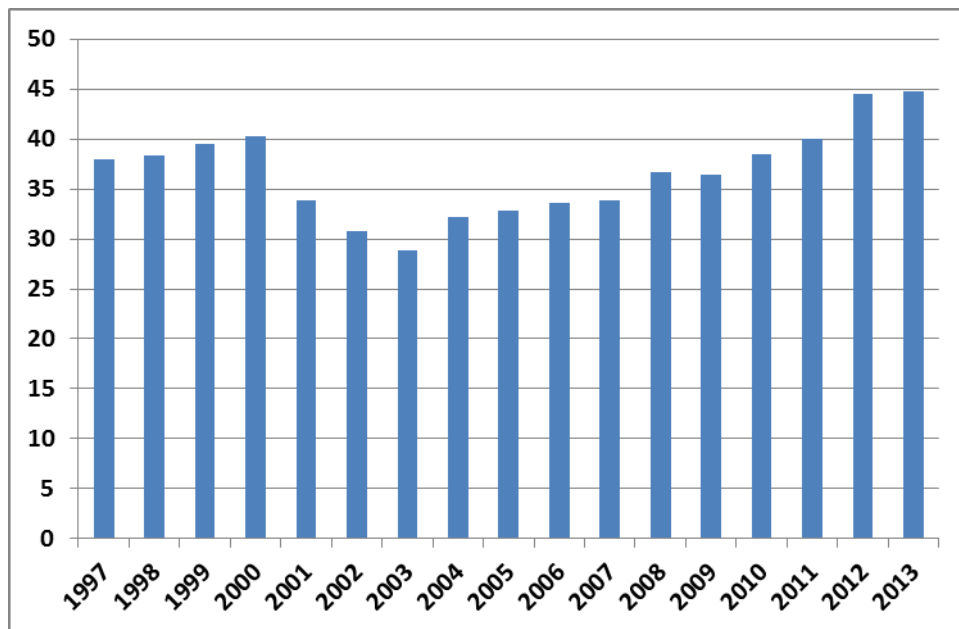
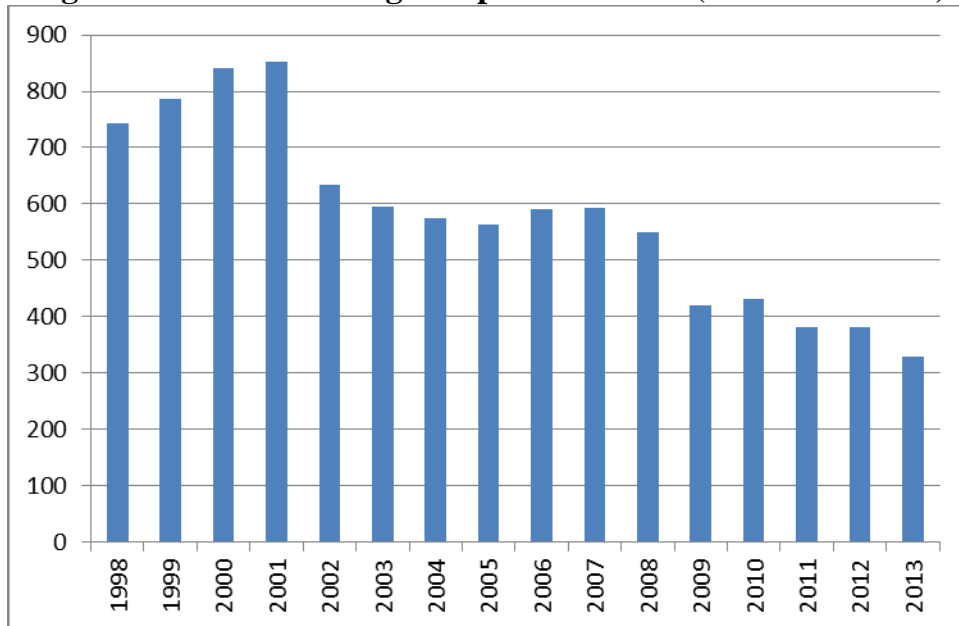
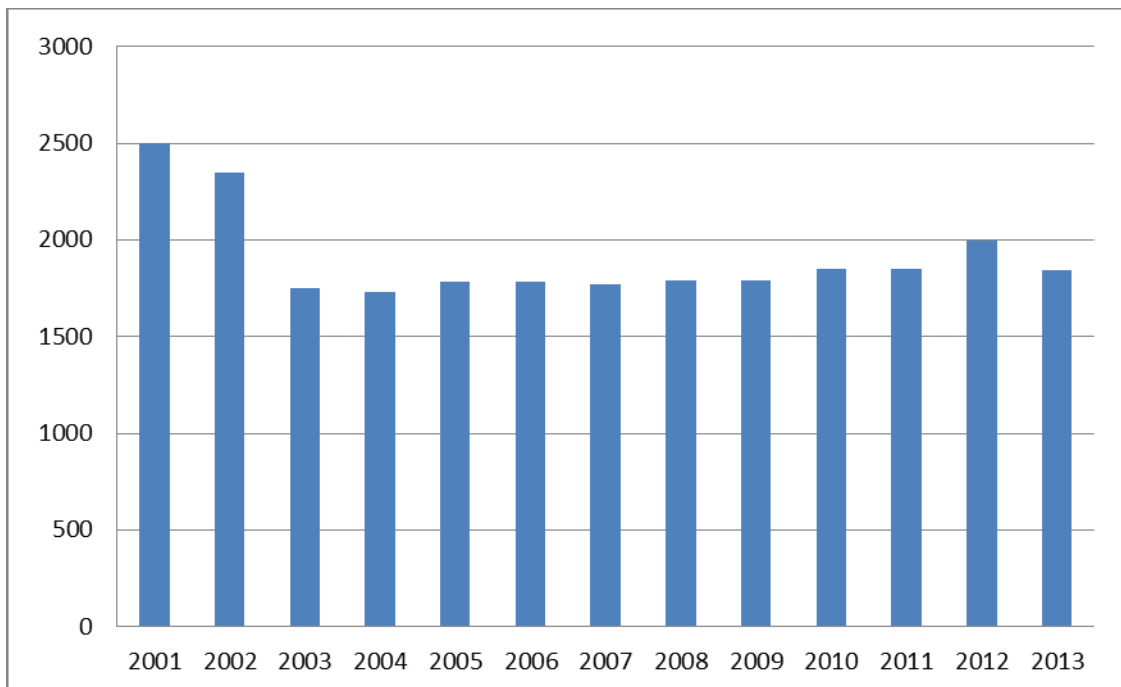
Figure 1-1. Annual Number of Flight Operations at SFO (in thousands)**Figure 1-2. Annual Passenger Traffic at SFO (in Millions)**

Figure 1-3. Annual Cargo Shipment at SFO (Thousand Tons)**Employment**

The number of SFO employees, including the Airport Commission's operating and project positions, Airport Police Bureau, Airport Fire Department, and City Attorney's SFO staff for the period 2001-2013 is shown in Figure 1-4. The combined number of employees was 1,842 in FY 2013.

Figure 1-4. SFO Employee Count for 2001-2013 Period

Key Partners

SFO partners with airlines, tenants, City Departments, local, State, and Federal Government agencies, and community organizations to achieve the various environmental, economic, and social goals. SFO will continue to work cooperatively with the various stakeholders, including airlines and tenants, to develop and implement a broad range of greenhouse gas emission reduction / offset measures in the future.

The San Francisco International Airport/ Community Roundtable is one the longest established community-based airport noise reduction organizations in the country, and is an example of neighborhood groups working cooperatively with the Airport and the aviation industry to reduce aircraft noise impacts on the surrounding communities. SFO has worked closely with San Francisco Public Utilities Commission (SFPUC) to evaluate and implement a broad range of energy efficiency measures, as well as installing extensive photovoltaic panels on the roof of Terminal 3 and Airport Engineering Building. SFO has also worked cooperatively with tenants and airlines to increase the rate of solid waste recycling. Additionally, SFO has installed electric outlets and CNG dispensing facilities to minimize the emission of air pollutants and greenhouse gases from taxis, buses, and passenger cars.

In 2009 SFO initiated a three year Green Car Rental Incentive Pilot Program in conjunction with the rental car companies operating at the Airport. This program provided financial incentives to the rental car companies to increase the number of fuel efficient cars with an EPA score of 17 or higher from 10% to 15% in their rental vehicle inventory. The program also provided a discount to the customers who rented a Green Car. The incentive program was concluded in December 2011 for passengers and in December 2012 for rental agencies.

2. SFO's Carbon Footprint

Summary

In the context of Airport Cooperative Research Program's Guidebook on Preparing Greenhouse Gas Inventories at Airports¹, SFO's carbon footprint can be defined by the following three categories of greenhouse gas (GHG) emissions:

- Category 1 - SFO Controlled Emissions** - GHG emissions from operations that are under the control of SFO, including SFO employees' commute emissions, and emissions from all modes of travel on SFO controlled roads.
- Category 2 - Airlines, Concessionaires, and Airline Support Services Emissions** - GHG Emissions, within the physical boundaries of SFO; by airline operations, including landing and take-off (LTO) cycles; ground service equipment (GSE) and other support services; and by various concessionaires and other tenants.
- Category 3 - Optional Emissions** – U.S. Environmental Protection Agency (EPA) defines optional emissions as those emissions that are not directly emitted by but are connected with the reporting enterprise's operations. Examples include GHG emissions from: 1) passengers' travel, in personal vehicles or by public transit, to and from SFO, 2) outbound cruising aircraft, 3) delivery trucks, 4) construction equipment, and 5) commute travel by employees of airlines, concessionaires, and airline support services.

Other classifications have been proposed for quantifying the GHG emissions in the context of international global warming initiatives such as the Kyoto Treaty. For example the World Resources Institute (WRI) has proposed GHG emission categories as Scope 1 through Scope 3 as follows:

- Scope 1 Emissions - These emissions are directly generated by the controlling entity within the defined boundaries of the facility. Examples include emissions from fuel and natural gas consumption.
- Scope 2 Emissions – Scope 2 emissions which are also called indirect emissions are associated with the energy sources used by the entity, such as electric energy and steam, which are generated at off-site facilities.
- Scope 3 Emissions - These emissions include both direct and indirect emissions generated by enterprises operating at the reporting facility which are not under the control of the reporting enterprise. At SFO, Scope 3 emissions include emissions from airlines, airline support services, and concessionaires' operations within and outside the defined boundaries of SFO. Examples include emissions from aircraft landing and takeoff operations, cruising aircraft, passenger and enterprise employees travel to and from SFO, etc. Emissions related to solid waste recycling/disposal operations at off-site facilities also fall under this scope.

Carbon dioxide is the major component of the GHG emissions. Other greenhouse gases include methane, nitrous oxide, refrigeration gases, and sulfur hexafluoride. The Transportation Research Board of the National Academies¹ provides the following classifications for GHG emission data depending on the type of gases included in such data:

- Level 1 Emissions** - This level includes only the carbon dioxide emission from the subject facilities and operations.
- Level 2 Emissions** - This level includes the Kyoto Treaty gases including carbon dioxide, methane, nitrous oxide; refrigerant compounds hydrofluorocarbons (HFC) and perfluorocarbons (PFC), and sulfur hexafluoride (SF₆) which is used as an insulator in electrical transmission and distribution systems.
- Level 3 Emissions** – This level includes the Kyoto Treaty gases plus any precursors and other gases with potential for global warming.

Data on Level 2 Emissions are provided in this report. The physical boundary of SFO's carbon footprint is defined as the geographic boundary of the Airport plus the airspace around SFO to an elevation of 3,000 feet for landing and takeoff (LTO) operations.

In this report data on SFO's carbon footprint are provided for emission Categories 1 through 3 to clearly distinguish the emissions from SFO controlled operations; on-site activities of the airlines, concessionaires, and airline support services; and the off-site emissions of these entities. This information is needed for devising policies and practices for reducing the GHG emissions of SFO as well as the emissions of airlines, concessionaires, and airline support services in the context of Ordinance No. 81-08. Available data on GHG emissions for the categories listed above are summarized in Table 2-1. Correlations between SFO emission categories and the WRI classifications are also provided in this table. Based on this information the GHG emissions at SFO in FY 2013 were 33,784 metric tons (tons), which was 32.1% below the 1990 emission level and exceeding Ordinance 81-08 mandate of 25% reduction by 2017. In addition the voluntary emission mitigation measures implemented by SFO yielded a total mitigation of 67,759 tons in FY 2013, as detailed in Table 2-7 of this chapter. Although these voluntary emission mitigation measures might not strictly meet the definition of emission offsets, nevertheless, these measures compensate for the climate impact of SFO controlled operations.

Table 2-1. Summary of Estimated GHG Emissions for SFO

WRI Emission Category	SFO Emission Category	GHG Emission (Tonnes)			
		1990	FY 2011	FY 2012	FY 2013
Scopes 1, 2, and 3	Category 1- SFO Controlled Emissions	49,780	38,464	33,232	33,784
Scopes 1, 2, and 3	Category 2- Airlines, concessionaires, and Airline Support Services Emissions	839,000	749,398	898,403	908,247
Scope 3	Category 3. Optional Emissions	7,127,543	8,487,665	9,570,521	8,414,155
	Total	8,016,323	9,275,526	10,507,085	9,356,187

¹ Guidebook on Preparing Airport Greenhouse Gas Emission Inventories, Report 11, Prepared for Airport Cooperative Research Program, Transportation Research Board of the National Academies and Sponsored by the Federal Aviation Administration, By Wyle Laboratories, Ian A. Waitz Consultant, and Synergy Consultants, Inc., 2009

Category 1 SFO Controlled GHG Emissions

GHG emissions are defined in this report as the sum of direct and indirect emissions from operating facilities at SFO.

Direct Emissions

Greenhouse gases are generated on-site at SFO from the operations listed below in approximate quantitative order:

- Consumption of various fuels by vehicular traffic on SFO controlled roads, SFO fleet vehicles, emergency generators, SFO Shuttle buses, etc.
- Consumption of natural gas
- Fugitive refrigerant gas releases, and
- Process emissions at SFO's wastewater treatment facilities

Indirect Emissions

Greenhouse gas emissions generated off-site which are associated with the consumption of resources by SFO controlled operations or by the activities connected to such operations, are classified as indirect emissions. The various categories of indirect emissions for SFO controlled operations are listed below in quantitative order:

- GHG emissions from various modes of commute travel by SFO employees
- Solid waste disposal and recycling operations
- Electrical energy consumption would constitute another source of indirect emissions however, in 2012 San Francisco Public Utilities Commission was certified as a Zero Emission Electric Utility by the State Air Resources Board and, consequently, electric energy use at SFO does not contribute to our carbon footprint.

Data for various elements of SFO controlled Category 1 GHG emissions are provided in the following sections.

Electric Energy and Natural Gas Consumption

In FY 2013, the GHG emissions from the consumption natural gas were 20,005 tonnes. The total electric energy consumption (by SFO and tenants) remained fairly constant ranging from 327,700 mWh in FY 2011 to 329,300 mWh in FY 2013, as shown in Figure 3-1. The slight increase in electric energy consumption of 0.8% is minimal considering the significant increase in passenger traffic since FY 2011. The decline in GHG emissions associated with electrical energy consumption from 4,817 tonnes in FY 2011 to zero in FY 2012 and FY 2013 were due the use of SFPUC supplied power that was generated from 100% renewable sources. Beginning in FY 2012 a zero emission factor was used for all electricity supplied by SFPUC to the Airport following the designation of SFPUC as a Zero Emission Electric Utility by California Air Resources Board. The GHG emissions from electricity consumption in previous years reflect the percentage of electricity supply that was purchased on the open market by SFPUC to make up the shortfall in hydroelectric power generated at the District owned facilities in the Sierra Nevada Mountains. While electric

energy consumption does not affect our GHG emission, saving electricity is important to SFO because it reduces operating cost and conserves this resource.

Figure 2-2 shows the historical natural gas consumption and GHG emissions by SFO and tenants. Although the natural gas consumption increased 3% from 3.64 million therms in FY 2012 to 3.76 million therms in FY 2013, the natural gas use for the past three years has been fairly steady. The steady natural gas consumption rate is attributed to the efficient operation of the Central Plant, minimizing natural gas usage despite the increasing passenger traffic in the SFO terminals.

Table 2-2 contains data on electric energy and natural gas consumption and the associated GHG emissions for 1990 and FY 2011 through FY 2013. Electric energy and natural gas consumption by SFO tenants are also included in Table 2-2 because these utilities are supplied by SFO to the tenants. Based on Ordinance 81-08 and the general GHG emission calculation protocols the emissions associated with these SFO supplied utilities are a constituent of SFO carbon footprint. The increases in energy consumption from the 1990 base year are attributable to the significant expansion of SFO facilities following the completion of the SFO Master Plan Program. SFO has also implemented a number of energy saving measures over the years; including the replacement of chillers and boilers, replacement of inefficient lighting fixtures and reduction of plug loads.

Figure 2-1. Historical Electrical Energy Consumption and Associated GHG Emissions

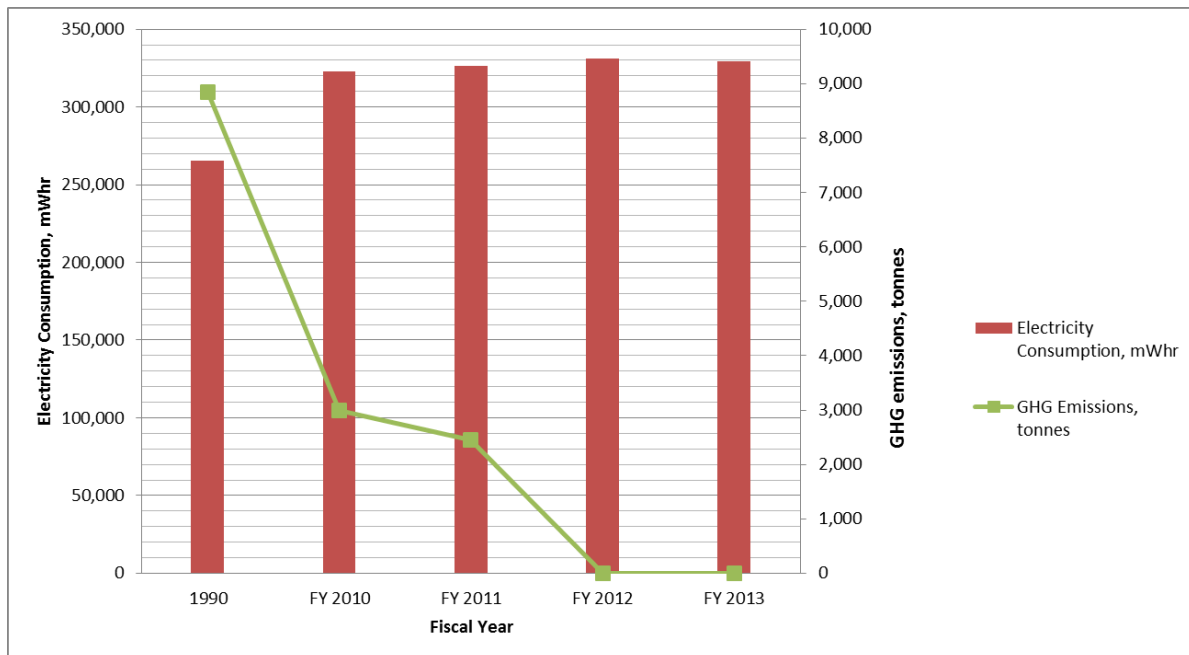


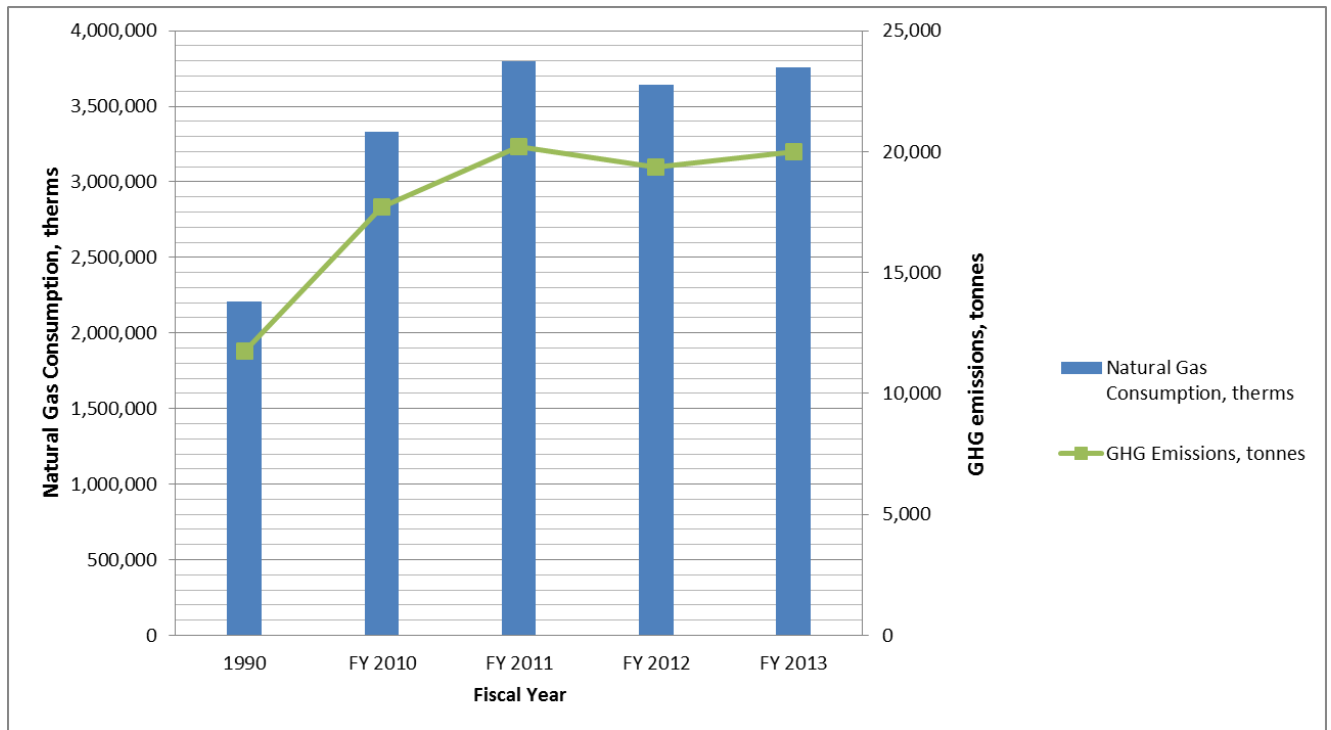
Figure 2-2. Historical Natural Gas Consumption and Associated GHG Emissions

Table 2-2. GHG Emissions from Electric Energy and Natural Gas Consumption at SFO

Activity	Energy Consumption					GHG Emission (Tonnes)				
	1990	FY 2010	FY 2011	FY 2012	FY 2013	1990	FY 2010	FY 2011	FY 2012	FY 2013
Electric Energy Consumption by SFO, mWh	131,435	173,100	160,702	167,465	165,470					
CO ₂ Emission ^a						8,656	2,544	2,362	0	0
CO _{2e} for CH ₄ Emission ^b						6.58	2.14	1.99	0	0
CO _{2e} for N ₂ O Emission ^c						26.06	7.30	6.78	0	0
Subtotal						8,689	2,553	2,371	0	0
Electric Energy Consumption by Tenants ^d , mWh	133,807	149,827	165,950	163,465	163,857					
CO ₂ Emission ^a						8,812	2,236	2,439	0	0
CO _{2e} for CH ₄ Emission ^b						6.70	1.86	2.05	0	0
CO _{2e} for N ₂ O Emission ^c						26.53	6.32	7.00	0	0
Subtotal	265,242	322,927	326,652	330,930	329,327	8,845	2,244	2,448	0	0
Natural Gas Consumption by SFO ^e , therms:										
SFPUC Supply	1,700,000	2,621,643	3,086,496	2,950,745	3,007,446					
CO ₂ Emission						9,022	13,913	16,380	15,660	15,961
CO _{2e} for CH ₄ Emission ^e						17	26	31	29	36
CO _{2e} for N ₂ O Emission ^e						5	8	9	9	9
PG&E ^{f,g} Supply	505,833	708,912	709,378	689,663	751,662					
CO ₂ Emission						2,684	3,762	3,765	3,660	3,989
CO _{2e} for CH ₄ Emission						5	7	7	7	9
CO _{2e} for N ₂ O Emission						1	2	2	2	2
Subtotal	2,205,833	3,330,555	3,795,874	3,640,408	3,759,108	11,735	17,719	20,194	19,367	20,005
Total						29,269	22,516	25,013	19,367	20,005

^a Based on an emission factor of 145.19 lbs of CO₂ per mWh for 1990, 3.67 lbs for 2008, and 43.9 lbs for 2009, and 32.4 lbs for 2010 for San Francisco Public Utilities Commission's electric power mix for the respective years. The emission factor in 2012 and 2013 was 0 lbs/mWh.

^b Based on an emissions factor of 0.0302 lbs of CH₄ per mWh for non-hydro portion of San Francisco Public Utilities Commission's power mix for 2008 and 2009. A factor of 1.3 lbs per GWH was used for 2010 per SFPUC communication. The emission factor in 2012 and 2013 was 0 lbs/mWh.

^c Based on an emissions factor of 0.0081 lbs of N₂O per mWh for non-hydro portion of San Francisco Public Utilities Commission's power mix for 2008 and 2009. An emission factor of 0.3 lbs of N₂O per GWH was used for 2010 per SFPUC communication. The emission factor in 2012 and 2013 was 0 lbs/mWh.

^d Electricity is supplied to all Airport tenants by SFO. The GHG emissions attributable to the related energy consumption by tenants are, therefore, included under Category 1 in SFO's carbon footprint

^e Based on an emission factor of 11.7 lbs CO₂/therm (U.S. Energy Information Administration)

^f Natural gas is supplied to most of the tenants by SFO. The GHG emissions attributable to the related energy consumption by tenants are, therefore, included under Category 1 in SFO's carbon footprint

^gThe 1990 natural gas supply by PG&E to SFO was estimated on the basis of the ratio of natural gas supply to electric energy use in FY 2008.

Fuel Consumption

Various types of fuel are consumed at SFO for operating the fleet vehicles, shuttle buses and the emergency standby generators. The GHG emissions resulting from the use of these fuels is included in SFO's Category 1 GHG Emissions. In addition to fuel consumed directly by the airport operations, all emissions from vehicles travelling on SFO owned roads as well as the emissions related to Commission employee's commute to and from the Airport are also included under Category 1 SFO controlled GHG emissions. In FY 2013, the GHG emissions from the consumption of various fuels totaled 15,556 tons.

Figure 2-3. GHG Emissions from Various Categories of Fuel Consumption

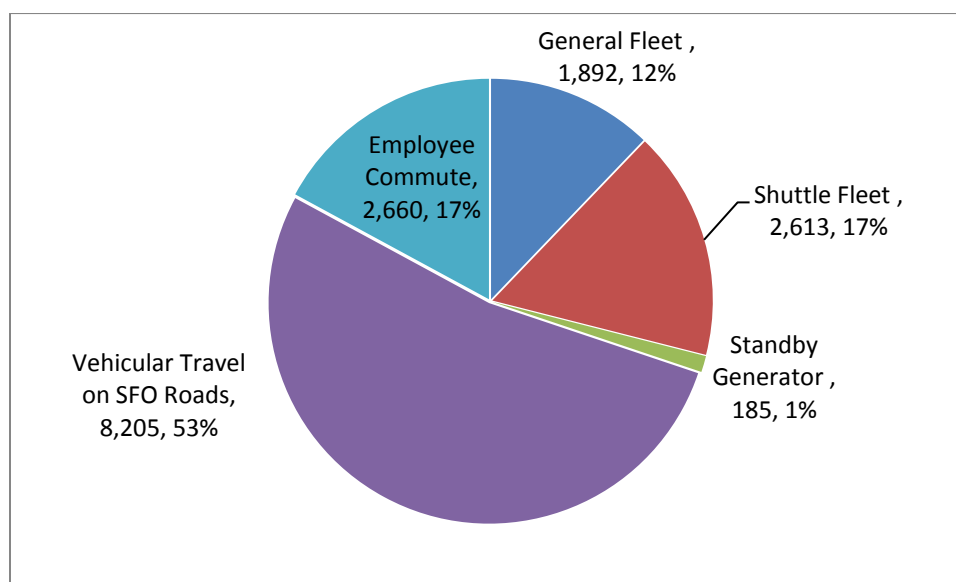


Figure 2-3 shows the GHG emission from various fuel consumption categories in FY 2013. These data indicate that over 53% of GHG emissions from fuel consumption were contributed by vehicles travelling on SFO roads. The employee commute generated about 17% of these GHG emissions, and the operation of shuttle buses and fleet vehicles accounted for 17% and 12% of the emissions, respectively. The fuel use by standby emergency generators contributed only about 1% of the overall GHG emission in this category.

Table 2-3 shows the estimated fuel consumption levels for 1990 and FY 2010 through FY 2013, and the corresponding GHG emissions. The GHG emissions from the consumption of various fuels at SFO increased from 15,002 tons in FY 2012 (updated value) to 15,556 tons in FY 2013. This increase resulted primarily from the expansion of shuttle bus services. Starting December 2012, the new employee parking Lot B became operational, increasing the number of shuttle bus routes from three to four routes. In addition, there were several events throughout the year, including the BART strike that necessitated the provision of additional bus services.

Significant efforts have been made to reduce the GHG emissions from the consumption of fuels at SFO. In recent years a portion of the fleet vehicles and the entire SFO shuttle buses have been converted to the use of biodiesel or compressed natural gas (CNG). These efforts have been effective in maintaining the GHG emissions from the overall fleet fairly stable and have compensated for any growth in the fleet size. Emissions attributable to biodiesel use are not included in the subtotal and total GHG emission values shown in Table 2-3 due to the biogenic nature of these emissions. Recently, efforts have also been made to reduce these GHG emissions by replacing aged fleet vehicles with more fuel efficient cars, and providing incentives for employees to use public transit. These and other initiatives are described in more detail in Section 4 Fleet Vehicles and Section 6 Employee Commute Program.

The FY 2013 emissions for all modes of employee travel were developed on the basis of a survey conducted by the SFO Operations Division in 2013. The survey results are discussed in greater detail in Section 6 Employee Commute Program

Table 2-3. GHG Emissions from Consumption of Various Fuels at SFO

Activity	Fuel Consumption					GHG Emission (Tonnes)				
	1990	FY 2010	FY 2011	FY 2012	FY 2013	1990	FY 2010	FY 2011	FY 2012	FY 2013
General Fleet Gasoline Consumption, gallons	166,583	121,155	94,491	114,094	105,785					
CO _{2e} Emission ^a						1,467	1,067	832	1005	932
N ₂ O Emission ^{b,c} as CO _{2e}						64.66	21.15	16.50	13.48	11.22
CH ₄ Emission ^{b,c} as CO _{2e}						6.64	1.54	1.20	0.89	0.97
General Fleet Biodiesel Consumption:										
Diesel Fuel, gallons	93,175	45,230	43,148	43,968	42,870					
CO _{2e} Emission ^d						946	459	438	446	435.20
N ₂ O Emission ^{b,c} as CO _{2e}						10.81	2.36	2.25	1.41	1.49
CH ₄ Emission ^{b,c} as CO _{2e}						3.81	0.59	0.56	0.21	0.25
100% Biodiesel, gallons	0	11,307	10,787	10,992	10,717					
CO _{2e} Emission ^e						0	107	102	104	90
General Fleet CNG Consumption, GGE	0	64,909	61,274	83,236	81,397					
CO _{2e} Emission ^f						0	393	371	504	492
N ₂ O Emission, as CO _{2e}						0.00	13.09	12.36	14.64	8.67
CH ₄ Emission, as CO _{2e}						0.00	11.87	11.21	13.91	9.75
Total Fleet Consumption / Emission	259,758	242,601	209,700	252,290	240,769	2,499	1,970	1,685	1,999	1,892
SFO Shuttle Fleet Biodiesel Fuel Usage:										
Diesel Fuel ^g , gallons	203,413	102,702	98,714	85,502	96,188					
CO _{2e} Emission						2,065	1,043	1,002	868	976
N ₂ O Emission as CO _{2e} , gm/mile		586,837	547,191	448,720	549,616	1.66	0.84	0.78	0.64	0.79
CH ₄ Emission as CO _{2e} , gm/mile		586,837	653,414	448,720	549,616	0.15	0.07	0.08	0.06	0.07
100% Biodiesel, Gallons	0	25,676	24,678	21,478	24,047					
CO _{2e} Emission						0	243	234	203	228
SFO Shuttle Fleet CNG Usage, GGE	0	190,236	191,066	182,767	255,320					

SFO's Carbon Footprint

CO _{2e} Emission						0	1,151	1,156	1,106	1,545
N ₂ O Emission as CO _{2e}		668,843	547,191	642,583	897,669	0	34.88	28.54	33.51	46.81
CH ₄ Emission as CO _{2e}		668,843	653,414	642,583	897,669	0	32.87	32.12	31.58	44.12
Total Shuttle Fleet Consumption / Emission	203,413	318,614	314,458	289,747	375,555	2,067	2,262	2,220	2,040	2,613
Emergency Standby Generators										
Generator Diesel Fuel Consumption, gallons	13,660	16,366	15,727	18,175	18,197					
CO ₂ Emission ^h						139	166	160	185	185
N ₂ O Emission as CO _{2e}						0.31	0.38	0.36	0.42	0.42
CH ₄ Emission as CO _{2e}						0.13	0.16	0.15	0.18	0.18
Total Standby Generator Consumption / Emission						139	167	160	185	185
General Fleet Propane Usage, gallons	5,176									
CO _{2e} Emission ⁱ						30	0	0	0	0
N ₂ O Emission as CO _{2e}						1.24	0	0	0	0
CH ₄ Emission as CO _{2e}						0.06	0	0	0	0
Subtotal						31	0	0	0	0
Fuel Consumption by General Vehicular Travel on SFO Controlled Roads, ^{j,k} GGE	693,285	837,155	849,411	902,882	898,649					
CO _{2e} Emission						6,107	7,374	7,482	7,953	7,916
N ₂ O Emission as CO _{2e}						311.45	255.56	259.30	275.62	274.33
CH ₄ Emission as CO _{2e}						28.43	13.54	13.74	14.61	14.54
Total SFO Roadway Traffic Consumption / Emission						6,447	7,643	7,755	8,244	8,205
SFO Employees' Commute Fuel	210,849	281,435	281,435	342,208	322,470					

Consumption, GGE										
CO₂e Emission						1,857	2,479	2,479	2,438	2,567
N₂O Emission^m as CO₂e						94.72	70.00	70.00	92.02	89.03
CH₄ Emission^m as CO₂e						8.65	4.00	4.00	4.00	4.72
Total Employee Commute Consumption / Emission						1,961	2,553	2,553	2,534	2,661
Grand Total	1,386,141	1,696,171	1,670,731	1,805,302	1,855,640	13,144	14,595	14,373	15,002	15,556
Total Biogenic GHG Emissions ⁿ	0	36,983	35,465	32,470	34,764	0	350	336	307	317

All emission factors in this table were obtained from: "Direct Emissions from Mobile Combustion Sources, US EPA, EPA430-K-08-004, May 2008"

^a Based on an emission factor of 19.42 lbs of CO₂ per gallon of gasoline

^b CH₄ and N₂O emissions for FY 2009 were calculated on the basis of the total annual mileage logged by each vehicle, vehicle model; the type of fuel consumed by the vehicle or equipment, as applicable; using the emission factors provided in the U.S. EPA May 2008 publication cited above. Related emissions for other reporting periods were estimated by extrapolating the FY 2009-10 data on the basis of consumed fuel volumes in each fiscal year. Details of the FY 2009 emission calculations are shown in the Table 4 in the Reference tab.

^c The ratios of CH₄ and N₂O unit emission factors for 1984 -1993 vehicle models to the average of these factors for 1994-2005 (3.1345 and 2.2234, respectively) were used to estimate the corresponding 1990 emission values for these gases

^d Based on an emission factor of 22.38 lbs of CO₂ per gallon of diesel fuel

^e Based on an emission factor of 20.86 lbs of CO₂ per gallon of 100% biodiesel

^f Based on the conversion of 1.00 GGE to 1.14 therms and using a unit GHG emission factor of 11.70 lbs CO₂ per therm

^g Estimated diesel fuel use in 1990 is based on available data for the average usage in 1998-1999 period. See Table 4 in the Reference tab for details of GHG emission calculations for FY 2009. CH₄ and N₂O emission factor are expressed per mile of driving. For other reporting periods the N₂O and CH₄ emissions were estimated on the basis of fuel use ratios to FY 2009.

^h Based on an emission factor of 22.38 lbs CO₂ per gallon of diesel fuel (Direct Emissions from Stationary Combustion Sources, US EPA, EPA430-K-08-003, May 2008). N₂O and CH₄ emission of 0.6 and 3.0 grams/MMBTU were also used from the same publication <http://www.epa.gov/climateleaders/documents/resources/stationarycombustionguidance.pdf>. An energy density level of 128,700 BTU per gallon of diesel fuel was used for CH₄ and N₂O emission calculation.

ⁱ Based on an emission factor of 12.65 lbs CO₂ per gallon of liquid propane. A 12 mile per gallon fuel efficiency was assumed for CH₄ and N₂O emission calculations

^jBased on data developed from annual traffic surveys performed by the SFO Traffic Engineering Group. For FY 2008-2010 an average fuel efficiency of 23.9 miles per gallon (mpg) of GGE, and average N₂O and CH₄ emission factors of 0.0079 and 0.0147 g/mile, respectively, were used based on the corresponding emission factors for the model year 2005. For 1990 an average fuel efficiency of 23.3 mpg and average N₂O and CH₄ emission factors for 1984-1993 model years of 0.0647 and 0.0704 g/mile, respectively, were used. (See Table 2 in the Reference tab for FY 2010 survey data)

^k The 1990 travelled miles was estimated by using the ratio of 1990 to 2007 total passenger traffic at SFO.

^l The 2008-11 values were estimated from the 2007-08 survey data based on a ratio of total employees. See Table 2 in Reference tab for 2008 survey data

^m GHG emissions for employee commute were estimated on the basis of equivalent gasoline gallons combusted using data on vehicular commute travel miles from the Employee Commute Survey (See the Employee Commute tab for details). A gasoline fuel efficiency of 23.3 mpg in 1990 and 23.9 mpg for recent years and a diesel fuel efficiency of 4.5 mpg for buses were used for calculating the CO₂ emission. N₂O and CH₄ _{average} emissions for 1994 through 2005 model years were used for the corresponding emission factors. The GHG emissions for employee commute in 1990 were stimated by assuming that all of SFO employees commuted to work by car for 237 days per year, with an average round trip travel of 19 miles.

ⁿ Biogenic GHG emissions were generated by the use of biofuel in fleet vehicles and SFO shuttle buses and are excluded from the grand total GHG emissions for fuel use

Solid Waste Disposal

Various solid waste disposal practices result in the generation of greenhouse gases. At SFO solid waste has been historically transported to, and disposed of, in landfills. In recent years, however, due to the mandates of State laws and City ordinances, a progressively higher percentage of the solid waste has either been source separated at the Airport or has been sorted at the offsite facilities of the waste haulers and has been recycled. In FY 2013 approximately 78.2% of the general solid waste generated at SFO was recycled. Solid waste generation data and the estimated greenhouse gas emission associated with solid waste disposal / recycling operations for 1990 and FY 2011 through FY 2013 are shown in Table 2-4.

Over the years, GHG emissions from solid waste disposal operations have significantly declined due to increased rates of solid waste recycling and composting at SFO. In FY 2013, GHG emission from solid waste disposal was 753 tons, which is consistent with emission levels for the past 3 years.

Significant construction activity occurred in FY 2013 with the construction of the new Boarding Area E and Air Traffic Control Tower and Integrated Facilities. These projects reported construction waste recycling rate of over 99%, far exceeding the City's Green Building Ordinance requirement of 75% diversion of construction and demolition waste. Due to the significant variability in generation of C&D waste SFO accounts for GHG emission reductions generated by the recycling of these wastes as mitigation rather than an offset measure. Recycling of construction and demolition waste contributed significant GHG emission mitigation for FY 2009 and FY 2010 (13,096 tons in FY 2009 and 4,545 tons in FY 2010). In this reporting period the construction and demolition waste disposal and recycling generated a GHG mitigation of 4,744 tons.

Table 2-4. Estimated GHG Emissions from Solid Waste Disposal and Recycling Operations

Activity Type	Solid Waste Generation (Tons)					GHG Emission (Tonnes)				
	1990 ^f	FY 2010	FY 2011	FY 2012	FY 2013	1990	FY 2010	FY 2011	FY 2012	FY 2013
Landfilled Solid Waste:										
General Waste^a	6,000	2,621	2,348	2,279	2,072	2,246	785	753	753	753
Recycled Solid Waste:										
General Recycling^c	0	3,053	3,300	4,413	3,816	0	-1,440	-1,821	2,053	-2,271
Composting^d	0	3,507	3,661	3,547	3,485	0	-765	-798	-798	-760
Sanitary Sludge^e					136					-30
Subtotal Regular Recycling							-2,205	-2,619	2,852	-3,061
Total						2,246	-1,420	-1,866	2,099	-2,309
Construction & Demolition Waste Disposal^d	5,000	500	500	0	154	350	35	35	0	11
Construction & Demolition Recycling		13,041	0	0	30,666	0	-4,545	0	0	-4,733
Construction & Demolition Mitigation						350	-4,510	35	0	-4,722

^a Methane emissions from landfilled solid waste were estimated by using Equation 9.1 of the publication: Local Government Operations Protocol Version 1.1, November 2010, California Air Resources Board, et al for a landfill equipped with comprehensive methane collection facilities (Landfill Emissions Worksheet)

^b Annual quantities of landfilled construction and demolition waste are based on reports filed by SFO contractors. The corresponding value for 1990 is an estimated quantity.

^c The Scope 3 Spreadsheet developed by ICF Intl for US EPA was used for estimating emission offsets from solid waste recycling. (See Solid Waste worksheet)

^d GHG emission mitigation factor of -0.2 tons/ton for composting operations and an emission factor of 0.07 tons / ton of landfilled construction and demolition (C&D) waste were obtained from the U.S. EPA's Waste Reduction Model (WARM) released in June 2013. The C&D landfilling factor is the average of the related factors for concrete, asphalt shingle, and drywall materials

http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

^e The GHG mitigation from C&D recycling was estimated using U.S. EPA's Waste Reduction Model (WARM) released in June 2013.

Fugitive Refrigerant Gas Emissions

SFO uses a central plant for providing preconditioned air to all terminal buildings. The central plant is currently equipped with two 3,000 ton and two 6,000 ton capacity chillers. SFO also uses various packaged air conditioning units in other airport buildings and facilities. In 1990 SFO used two 3,000 ton chillers in the central plant each containing a refrigerant charge of 8,800 lbs of R-12. The two 3,000 ton chillers were converted from R-12 to R134A in 2001. In FY 2008 the older of the 6,000 ton chillers was converted from R-500, an ozone depleting gas, to R-134A refrigerant, an ozone safe gas with a lower global warming potential (R-500 refrigerant gas is a blend of 73.8 wt. % R-12 and 26.2 wt. % of R-152A with a global warming potential (GWP) of 6,014). The newest 6,000 ton chiller was installed in 1999 with R-134A refrigerant gas. Currently Chiller No. 2 is offline and will be replaced in 2014/2015.

A portion of the refrigerant gases stored in the central plant chillers and in the packaged air conditioning units is lost each year due to leakage through the shutdown seals. In this reporting period, an estimated 279 lbs of refrigerant gases stored in the chillers was assumed to have been lost by such leakage. For 1990 an estimated loss rate equal to 5% of the capacity of chiller units was assumed based on the recommended default loss factor by U.S. EPA. The loss rate for the packaged air conditioning units in the respective fiscal years is based on the quantity of make-up gases purchased during each year. A similar make-up rate was assumed for the packaged air conditioning units in 1990, but in proportion to the estimated number of such units in that year. Data for the capacity of air conditioning units in Fleet vehicles and SFO shuttle buses was used to estimate the corresponding refrigerant gas make up rates and GHG emissions for these equipment.

A summary of the capacities, estimated annual leakage rates, and GHG emissions from the various air conditioning units at SFO is provided in Table 2-5. These data indicate that fugitive refrigerant gases were the source of an estimated 4,874 tons of equivalent carbon dioxide gas emissions at SFO in 1990. In FY 2013, GHG emissions from fugitive refrigerant gases were estimated at 279 tons. The indicated reduction in the GHG emissions from fugitive refrigerant gases after 1990 is in part due to the replacement of Dichlorodifluoromethane (R-12) with a GWP of 8,100 with 1,1,1,2-Tetrafluoroethane (R-134A) and Chlorodifluoromethane (R-22) which have a lower GWP of 1,300 and 1,810, respectively. It should also be noted that Kyoto Treaty only requires the inclusion of fugitive refrigerant gases of hydrofluorocarbons and perfluorocarbons types in the carbon footprint of an enterprise. Releases of fugitive refrigerant gas R - 134A were included in the final accounting of SFO's carbon footprint because the inclusion is recommended by Air Resources Board in the publication entitled Local Government Operations Protocol as cited in the footnotes to Table 2-5.

Table 2-5. Estimated GHG Emissions from Refrigerant Gas Losses at SFO

Year	1990		FY 2011				FY 2012 ^d				FY 2013 ^d			
Chiller Units	1	2	1	2	3	4	1	2	3	4	1	2	3	4
Chiller Size, Tonnes	3,000	3,000	3,000	3,000	6000	6000	3,000	N/A	6000	6000	3,000	N/A	6000	6000
Estimated Refrigerant Gas in Storage, lbs	8,800	8,800	4,600	0	16,000	15,000	8,600	N/A	17,100	21,000	8,600	N/A	17,100	21,000
Refrigerant Gas Type ^a	R-12	R-12	R-134A	R-134A	R-134A	R-134A	R-134A	N/A	R-134A	R-134A	R-134A	N/A	R-134A	R-134A
Estimated Annual Gas Loss Rate, lbs	440	440	116	0	327	257	116	0	327	257	0	0	0	0
Combined Annual Gas Loss Rate ^c lbs/year	880		700				700							
Packaged Air Conditioning Units Make up, lbs/year	375		330	0	20	0	200	50	0	0	289	0	0	0
Refrigerant Gas Type ^a	R-12		R-22	R-134A	R-407C	R-410A	R-22	R-134A	R-407C	R-410A	R-22	R-134A	R-407C	R-410A
Vehicular Air Conditioning Units Make up, lbs/year														
SFO Fleet ^b	34.8		34.8				34.8				34.8			
SFO Shuttle Fleet ^b	36.8		36.8				36.8				36.8			
Estimated Total Refrigerant Gas Loss, lbs/year	1,327		1,122				1,022				361			
Estimated Total GHG Emission ^c , Tonnes/Year	4,874		740				649				279			

^a R-12 = Dichlorodifluoromethane, R-134A = 1,1,1,2-Tetrafluoroethane, R-410A = Mixture of Difluoromethane, and Pentafluorethane, R-410C = Mixture of Difluoromethane, Pentafluorethane, and 1,1,1,2 Tetrafluoroethane, and R22=Chlorodifluoromethane

^b R-22

^c Global Warming Potential (GWP) for R-12 = 8,100, for R-152A=120, for R-134a = 1,300, for R-22=1,810, for R-407C = 1,526, and for R-410A = 1,725

Source of GWP factors: Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories, California Air Resources Board, et al, September 2008, and US EPA web site at the following address:

http://www.epa.gov/climatechange/emissions/downloads/ghg_gwp.pdf

^d Chiller No. 2 was removed from service in 2011. A new chiller will be installed in 2014.

^e The refrigerant loss rate for FY 2012 was estimated to have been the same as FY 2011.

SFO Fire Department maintains the various fire extinguishers deployed at the terminals and other buildings and facilities. Fire Department replenishes these extinguishers annually with about 36 lbs of Halon 1211 and 60 lbs of multi-purpose ABC dry chemical extinguishers (consisting of ammonium phosphate and mono-ammonium phosphate). No data is available for the 1990 replenishment rate for the fire extinguishers but it could be assumed that Halon 1211 was used predominantly in 1990 for this purpose. U.S. EPA provides a direct global warming potential of 1,300 for Halon 1211. This gas also manifests a negative GWP ranging from (3,600) to (24,000) because Halon depletes the Ozone in the atmosphere and Ozone is a more potent greenhouse gas than Halon. For this reason no GHG emission values are assigned to fugitive Halon emissions from individual fire extinguishers at SFO. Currently the Fire Department is phasing out the use of Halon 1211 in fire extinguishers due to its harmful effect on the earth's Ozone layer.

Wastewater Treatment Process and Receiving Water Emissions

SFO operates both a Sanitary Wastewater Treatment Plant (SWTP) and an Industrial Wastewater Treatment Plant (IWTP). The SWTP operates a state-of-the-art biological-batch-reactor treatment process with a design capacity of 2.2 million gallons per day (mgd). The average daily discharge from the SWTP has ranged from 0.54 mgd to 0.68 mgd from FY 2010 to FY 2013. The SWTP processes do not include nitrification/de-nitrification treatment.

The IWTP treats wastewater generated at the various vehicular and aircraft maintenance facilities and the first flush of storm water runoff generated in the terminal and industrial areas of the Airport. The dry weather capacity of the IWTP is 1.2 mgd. The average annual discharge from the IWTP ranged from 0.47 mgd to 0.65 from FY 2010 to FY 2013. The influent to and effluent from the IWTP does not contain nitrogen compounds to any appreciable extent and is, therefore, not considered as a source of GHG emissions.

Treated effluent from the two plants is discharged into San Francisco Bay through an offshore outfall operated by North Bay System Unit. The sludge generated at the sanitary treatment plant is treated by anaerobic digestion process and the treated and dewatered sludge is then shipped to an offsite composting facility. Industrial plant sludge is filter pressed and air dried prior to shipping to a landfill disposal site. Methane and hydrogen sulfide gases generated in the sludge digester are collected and flared at the treatment plant. GHG emissions from treatment processes, the biogas flaring operations, and the receiving water where the effluent is discharged are summarized in Table 2-6 and indicate total GHG emissions of 372 tons per year for FY 2013. The estimated GHG emissions from the wastewater treatment process ranged from 282 to 410 tonnes per year in the FY 2010-FY 2013 period.

Table 2-6. Estimated GHG Emissions from SFO Wastewater Treatment Plants^a

	Generation Rates					GHG Emissions				
	1990	FY 2010	FY 2011	FY 2012	FY 2013	1990	FY 2010	FY 2011	FY 2012	FY 2013
Sanitary Plant Average Annual Flow^b, mgd	0.44	0.54	0.63	0.61	0.68					
Treatment Process N₂O Emission^c, tonnes / year	0.06	0.07	0.08	0.08	0.09	18	22	25	25	27
Average Annual Ammonia Nitrogen in the Discharged Sanitary Effluent, mg/l	64	64	64	64	64					
Receiving Water N₂O Emission, Tonnes/Year	0.19	0.24	0.28	0.27	0.30	61	75	87	84	93
Digester Gas Flaring Operations^{d,e}										
Methane, ft³	2,156,936	2,567,313	3,621,825	4,176,890	3,487,765	156	185	261	301	252
Total						235	282	373	410	372

^a The following Reference was used for all emission calculations shown in this Table: Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories, Version 1.1, May 2010, Developed in Partnership by California Air Resources Board, et al.

^b The 1990 flow rate was prorated from the 2008-09 flow rate in proportion to the total number of passengers for the respective years

^c Calculated by using formula No. 10-9 from the reference above for N₂O emission from Wastewater Treatment Plant without nitrification/de-nitrification and assuming a per capita sanitary wastewater generation rate of 25 gallons per day and a nitrous oxide generation of 3.2 grams per capita per day

^d Reported FY 2009 annual digester gas generation at SFO's Wastewater Treatment Plants was extrapolated to 1990 on the basis of passenger traffic data (29,939,835 in 1990 versus 36,733,910 in FY 2009). Density values of 0.662 kg/m³ and 1.842 kg/m³, at 20° C and atmospheric pressure, were used for CH₄ and CO₂ gases, respectively. Approximately 99% of the flared methane gas was assumed to be converted to CO₂ and H₂O and a conversion factor of 44/12=3.67 was used for oxidation of CH₄ to CO₂ in the flaring process.

^e Methane gas constitutes 65% of the total gases generated by the digesters and the balance consists mainly of biogenic carbon dioxide.

GHG Emission Reduction, Offset, and Mitigation (ROM) Measures Implemented at SFO

SFO has successfully implemented a number of measures in recent years to reduce, offset, and mitigate the GHG emissions at local and regional levels. The emission reduction measures generally refer to actions that directly reduce the GHG emissions from SFO controlled operations, such as: increasing the fuel efficiency of fleet vehicles, reducing electric energy and natural gas consumption, using biodiesel in SFO fleet vehicles and SFO shuttle buses, etc. Emission reduction measures have been taken into account in the baseline emission values shown in Tables 2-2 through 2-6. Emission offset measures, consisting of solid waste recycling and carbon dioxide sequestration by tree plantings at SFO; reduce the Category 1 carbon footprint of SFO. Several mitigation measures have also been implemented at SFO to reduce the GHG emissions from sources that are not directly related to SFO controlled operations, such as: providing Preconditioned Air and 400 Hz power to aircrafts at the gates, providing partial funding for the extension of Bay Area Rapid Transit (BART) to SFO, constructing the AirTrain system to eliminate the need for rental car shuttle buses, and implementing the Green Car Rental Incentive Program. Each of the above elements is described briefly in the following paragraphs.

Implemented GHG Emission Reduction Measures

These measures directly reduced the GHG emissions from day-to-day operations of the Airport. In FY 2013 these measures reduced the GHG emissions at SFO by 15,958 tons, as itemized below:

- General reduction in the GHG emission factor for electricity supplied by SFPUC to SFO in FY 2013 and implementation of electric energy efficiency measures resulting in a GHG emission reduction of 9,263 tons for electric energy consumption in comparison with the corresponding 1990 emission level
- GHG emission from SFO Fleet declined by 607 tons from the 1990 level due to improved fuel efficiency of the fleet vehicles and the use of alternate fuels which compensated for the rise in the number of vehicles
- Reducing the quantity of landfilled solid waste from 6,000 tons in 1990 to 2,355 tons in FY 2013 reduced the GHG emissions for landfilling operations by 1,493 tons
- Reducing the release of fugitive refrigerant gases from Central Plant Chillers and using more climate friendly refrigerant gases resulted in an emission reduction of 4,595 tons compared to 1990 emission level.

These emission reductions which are summarized in Table 2-7 were in part balanced by growth induced increases in consumption of energy and various fuels resulting in a net GHG emission reduction of 12,814 tons from 1990 to FY 2013 or a reduction of 25.7%.

Table 2-7. Impact of Implemented GHG Emission Reduction Measures in FY 2013

Activity	FY 2013 GHG Emission Reductions from 1990 Baseline, tonnes/yr
Electric Energy	9,263
Fuel Consumption	607
Solid Waste Disposal	1,493
Fugitive Refrigerant Gases	4,595
Total	15,958

Implemented GHG Emission Offset Measures

These measures relate to Airport operations or actions taken that yield a direct reduction in the GHG emissions to the atmosphere. In FY 2013 the following offsets were achieved by SFO:

- SFO recycled about 78.2% of the general solid waste collected at the Airport yielding an emission offset of 3,061 tons in FY 2013.
- SFO has planted 2,020 trees of various species around the Airport which sequester about 121 tons of carbon dioxide from the air per year.

As the result of the above offset measures SFO's Category 1 carbon footprint was reduced by an additional 3,182 tons in FY 2013, thereby yielding an additional 6.3% reduction from 1990 levels

The net GHG emission of 33,784 tons in FY 2013 indicates a 32.1% reduction from the 1990 emission level. This reduction is the result of implemented emission reduction and offset measures that balance any increases in GHG emissions due to growth in airport operations and passenger traffic.

Implemented Voluntary GHG Emission Mitigation Measures

The following voluntary GHG emission mitigation measures have been implemented at SFO in recent years:

- Installation of preconditioned air supply (PC Air) and 400 Hz power supply equipment at the International Terminal Boarding Areas A and G, Terminal 1 Boarding Areas B and C, Terminal 2 and Terminal 3. These facilities have mainly eliminated the need for the use of Auxiliary Power Units (APUs) aboard the aircraft while the aircraft is deplaning and enplaning passengers. SFO regulation 11.4 (B) requires the use of PC Air and 400 Hz power as described below:

"Operators are encouraged to use ground power and air sources whenever practicable. APU's may be used when aircraft are being towed.

- (1) At domestic terminals, the use of APU's is prohibited between the hours of 2200 - 0600 except 30 minutes prior to departure, when passengers are aboard, or it is needed to test other aircraft equipment.
- (2) At the International Terminal, the following procedures apply:
 - (a) Aircraft scheduled to be at a gate in Boarding Areas A and G for more than 45 minutes between the hours of 0700 – 2200, are required to use 400Hz ground power and pre-conditioned air, where available. APU's are not authorized without prior permission from Airport Operations, during the use of ground power and pre-conditioned air until 30 minutes prior to push-back.
 - (b) All aircraft scheduled to be at a gate between 2200 – 0700 hours are required to use 400Hz ground power and pre-conditioned air, where available, regardless of the duration at the gate. APU's are not authorized without prior permission from Airport Operations, during the use of ground power and pre-conditioned air until 30 minutes prior to push-back.”

In FY 2013, the PC Air system mitigated the GHG emissions at SFO by 53,704 tons. The significant increase in the PC Air emission mitigation level since FY 2010 was due to the installation of dedicated PC Air units at 12 jet bridges in Boarding Areas C and F and also the installation of 14 PC Air units at the jet bridges during the Terminal 2 renovation. The Boarding Area E renovation, completed in January 2014, equipped all gates with PC-Air and 400 Hz power units.

- In 2009 SFO initiated a three year Pilot Green Car Rental Incentive Program (GCRIP) in conjunction with the rental car companies operating at the Airport. This program provided financial incentives to the rental car companies to increase the number of fuel efficient cars with an EPA score of 17 or higher to 15% of their rental vehicle inventory. The program also provided a \$15 discount to the customers who rented a Green Car. On January 1, 2012, SFO discontinued the customer discount, while the financial incentives for the rental car companies remained in effect until January 1, 2013. In FY 2013, the net emission mitigation from the GCRIP was estimated at 4,562 tons, which was higher on an annual basis than 8,049 tons of mitigation that was achieved in FY 2012. The considerable continuing customer demand for fuel efficient cars indicates that the three year financial incentive program was effective in providing an environmentally friendly option for passengers who would need to rent vehicles at SFO rental agencies.
- The GHG emission mitigation associated with construction & demolition (C&D) waste recycling operations at SFO were estimated to be 4,722 tonnes in FY 2013. In previous years when major construction activity occurred, the GHG emissions mitigation level reached as high as 13,096 tons per year. The significant variations in the magnitude of these mitigations are associated with the composition of recycled waste and variations in the quantity of construction and demolition waste generated in any given year.
- SFO provided partial funding for BART extension to SFO which in FY 2013 resulted in a reduction of about 84 million miles of travel by airline passengers based on monthly passenger data provided by BART to SFO staff. SFO shares approximately 9.1% of this mitigation based on SFO's contribution of 200 million dollars to the capital cost for extending BART from Colma

to SFO and Millbrae. In FY 2013, it is estimated that BART service mitigated SFO's GHG emissions by 2,551 tons.

- In 2003 SFO completed the construction of AirTrain system which has eliminated the need for the use of shuttle buses by all on-Airport Rental Car Agencies. In FY 2013, the AirTrain system mitigated SFO's GHG emissions by 2,198 tons.

The measures listed above yielded a total GHG emission mitigation of 67,737 tons in FY 2013 at SFO, as shown in Table 2-8.

Table 2-8. Summary of Implemented GHG Emission Mitigation and Offset Measures at SFO

Type of mitigation Measure	Resources Saved			GHG Emission Mitigation or Offset (tonnes per year)		
	FY 2011	FY 2012	FY 2013	FY 2011	FY 2012	FY 2013
GHG Emission Mitigation Measures						
PC Air and 400 Hz Power Supply Installation at International and Domestic Terminals ^{a,b} , gallons jet fuel	4,912,280	5,736,092	5,519,282	-48,295	-57,192	-53,704
Green Car Rental Incentive Program ^c , gallons gasoline	1,118,473	904,787	1,163,480	-9,946	-8,049	-4,562
Construction & Demolition Waste Recycling, tons	0	0	30,666	0	0	-4,722
SFO's Share of GHG Mitigation for BART Extension to SFO ^d , gallons gasoline	241,262	267,206	282,465	-2,180	-2,415	-2,551
AirTrain Facility ^e , gallons diesel	193,281	208,740	216,483	-1,960	-2,120	-2,198
Subtotal Emission Mitigation				-62,381	-69,775	-67,737
GHG Emission Offset Measures						
Solid Waste Recycling ^f , tons	6,560	6,961	7,960	-2,619	-2,852	-3,061
Tree Planting Operations ^f	2020	2,020	2,020	-121	-121	-121
Total GHG Emission Offset				-2,740	-2,973	-3,182

^a Volume of jet fuel saved by providing PC Air and 400 Hz power supply to aircraft . APU jet fuel usage was calculated for each reporting period on the basis of actual SFO flight operations during a representative 24-hour period in the peak travel month which was then extrapolated to the entire year by using an adjustment factor of 0.82 for converting the peak month-average day passenger traffic to annual-average day passenger traffic. The duration of APU use for each flight on the Design Day was calculated on the basis of reported turn-around-times (TAT) for these flights. In general for all flights with a TAT less than 60 minutes no preconditioned air usage was assumed. For flights with TATs between 60 and 120 minutes it was assumed that PC Air and ground power was used for all but 30 minutes of the TAT. For flights with TATs exceeding two hours it was estimated that the PC Air and ground power would be used for a total of 90 minutes. The figures for PC Air usage were estimated from the results of a survey of international and domestic carriers at SFO. APU fuel use in 1990 was calculated on the basis of the reported aircraft types, the number of average-day flight operations (Master Plan Program Final Environmental Impact Report, May 1992), and the published APU fuel use levels for the respective aircraft types.

^b In FY 2012, no PC Air units were installed at Boarding Area B, and Boarding Area E was not operational; only 5 of 9 gates and 7 out of 25 gates, in Boarding Areas C and F, respectively, have PC Air units installed.

^c Gasoline savings resulting from the implementation of the Green Car Rental Incentive Program (Green Vehicles Program tab)

^d Gallons of gasoline saved by passengers using BART service to SFO. An estimated one-way average travel distance of 19 miles per BART passenger was used based on 2006 Metropolitan Transportation Commission Survey of SFO and Oakland Airport passengers. The average vehicle fuel efficiency was assumed at 23.9 mpg per US EPA, and a BART per passenger per mile fuel use at 12% of the passenger vehicle per mile was obtained from BART staff. The share of SFO was estimated at 9.1% of the total GHG emission mitigation. (See BART tab in Master Spreadsheet)

^e Gallons of diesel fuel saved by eliminating the need for 800,000 miles of travel by Car Rental Agency shuttle buses in 2007-08. Avoided miles for subsequent years were estimated on the basis of the ratio of total SFO passengers for the respective years to FY 2008. A fuel efficiency of 4.5 mpg was assumed for the shuttle buses. (See Airtrain Mit tab in Master Spreadsheet)

^f Impact of general and construction/demolition solid waste recycling at SFO (See Solid Waste Tab)

^g The impact of carbon sequestration by 2,020 trees planted throughout the Airport as a part of the SFO landscaping program (see Table 3 of Reference Data tab in Master Spreadsheet)

Summary of Category 1 SFO Controlled GHG Emissions

Estimated Category 1 GHG emissions at SFO for 1990 and FY 2010 through FY 2013 are summarized in Table 2-9. These data show that SFO controlled operations generated 49,780 tons of GHG emissions in 1990 and 33,784 tons in FY 2013, a 32.1% reduction from 1990 level. These emission levels included an annual offset of 3,182 tons, which is a fairly consistent with the levels experienced in FY 2012. GHG emission mitigation levels at SFO increased from 39,409 tons in FY 2009 (not shown in the table) to 67,759 tons in FY 2013. The significant increase in GHG emission mitigation levels was, mainly, attributable to expanded PC Air and ground power service to aircraft at additional Boarding Areas, as described previously.

Table 2-9 - Summary of Historical and Current Category 1 GHG Emission and GHG Emission Offset and Mitigation Levels at SFO

Activity	Category 1 SFO Controlled GHG Emissions (tonnes per year)			
	1990	FY 2011	FY 2012	FY 2013
GHG Emission Levels				
Electric Energy and Natural Gas Consumption^a	29,269	25,013	19,367	20,006
Fuel Consumption	13,155	14,290	15,002	15,556
Fugitive Refrigerant Gas Emissions	4,875	740	649	279
Solid Waste Disposal	2,246	788	753	753
Wastewater Treatment	235	373	410	372
Total Gross Baseline Category 1 GHG Emission	49,780	41,204	36,180	36,966
GHG Emission Offset Levels				
Solid Waste Recycling Offset	0	-2,619	-2,827	-3,061
Tree Sequestration Offset	0	-121	-121	-121
Total GHG Emission Offsets	0	-2,740	-2,948	-3,182
Net Category 1 GHG Emission	49,780	38,464	33,232	33,784
GHG Emission Mitigation Level				
Total GHG Emission Mitigation	0	-62,381	-69,775	-67,737

^a GHG emission estimates for fuel consumption at SFO for the preceding reporting periods were revised by deducting the SFO Shuttle Bus GHG emissions from the estimated emission for vehicular travel on SFO controlled roads, thereby eliminating the double counting of the Shuttle Bus emissions.

Summary of Planned GHG Emission Reduction, Offset, and Mitigation Measures at SFO

A number of additional GHG emission reduction, offset, and mitigation measures are currently being implemented or are being planned at SFO as follows:

Planned GHG Emission Reduction Measures

- Projected reductions in natural gas consumption could mitigate the GHG emissions by 791 tons per year.
- Implementing the planned fleet vehicle replacement program for existing aged vehicles with more fuel efficient vehicles. This program is expected to reduce Category 1 GHG emissions by 122 tons per year upon completion (See Table 4-3 in Section 4)
- Implementing various employee commute programs, including eliminating the BART surcharge fee for travel to the Airport for Commission employees, promoting carpool through the use of social ridesharing, and adding new local, ferry and commute bus services. This program is expected to reduce the category 1 GHG emissions by 226 tons per year upon completion.

Planned GHG Emission Offset Measures

- Increasing the solid waste recycling rate to 80% by 2017 from the FY 2013 recycling rate of 78.2%. This measure is expected to yield an additional GHG emission offset of about 225 tons per year.

Planned Voluntary GHG Emission Mitigation Measures

- Full year operation of PC Air units at Boarding Area E in FY 2014. These systems are expected to yield a GHG emission mitigation of 5,136 tons per year

The planned Category 1 GHG emission ROM measures at SFO are summarized in Table 2-9 and indicate that GHG emissions at SFO could be further reduced by the combined impact of planned reduction and offset measures by 1,364 tons per year by 2017.

Table 2-10 - Summary of Planned Additional GHG Emission Reduction, Offset, and Mitigation Measures at SFO

Activity	Planned GHG Emission Reduction/Offset /Mitigation Measures, tonnes per year
GHG Emission Reduction Measures	
Natural Gas Use Reduction ^a	791
Electric Energy Efficiency Measures ^b	0
Fuel Consumption ^c	348
Subtotal Emission Reductions	1,139
GHG Emission Offset Measures	
Enhanced Solid Waste Recycling ^d	225
Subtotal Offset Measures	225
GHG Emission Mitigation Measures	
PC Air and 400 Hz Power Supply System at B/A E ^e	5,136
Subtotal Mitigation Measures	5,136

^a Based on the Energy Audit Report recommendations and potential impact of energy saving measures incorporated in the new construction projects

^b Based on the Energy Audit Report's electric energy saving recommendations and completion of airport-wide lighting retrofits

^c Based on scheduled fleet vehicle replacement and enhanced employee commute programs

^d Based on increasing the recycling rate from 77% to 80% by 2017

^e Expected offset generated by PC Air and 400 Hz power supply system at the renovated Boarding Area E.

Category 1 GHG Emission Projections

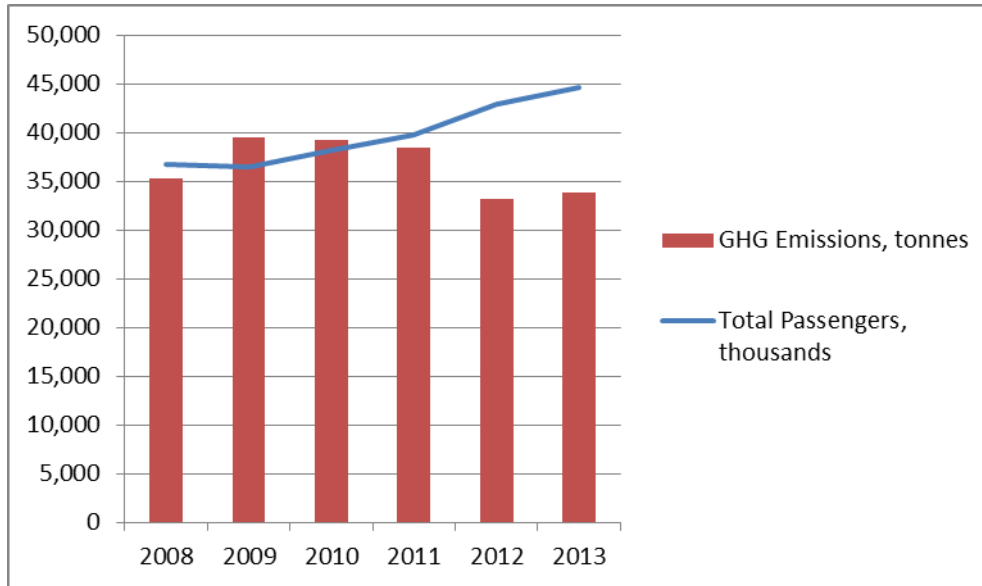
Ordinance No. 81-08 requires a reduction in GHG emissions to 25% below 1990 emission levels by 2017 and 40% below 1990 emission levels by 2025. Therefore, it is necessary to establish baseline estimates for SFO's expected carbon footprint in 2017 and 2025 to assess the magnitude of compliance requirements in the future years.

Basis for GHG Projections

Historically, GHG emission projections were based on a direct correlation between the rate of increase in GHG emissions and passenger growth. The observed correlation reflects the impact of increased passenger traffic on electric energy consumption for the operation of baggage handling systems, escalators, elevators, and moving walkways. The increased passenger loads could also increase the load

on the central air conditioning system during the summer months, coinciding with the peak passenger traffic period at the Airport. Other parameters such as the number of flight operations, impacting PC Air and 400 Hz power supply or APU usage, and solid waste loadings are also related to the passenger traffic level at SFO. However, due to focused efforts aimed at reducing GHG emissions and increasing GHG emission offsets, in recent years the GHG emissions at SFO have declined despite an appreciable increase in the number of enplaned passengers at SFO. Therefore, projected GHG emissions in proportion to passenger growth would constitute a conservative upper limit to such emissions. Accordingly a lower bound for projected GHG emissions were also developed as described below.

Figure 2-4. Plot of Historical Data for Total Number of Passengers and GHG Emissions at SFO



Passenger Projection Levels. Passenger growth scenarios for SFO have been analyzed by the Planning Division and consolidated projections for the number of enplaned passengers have been developed based on FAA and SFO Finance Department growth estimates. The results of these projections are summarized in Table 2-11 and indicate passenger traffic growth of 10.9% by 2017 and 31.98% from 2013 levels by 2025.

Table 2-11. Projected Passenger Enplanements at SFO

Growth Scenario	FY 2013	2017	2025
Enplaned Passengers	22,334,455	24,770,330	29,477,668
% Growth from 2013		10.91%	31.98%

Projected Gross GHG Emissions. An upper and lower bound projections for GHG emissions at SFO are shown in Table 2-12. These projections do not include the impact of any future reduction and offset

measures. Upper bound projections are based on the assumption that in the future GHG emissions would increase in proportion to the rate of growth in the number of enplaned passengers. However past data indicate that GHG emissions have increased at a slower rate or have remained stable at SFO. Therefore, a more realistic lower bound projection is also presented in Table 2-12. The adjusted projection was developed by assuming an increase in GHG emissions at about 50% of the rate of increase in passenger traffic at SFO.

Table 2-12. Projected 2017 and 2025 Category 1 Gross GHG Emission Levels at SFO (Tons per Year)

Projection	2017	2025
GHG Emission Level (Upper Bound)	37,470	44,588
GHG Emission Level (Lower Bound)	35,627	39,189

The summary of projected gross and net GHG emission levels at SFO for 2017 and 2025 is shown in Table 2-13 and indicate a potential need for developing additional emission reduction/offset levels of 7,413 tons by 2025 based on adjusted gross GHG emissions of 39,189 tons. The projected GHG mitigation level is assumed to be lower due to the discontinuation of rental car incentive program.

Table 2-13. Projected Category 1 GHG Emission and Emission Offset and Mitigation Levels at SFO (Tons per Year)

Item	2017	2025
Allowable GHG Emission Level (Ordinance 81-08)	38,027	30,421
Projected GHG Emissions (Lower Bound)	35,627	39,189
Planned Emission Reduction	-1,139	-1,139
Planned Emission Offset	-225	-225
Potential Reductions from Major Renovation	TBD	TBD
Total GHG Emission Level	34,263	37,825
Required Additional GHG Emission Reduction / Offset Level under Ordinance 81-08		7,413
Projected GHG Emission Mitigation Measures	-63,589	-63,589

Estimated Category 2 GHG Emissions at SFO

Category 2 GHG emissions are defined to include the various emissions from airlines, airline support services, and concessionaires as well as governmental operations such as the U.S. Post Office's vehicle fleet at SFO, etc. A partial list of the emissions included under this category is as follows:

- Natural gas consumption by airlines, Ground Services Operations, and concessionaires which are not delivered under SFO accounts
- Gasoline, diesel, biodiesel, and CNG consumption by fleet vehicles for airlines, concessionaires, and airline support services
- Jet fuel consumption for aircraft landing and takeoff (LTO) cycles.
- Jet fuel consumption for aircraft Auxiliary Power Units (APU)
- Fuel consumption by construction contractors working at SFO for Airport, airlines, and other tenants
- Fuel consumption for vehicular commute by employees of airlines, concessionaires, and airline support services
- Fuel consumption by U.S. Post Office's fleet vehicles
- Fuel consumption by trucks delivering supplies to tenants, concessionaires, airlines, and airline support services

Because the focus of the SFO Climate Action Plan is on activities managed and controlled by the Airport Commission, information on some of Category 2 carbon footprint elements was not available for inclusion in this report. The missing emission data will be collected and will be included in future updates of the Airport CAP. Available data on the carbon footprint of these activities is summarized in Table 2-14 and indicate a reduction in Category 2 GHG emissions from 839,000 tons in 1990 to 908,247 tons in FY 2013. The estimated increase is mainly due to the growth in airline operations and passenger traffic over the years. The 1990 estimates, however, could probably be refined by performing a more rigorous analysis. Some of the aircraft flight emission data included for FY 2008 in this table was developed by Wyle Aviation Services, et al in conjunction with SFO staff, by using FAA's EDMS model. The related emissions for 1990 and for subsequent years were extrapolated from FY 2008 data based on the number of flight operations for the respective years.

The GHG emission data shown in Table 2-14 for such elements as solid waste handling and fugitive refrigerant gas emissions are specific to airline operations and have not been included under Category 1 emissions. The GHG emissions associated with solid waste handling for food service tenants have been included under Category 1 emissions because their waste is collected under the SFO solid waste collection contract.

Table 2-14 Estimated 1990, FY 2011 to FY 2013 Category 2 GHG Emissions from Airlines, Airline Support Services, and Concessionaire Operations*

Activity Type	Consumption/Quantity				GHG Emission, Tonnes			
	1990	FY 2011	FY 2012	FY 2013	1990	FY 2011	FY 2012	FY 2013
Commercial Passenger Aircraft LTO Cycle Jet Fuel Use ^a (million gallons)	67	59	79	72	658,688	579,105	685,095	641,972
Cargo Aircraft LTO Cycle Jet Fuel Use, million gallons	3.2	2.3	2.5	2.1	31,730	22,151	24,032	23,558
Aircraft Auxiliary Power Unit Jet Fuel Use ^b , million gallons	7.8	6.3	9.8	12.8	75,897	62,002	95,823	124,218
Employee Commute Fuel Consumption ^c (GGEx106)	2.5	3.6	3.9	5.3	22,210	31,381	34,046	43,908
Tenants Independent Natural Gas Use (Therms) ^d	TBD	TBD	TBD	325,930	TBD	TBD	TBD	1,907
Ground Services Equipment Gasoline Fuel Use ^c (GGEx106)	4.4	3.9	4.2	2.2	38,779	37,731	40,936	19,027
Ground Services Equipment Diesel Fuel Use ^c (GGEx106)	N/A	N/A	N/A	3.7	N/A	N/A	N/A	37,967
Tenants' Fleet Vehicles Gasoline Fuel Use ^e (GGEx106)	0.6	0.8	0.9	0.3	5,641	7,737	8,394	2,625
Tenants' Fleet Vehicles Diesel Fuel Use ^e (GGEx106)	N/A	N/A	N/A	0.1	N/A	N/A	N/A	558
Landfilled and Recycled Solid Waste ^f (tonnes)	8,325	11,170	12,119	12,568	5,016	8,027	8,709	9,032
Fugitive Refrigerant Gas Emissions ^g (lbs)	TBD	TBD	TBD	194	456	566	614	444
Tenants and Concessionaires Fuel Use for Supply Deliveries ^f (GGEx106)	0.6	0.8	0.9	3.4	564	695	754	3,032
Total					838,980	749,393	898,403	908,247

*Most emission estimates for FY 2011 & FY2012 were derived from detailed calculations performed in FY 2008 as modified by the ratio of annual enplaned passengers. See previous Climate Action Plans for derivation details for FY 2008 values. FY 2013 Category 2 GHG emissions were estimated using SFO Tenants GHG emission survey results.

^a FY 2012 and 2013 numbers were estimated by calculating LTO cycle jet fuel use for one day that year (July 30) and multiplying it by 365. The LTO cycle jet fuel use was estimated from the IPCC document: www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_5_Aircraft.pdf 1990 flight data were obtained from three sources: Landed Fee Reports, SFO Master Plan EIR, and the Official Airline Guide Schedule Data.

^b APU fuel use for FY 2012 & 2013 was calculated by SFO staff using actual flight operations data for one day that year (July 30) at all terminals and extrapolating the data to the entire year. APU fuel use in 1990 was calculated on the basis of reported aircraft types and the number of average day flight operations (SFO Master Plan Final EIR, 1991).

^c FY 2013 data estimates based on 2013 SFO Tenant Commute survey. 1990 and FY 2010- 2012 estimates were extrapolated from 2008 by using the ratios of total passengers for the respective years.

^d FY 2013 data estimates based on 2013 SFO Tenant Commute survey. No data was estimated for this category previously.

^e FY 2013 tenant fleet vehicle emissions were calculated on the basis of the survey data obtained by SFO Environmental Services staff in 2013. FY 2010 through FY 2012 data were extrapolated from FY 2008 survey data.

^f Calculated FY 2008 data was extrapolated to 1990, FY 2009- 2012 by SFO staff using the ratios of total passengers for the respective years.

^g FY 2013 refrigerant emissions was reported by in a survey conducted by SFO Environmental staff in 2013. FY 2010- 2012 numbers were extrapolated from calculated FY 2008 data by SFO staff using the ratios of total enplaned passengers for the respective years.

Estimated Category 3 GHG Emissions at SFO

The Category 3 carbon footprint at SFO includes the GHG emissions generated beyond the defined boundary of SFO but which are related to enterprise activities at SFO. Examples of these emission sources for SFO are as follows:

- Jet fuel consumption at cruising altitude by passenger and cargo aircraft flying from SFO to their immediate departure destination. These emissions are included under Category 3 to indicate that they occur outside the geographical boundary of SFO.
- Vehicular and public transit travel by airline passengers to and from SFO
- Emissions from cargo service trucks and from trucks delivering supplies or providing services to SFO and to Airport enterprises
- Emissions from Car Rental Fleets. These emissions pertain to the actual operation of the rental fleets, including the green car fleets. SFO claims mitigation only for the saved fuel in the green car fleets under the Green Car Rental Incentive Program, as described in a previous section.

Table 2-15 shows the Category 3 GHG emissions at SFO, which ranged from 7 million tons in 1990 to 9.5 million tons in FY 2012 and 8.41 million tons in FY 2013. The estimated increase since 1990 is mainly due to the fact that passengers are flying more and to further destinations. The decrease in GHG emissions from FY 2012 to FY 2013 may indicate a fewer number of flights this year, although these numbers are estimated only using the best available data. The annual jet fuel consumption for commercial and cargo aircraft flying to the departure destination has been estimated based on flight operations for a 24 hour period on June 30, 2013, and extrapolating to the entire year. Comprehensive data analysis was performed in FY 2008 by Wyle Aviation Services, et al in conjunction with the SFO staff to estimate the annual jet fuel consumption for commercial and cargo aircraft flying to the departure destination. The GHG emissions for these activities for FY 2009 through FY 2011 were extrapolated from FY 2008 data by applying a factor based on the ratio of flight operations or cargo tonnage for the respective years. Other Category 3 GHG emission values were developed on the basis of responses received from the airlines, airline support services, and concessionaires to a questionnaire distributed by SFO staff in 2009, and the tonnage of cargo shipments at SFO. Refer to the footnotes on the Table 2-15 for details of this data were generated.

Table 2-15. Estimated 1990, FY 2010-FY2013 Category 3 GHG Emissions

Activity	Consumption				GHG Emission, Tonnes			
	1990	FY 2011	FY 2012	FY 2013	1990	FY 2011	FY 2012	FY 2013
Jet Fuel Consumption for Commercial Aircraft Flying to the Departure Destination ^a , (million gallons)	646.94	806	896	765	6,335,565	7,927,120	8,715,084	7,440,253
Jet Fuel Consumption for Cargo Aircraft Flying to the Departure Destination ^b , million gallons	41.31	21	43	47	404,513	201,907	421,191	455,646
Fuel Consumption by Multimodal Passenger Travel ^c , (millions GGE)	31.61	39	42	42	278,459	347,123	363,568	363,568
Fuel Consumption for Cargo and US Mail Shipment Delivery/Pickup at SFO ^d , (gallons)	173,774	124,050	119,918	119,918	1,763	1,071	840	840
Emissions from Construction Contractors' On and Off-Road Equipment	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Emission from Rental Car Fleets ^e	12,343,605	14,363,056	16,948,842	15,223,508	107,243	119,426	149,847	153,848
Total					7,127,543	8,596,647	9,650,529	8,414,155

^a FY 2012 and FY 2013 numbers were estimated by calculating the jet fuel consumption for commercial aircraft flying to the departure destination for one day of that year (July 30) and multiplying it by 365. The cruise emissions for FY 2011 were estimated by multiplying the FY 2009 (not shown) fuel use value by the ratio of annual number of flight operations for the respective years. Estimated cruising altitude emissions for FY 2008 were calculated by using the FAA's Emission and Dispersion Modeling System, Version 5.1.1 and the annual flight data base provided by SFO Noise Monitoring Office. 1990 flight data were obtained

from three sources: Landed Fee Reports, SFO Master Plan EIR, and the Official Airline Guide Schedule Data.

^b FY 2012 and 2013 numbers were estimated by calculating the jet fuel consumption for cargo aircraft flying to the departure destination for one day of that year (July 30) and multiplying it by 365. Data for the number of cargo aircraft flights and aircraft types for FY 2008 (not shown). The FY 2011 consumption and emissions were estimated by multiplying the FY 2008 consumption by ratio of annual cargo tonnage handled.

^c Based on data developed in 2006 by the Metropolitan Transportation Commission. Estimates for 1990 and other reported years were developed by extrapolating the MTC data on the basis of passenger counts for the respective years (See Table 8-1 for details of MTC data)

^d Estimated by using the reported annual cargo and US Mail shipments at SFO for the respective years and assuming an average roundtrip distance of 25 miles for cargo delivery / pickup in trucks holding 15 tonnes of cargo with a diesel fuel efficiency of 5.9 miles per gallon. The emissions for FY 2010-2012 were estimated on by the ratio of annual cargo tonnage to FY 2008.

^e Estimated on the basis of the reported rental transaction for regular fleet, EPA rated 17+, and EPA 18 rated vehicles. An estimated travel distance of 221 miles per transaction and vehicle fuel efficiencies of 20, 30, and 40 miles per gallon, respectively were used for regular and high efficiency vehicles. The 1990 transactions were estimated by multiplying the 2009 transaction level by the ratio of total passenger traffic for the respective years. Also, an average gas efficiency of 17.5 miles per gallon and a trip length of 221 miles were used for estimating the 1990 GHG emission level. (See Green Vehicle Program tab in spreadsheet)

SFO Energy Use

Summary

SFO is the San Francisco Public Utility Commission's (SFPUC) largest purchaser of energy and in 2012 purchased 1,497,263 MMBtu, or nearly 39.5% of SFPUC's energy supply. The electric energy is used for lighting and for powering equipment (such as people movers and AirTrain system) operating in public spaces; and heating, ventilation, and air conditioning (HVAC) equipment at the terminals, boarding areas, and other SFO facilities. SFO supplies all electric energy needs of airlines, concessionaires, and other Airport tenants; and in FY 2013 their electric consumption accounted for 50% of the electricity purchased from SFPUC. SFO is also the second-largest purchaser of natural gas from the SFPUC, and in FY 2013 purchased 3.0 million therms of natural gas for use by Airport operations and for meeting the needs of most of the tenants. The local utility also supplied an additional 752,000 therms of natural gas to SFO.

SFO is actively implementing and planning a number of Energy Efficiency Projects to reduce energy consumption and GHG emissions. Table 3-1 shows a summary energy saving measures and the greenhouse gas (GHG) emission reductions associated with these measures. These data indicate that implemented boiler replacement and boiler use optimization projects have yielded about 214,000 therms of annual natural gas savings and GHG emission reduction of 1,432 tons per year. In addition implemented lighting efficiency measures have yielded energy savings of 11,591 mWh / year. Planned energy and lighting efficiency projects are expected to yield an additional energy saving of 22,745 mWh / year and natural gas savings of 149,000 therms per year, with a GHG emission reduction of over 790 tons per year.

Major Accomplishments this FY

- Maintaining a steady rate of natural gas consumption and electric energy use despite increase in passengers.
- Achieving 89% energy reduction from 2005 levels by ITT department, by consolidating printers and replacing monitors and servers with more energy efficient solutions.

Table 3-1. Summary of Implemented and Planned Energy Efficiency Projects at SFO

Project Title	Number of Projects	Electrical Energy Savings (mWh/yr)	Natural Gas Savings (therms/yr)	GHG Emission Reduction Tons/year
Implemented Boiler Replacement Projects	3	-	214,000	1,432
Implemented Lighting Efficiency Projects	49	11,591	-	0
Planned Energy Efficiency Projects	6	22,745	149,000	790
Planned Lighting Efficiency Projects	4	-		NA

Investment Grade Audit Report

In November 2005, the San Francisco Public Utilities Commission (SFPUC) Power Enterprise approached SFO to participate in its *Clean Energy Clean Air Program* to reduce operating costs and improve efficiency at the airport. SFO has had an ongoing effort to reduce the airport's energy costs, and in support of the Mayor's Executive Directive on Energy Efficiency, is participating in the *Clean Energy Clean Air Program* to advance the Airport Commission's energy conservation goals. As a part of this program, the SFPUC engaged their energy consultants, HDR and Cogent Energy, to complete a Preliminary Energy Audit of the SFO Airport in December of 2006. The results of the preliminary audit were presented to SFO senior management in May 2007. The Airport Director then instructed SFO staff to work with the SFPUC to develop an implementation plan to move forward with further evaluation and implementation of energy efficiency improvements. As a next step, the SFPUC and Cogent Energy worked with SFO engineering and maintenance staff to complete an investment grade energy audit of the mechanical and Heating, Ventilating and Air Conditioning (HVAC) systems of the airport's main terminal complex.

The Investment Grade Audit (IGA) studied the mechanical and Heating, Ventilating and Air Conditioning (HVAC) systems of the airport's main terminal complex, focusing on the public areas of the domestic and international terminals, boarding areas, the central plant, the parking garages and the car rental center, altogether representing over 9 million square feet. SFO engineering is pursuing lighting and other energy efficiency opportunities that were identified in the Preliminary Energy Audit independent from the SFPUC. The objective of the IGA study was to assess the economic feasibility of the HVAC energy-efficiency measures identified in the Preliminary Energy Audit by providing more accurate energy savings and project cost information. The IGA report describes a package of recommended energy efficiency measures estimated to reduce SFO's energy costs by \$6.1 Million per year. The capital investment required to achieve these savings is estimated to cost \$34 Million providing a simple payback of 6.0 years.

In addition to reducing annual energy costs, implementation of energy efficiency measures will provide the opportunity to upgrade outdated equipment, enhance the airport environment and comfort, reduce operations and maintenance costs, reduce electric demand and provide more efficient operation of the airport's heating and cooling systems. As a further benefit, these measures will support SFO's sustainability program and will aid SFO in achieving the goal of carbon neutrality.

IGA's Recommended Energy Efficiency Measures

The current energy cost to operate SFO's HVAC systems, including the central plant, is estimated at \$10.5 million per year. The following recommended measures were extracted directly from the IGA Report:

- Upgrade and standardize the existing controls system.
- Optimize the new control systems at the International Terminal and Rental Car Center
- Convert constant volume dual duct air handlers in Terminal 3 to dual duct variable air volume (VAV).
- Replace two of the boilers in the central plant.
- Upgrade components of the cooling tower and install variable frequency drives on the cooling tower fans.
- Optimize the chilled water and heating hot water distribution systems and convert them to variable flow systems.
- Install a thermal energy storage system at the central plant to generate and store chilled water at night.

- Optimize the pre-conditioned air plant equipment.
- Reset zone temperature set-points.
- Replace two of the older chillers in the central plant with three new high efficiency units.

More details on these energy efficiency measures (EEMs), along with the results of the energy and economic analysis is provided in Appendix C.

Implemented and Planned IGA Energy Efficiency Measures

SFO's Design and Construction Division has integrated the recommended energy efficiency measures from the IGA Report into the Division's Capital and Maintenance Plan, based on priority, impact, resources and funding. The measures that pertain to Terminal 2 have already been completed during the last major renovation which was completed in April 2012. EEMs that require significant changes to the current infrastructure and controls at Terminal 1 and Terminal 3 have generally been deferred to the next major renovation. Table 3-2 shows the EEMs already implemented and currently planned in 2012-2014. The total GHG emissions reduction from the planned projects is estimated to be 790 tons.

Table 3-2. Summary of Implemented and Planned Energy Efficiency Measures

Group	Proposed Energy Efficiency Measure	Annual Electricity Savings mWh/yr	Annual Gas Savings Thousand Therms/yr	Avoided Gas GHG Emission ^b CO _{2e} tons	Status
1	EEM 7a: Boiler Replacement	-29	106.7	568	Implemented
1	EEM 36: Shut down boiler plant during summer months	10	55.5	295.30	Implemented
2	EEM 7b: Boiler Replacement	-29	106.7	568	Implemented
5	EEM 11: Chilled Water Distribution System - Convert Constant Volume Tertiary Pumps to Variable Flow to Lower Pump Speed during Part-Load Operation ¹	197	0.0	0.00	Planned for Design FY 16/17 (#8806)
5	EEM 14: Hot Water Distribution System - Convert Constant Volume Tertiary Pumps to Variable Flow; Balance the Speed of Parallel Pumps to Lower Pump Speed during Part-Load Operation ^a	197	-7	-37.3	Planned for design FY 16/17 (#8806)
6	EEM 35: Chilled Water Distribution System - Convert Constant Volume Secondary Pumps to Variable Flow to Lower Pump Speed during Part-Load Operation	1,341	0.0	0.00	Planned for design FY 14/15 (#9158)
6	EEM 8: Chilled Water Distribution System - Install Check Valve in Central Plant Bypass (Decoupler) Line to Improve Chilled Water Distribution Low Temperature Differential	161	0.0	0.00	Planned for design FY 14/15 (#9158)
6	EEM 41: Replace Chillers 1 and 2 with three 1,500 ton Chillers and Tower-Free Cooling	3,795	0.0	0.00	#8492 Currently in design, #8545 Planned for FY 14/15
7	EEM 26: Terminal 3 Main Terminal Building - Convert to Dual Duct VAV to Increase Efficiency	17,054	155.6	828.09	Planned for Design FY 15/16 (#9179)

^a EEM 14, originally proposed in the IGA, is for conversion of tertiary pumps at Terminals 1, 2 and 3. The planned project here is for Terminal 3 only. Conversion work in Terminal 2 has already been completed.

^b No GHG reduction is attributed to the savings in electrical energy consumption due to the certification of SFPUC as a Zero Carbon Footprint Utility by State Air Resources Board.

Lighting Efficiency Projects

SFO's Facility Division has implemented 51 energy efficiency enhancement projects since 1998. These projects have yielded electric energy savings of 11,591 mWh (Table 1 in Appendix D). Currently, Design and Construction and Technology is working on designing and implementing two lighting enhancement projects in Terminal 1, Domestic Garage and off-site buildings. This is an estimated \$7 million dollar lighting improvements, with an estimated energy use reduction impact of 35%. The completion of these projects by mid-2015 will comply with the requirements of San Francisco Lighting Efficiency Ordinance No. 103-10.

Table 3-3. Planned Lighting Efficiency Projects

Project	Estimated Completion Date
T1 - Baggage Claim Area (#8599)	June-14
T1 - Boarding Areas (#8599)	June-14
Domestic Garage - Core A/B, B & C (#8599)	June-14
Non Terminal Buildings (#9188)	May-15

Information Technology Transfer Section's Energy Saving Measures

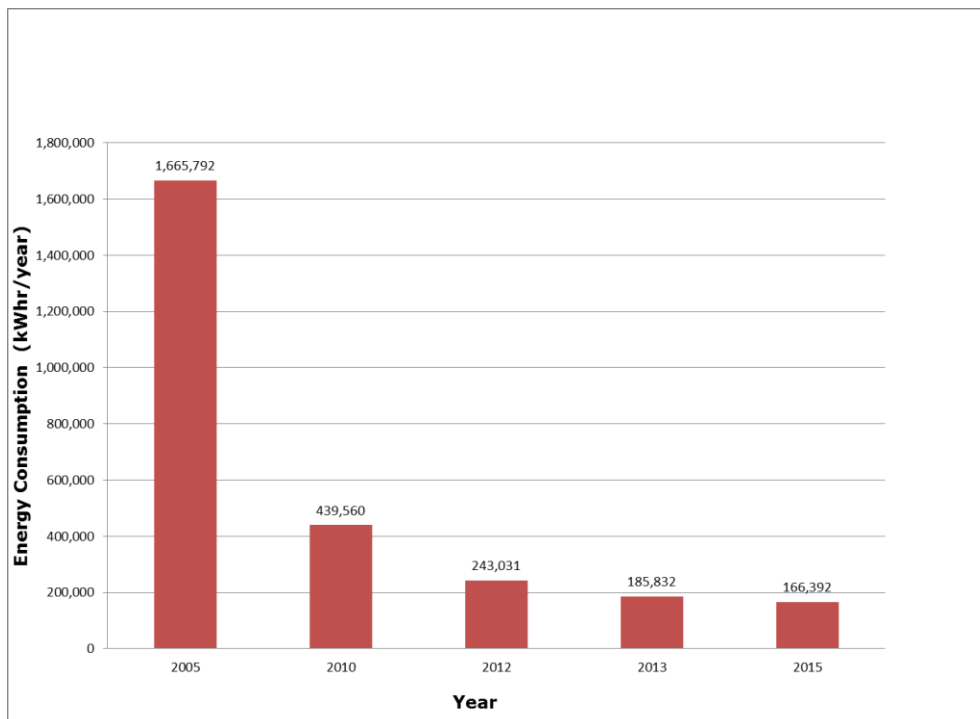
Since 2005, SFO ITT has embarked on a carbon footprint reduction program to reduce energy consumption by computers and monitors. The energy efficiency measures implemented in this program include:

- **Printer Consolidation for reduced energy use** - Starting in 2010, ITT executed a printer consolidation program to reduce the number of printers throughout the Airport Commission. SFO ITT continues to consolidate its printer inventory. In 2013, ninety-five printers were consolidated, reducing the printer count from 250 to 155. SFO ITT has reached its goal of a 1:8 ratio of users to printers. Further reduction in printer numbers can be achieved through the use of multi-function devices (MFDs) that combine printing, scanning and copying functions and by consolidating black and white printers into color printers.
- **Paper Reduction through Double-Sided Printing-** Double-sided printing setting has been programmed for all printers. This action has reduced SFO's paper consumption by about 50%

- **Energy Star computers and Laptops-** Since 2005, SFO has been gradually replacing older, outdated computers with Energy Star compliant laptops, computers, and monitors. These computers are more energy efficient and reduced SFO's electrical usage.
- **Automated Shutdown of Inactive computers at night-** ITT has also established a PC Power Management Program that turns off all inactive desktop computers at 7:00 PM each night.
- **Automated hibernation of inactive computers** – All desktop computers are automatically set to go in to hibernation/standby mode after 10 minutes of inactivity.
- **Server replacement for reduced energy use** – In the Data Centers at SFO, IBM Blade Servers, a rack-based system utilizing common power supplies and network interfaces, have been used for server consolidation and virtualization and replacing older server hardware, while improving CPU utilization and energy consumption. SFO ITT continues supporting the City of San Francisco and COIT's initiative, Virtualization First, to increase virtualization of our server farms. We have achieved 48% virtualization at the end of 2013. In the future, virtualization will be applied where applicable to reduce the number of physical servers for airport operations.
- **Replacement of LCDs with LEDs** - ITT is gradually converting desktop monitors with LED displays, which require 40% less energy on average than a typical LCD panel. In total, 900 LCDs will be replaced by LED displays during the next three years. SFO ITT replaced 188 CRT inventory with LCD/LED monitors in 2013.

The overall ITT energy efficiency program has yielded a reduction of 89% in energy consumption from 2005 consumption level. It is anticipated that ITT will reduce an additional 10% of the current energy consumption by 2015 (Figure 3-1).

Figure 3-1. Historical and Projected ITT Annual Energy Consumption at SFO



4. Fleet Vehicles

Summary

SFO's fleet contains a total of 598 vehicles; consisting of 139 CNG powered, 152 diesel powered, and 307 gasoline powered vehicles (including 40 hybrid gas / electric vehicles and one plug in hybrid). SFO also operates 23 Neighborhood Electric Vehicles. In FY 2013 SFO's fleet consumed 105,785 gallons of gasoline, 53,587 gallons of biodiesel fuel, and 81,397 gasoline gallons equivalent of compressed natural gas. The combined GHG emission of the fleet was 1,892 metric tons for this period, showing a 5.4% reduction from FY 2012 emission level.

SFO is planning to replace approximately 120 fleet vehicles in 2013 – 2017 period. This program is estimated to cost 5.6 million dollars and would reduce the fleet's carbon dioxide emission by 122 tons a year when it is fully implemented. In 2011-2013, SFO replaced 38 vehicles with more fuel efficient models, yielding a GHG emission reduction of 53 tons per year.

A summary of major fleet emission reductions measures in FY 2013 is shown below:

- Reducing fuel consumption by 5.4% from FY 2012 levels.
- Replacing 38 of the fleet's least efficient vehicles with new fuel efficient models.
- Removing 10 vehicles from the fleet to comply with the City's HACTO Ordinance.

SFO Fleet Composition

SFO's fleet contains a total of 598 vehicles – of which 415 vehicles are light duty vehicles, including passenger cars, light duty trucks and motorcycles. In addition SFO operates 30 heavy duty trucks, 15 fire trucks, 4 buses; 81 off road construction equipment, 27 portable light stands, 10 lifts, 6 boats, and 10 trailer mounted heavy duty portable generators. SFO also operates 28 Neighborhood Electric Vehicles. Data for fuel consumption and GHG emissions for the fleet vehicles by fuel type are shown in Section 2. The fleet vehicles consumed a total of 240,770 gallons of various fossil fuels in FY 2013 and generated 1,892 tons of GHG emissions.

Table 4-1. Summary of SFO Fleet Vehicles for FY 2012/2013

Fuel Type	Number of Vehicles
Gasoline	307
Biodiesel	152
CNG	139
Total	598

Fleet Vehicles Reduction and Replacement Program

In 2011, SFO initiated the process of replacing an estimated 234 of the fleet vehicles with the highest odometer readings. The fleet vehicles replacement program is intended to replace existing gasoline and diesel powered vehicles with more fuel efficient models, such as hybrid, CNG powered or electric powered vehicles. Table 4-2 summarizes the planned fleet vehicle replacement schedule and estimated GHG emission reductions associated with the replacement program. Based on the data gathered from vehicles replaced in 2011-2012, it is estimated that each vehicle replaced in the future will yield a GHG reduction of 20%.

Table 4-2. SFO Fleet Vehicles Replacement Schedule and GHG Emission Reduction Impacts

Fiscal Year	Number of Vehicles to be Replaced	Estimated Annual Mileage^a	Estimated Future GHG Emission (Tons)	Current GHG Emission^b (Tons)	GHG Emission Reduction^c (Tons)
2013-15	60	461,622	302	378	76
2015-17	60	333,142	186	232	46
Total	120	794,764	488	610	122

^a Based on the average annual mileage driven in FY 2012/2013.

^b Based on actual GHG emissions in FY 2012/2013.

^c Based on an estimated 20% reduction in GHG emissions due to replacement of older vehicles with fuel efficient models (gasoline, CNG, hybrid etc)

Status of Fleet Replacement

In 2011-2012, SFO replaced 38 vehicles. Table 4-3 below shows actual mileage and GHG emission levels of the vehicles replaced during 2011-2013. The data shows that although the mileage travelled by these vehicles increased by 5.5% from 2011 to 2012, the annual GHG emissions decreased by over 20%. This is attributed to older vehicles being replaced by newer and more fuel efficient models.

Table 4-3. 2011-2013 Fleet Vehicle Replacement

Fiscal Year	Number of Vehicles Replaced	Annual Mileage Travelled		Annual GHG Emission (Tons)		Estimated Annual GHG Emission Reduction (Tons)
		2011	2012	2011	2012	
2011-13	38	275,123	290,176	204	257	53

Healthy Air and Clean Transportation Ordinance (HACTO)

All City departments are required by Healthy Air and Clean Transportation Ordinance (HACTO) to reduce the size of the vehicle fleet up to 8,000 lbs gross weight by 5% per year over a four year period starting in 2012. Currently 262 vehicles at SFO fall under HACTO provisions. SFO is diligently working to reduce the number of vehicles in our fleet in order to be in compliance with the HACTO. To date, SFO has reduced 10 vehicles from our fleet. In addition, SFO recently started a carpool program which includes 26 passenger cars that are stationed at four locations throughout airport. These vehicles are available to all employees for work related use by reserving a car over the intranet. We are currently collecting vehicle use data from this program to evaluate the feasibility of removing additional vehicles from service.

Other Implemented or Planned Emission Reduction / Offset Measures for Fleet Vehicles

The following additional emission reduction / offset measures are planned for SFO's fleet vehicles:

- All diesel powered vehicles that are fuelled at the Airport Auto Shop's fuel island have been converted to Bio-Diesel (B20) fuel
- 50% of "on-road diesel" vehicles have been equipped with a Diesel Particulate Filter (DPF) to reduce 95% of exhaust particulate emissions.
- 40% of "off- road diesel" construction equipment have been equipped with a DPF to reduce 95% of exhaust particulate emissions.
- Any vehicle requiring air-conditioning repair and which uses the R-12 refrigerant, an ozone depleting gas, will be retro-fitted to use the R-134A, an ozone-safe refrigerant gas with a lower global warming potential.
- Neighborhood Electric Vehicles will be purchased for use at SFO whenever possible.
- Administrative and educational measures will be taken to inform all SFO staff to avoid running the fleet vehicle engines in the idle mode, to the maximum extent possible. Unnecessary idling of the vehicle engines is wasteful of fuel and would result in poor mileage efficiency for all vehicles.

SFO is continuing to upgrade the fleet vehicles and replacing the aging vehicles with fuel efficient cars including hybrids and electric vehicles. The budget for fleet replacement program has been included in the

Capital Improvement Program and is expected to be completed over the next four years. The following is a summary of planned vehicle replacement and other related energy efficiency measures:

- Continue to purchase alternative fuel vehicles. (Additional cost for CNG conversion to base vehicle price is \$18,000 for a pickup truck)
- Purchase more NEV (neighborhood electric vehicles)
- Purchase 100% electric powered vehicles. A new breed of electric vehicles is expected to be available in the near future.
- Install DPF's (diesel particulate filter) with N₂O (nitrous oxide) reduction. (Cost \$18,00.00 to \$32,000.00)
- Install DPF's on non-emergency generators to be used in construction.
- Replace towable diesel powered light plants with hydrogen power. Auto Shop is currently working with Sandia Laboratories on this project and hopes to have a prototype in service at SFO late this year when the hydrogen fuel station is expected to open at the south end of the airport.
- Purchase hybrid service trucks. Example: Bucket truck in which the diesel engine can be shut off and the Bucket (or accessories) can be used while powered by on board batteries.
- Reduce vehicle idle time.
- When traffic lanes need to be closed for work, use more solar powered traffic signs. Use battery operated illuminated traffic cones.
- Determine if an employee van pool would work from outlying areas. For example employee commuting from South Bay, East Bay, or North Bay could potentially benefit from a car pool van.

5. Zero Waste Plan

Summary

In FY 2013 SFO collected a total of 9,509 tons of solid waste at the terminals and at other facilities. A total of 7,437 tons (78.2%) of this waste was recycled by the Airport's solid waste contractor. On-site source separation contributed 1,652 tons (17%) of the recycled waste. In addition 3,621 tons or 38% of the generated solid waste was hauled directly to a composting facility. Recyclable materials from the remainder of the waste are separated at off-site facilities of South San Francisco Scavenger Company (SSFSC). The solid waste reduction and recycling programs offset the GHG emissions at SFO by 3,061 tons in FY 2013. SFO is continuing to enhance solid waste recycling operations and is aiming for the goal of 80% recycling by 2017 and zero waste by 2020.

Major construction activity occurred during FY 2013, including the construction of the new Boarding Area E, the Air Traffic Control Tower, West Filed Cargo Hangar, and Integrated Facilities. These projects are achieving construction waste diversion rates of over 95% to garner LEED points in Materials and Resource and Innovation category. It is estimated that the diversion of these materials mitigated 4,744 tons of GHG emissions during this period.

Major Accomplishments this FY included:

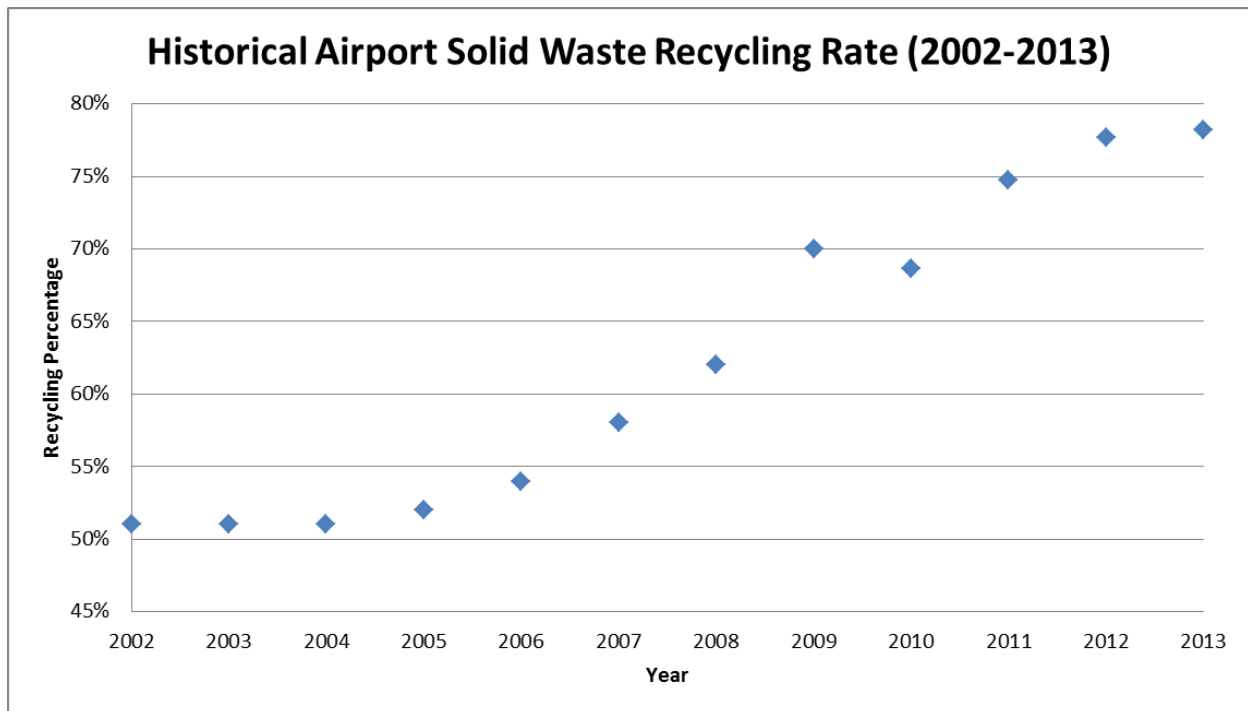
- Achieving an overall solid waste recycling rate of 78.2%
- Achieving construction waste recycling of over 99%
- Providing compostable waste cans in all Commission employee lunchrooms

Background

Solid waste is generated at Airport operated facilities, aboard incoming aircraft, and by various Airport tenants. SFO provides solid waste collection and disposal services in the public areas of all terminals and provides various waste compactors for use by concessionaires and most airlines. Separate containers are provided for passengers, tenants and SFO staff to deposit recyclable materials, such as cardboard, paper, glass, aluminum, plastic bottles and compostable materials. These materials are collected and recycled by SFO's solid waste contractor, South San Francisco Scavenger Company (SSFSC). All mixed solid waste materials collected from the Airport are also sorted at the offsite facilities of SSFSC where additional recyclable materials are diverted from the waste stream.

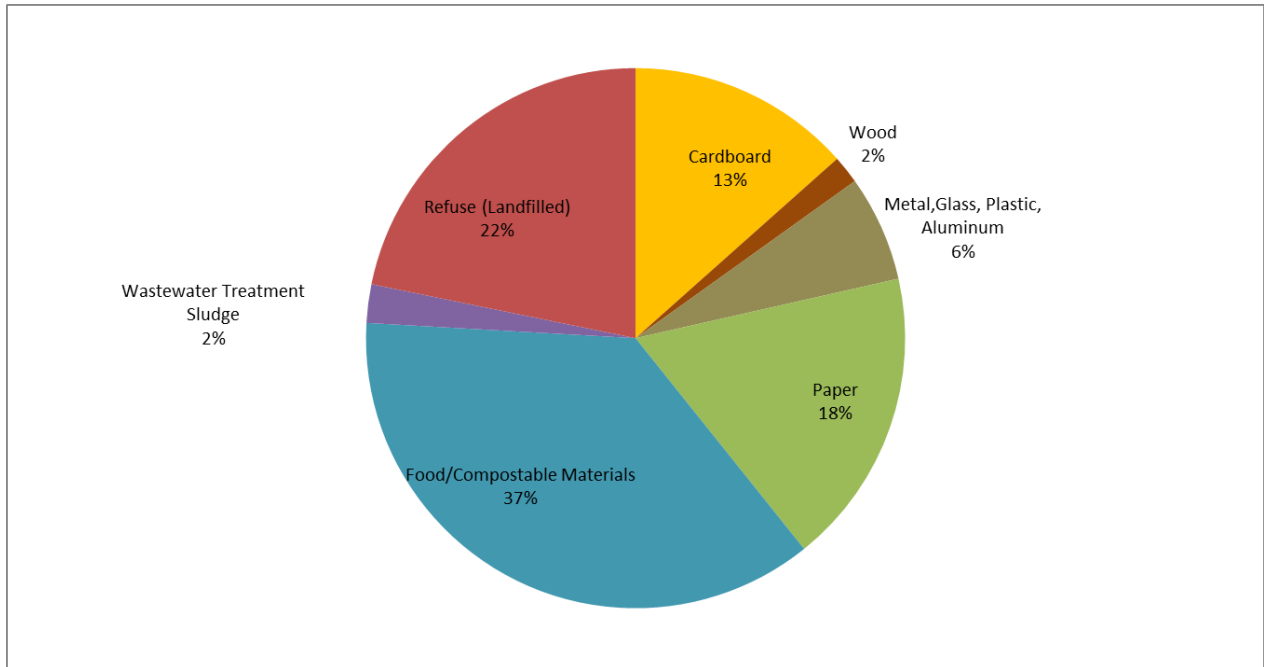
Since 2008, SFO has undertaken a comprehensive waste reduction program including resource conservation, source separation, and composting, which has resulted in a gradual increase in the Airport's recycling rate. Figure 5-1 shows an increase in the Airport's recycling rate from 54% in 2006 to 78.2% in 2013.

Figure 5-1. Historical Solid Waste Recycling Rate at SFO



Waste Profile

In FY 2013 about 9,509 tons of general solid waste was generated at SFO, showing a 7.1% decrease from 10,239 tons generated last year. The solid waste profile, shown in Figure 5-2, depicts the composition of the waste materials collected at SFO. Detailed information on the waste composition is provided in Table 5-1. These data indicate a fairly consistent overall recycling rate was achieved throughout FY 2013. The quarterly recycling rates for the Airport's source separation operations ranged from 16.6 to 18.3% of the total waste, with an annual average rate of 17%. The SSFSC's quarterly offsite recycling rates varied from 59.9% to 62.1% with an average annual recycling rate of about 61%. The estimated recycled tonnages for the sorting operations performed by SSFSC at their offsite facilities are estimated based on SSFSC's service area characteristics and do not necessarily reflect the composition of the waste materials hauled off from the Airport.

Figure 5-2. FY 2013 SFO Solid Waste Composition ^a

a. This breakdown does not include construction and demolition waste.

Table 5-1. FY 2013 Solid Waste Generation and Recycling Rates at SFO by Waste Type

Solid Waste Type	Quantity, tons				Total Quantity Recycled, tons
	1st quarter	2nd Quarter	3rd Quarter	4th Quarter	
Cardboard	331	321	291	335	1,278
Wood	24	38	53	45	160
Mixed Recyclables (aluminum, glass, plastics)	79	71	53	72	275
Mixed Paper	26	21	29	20	96
Composted Waste	920	913	777	876	3,485
Newspaper	124	121	110	130	484
Magazines	119	117	106	125	467
Waste Paper	165	161	146	172	644
Glass	48	47	43	50	189
Aluminum	19	19	20	20	75
Plastics	6	6	5	6	22
Scrap Metal	10	10	12	10	42
Clippings	0	0	0	0	0
Industrial Treatment Sludge	21	60	0	2	83
Sanitary Treatment Sludge	34	34	34	34	136
Total Recycled	1,926	1,941	1,674	1,897	7,437
Mixed Waste (landfilled)	576	540	444	512	2,072
Grand Total	2,502	2,481	2,118	2,409	9,509

Table 5-2. Quarterly Solid Waste Generation and Recycling Rates at SFO in FY 2013 (Tons)

Period	Solid Waste Generation, Tons			Offsite Recycling Rate ^a	Onsite Source Separation Rate ^a	Combined Recycling Rate
	Mixed	Source Separated	Total Combined			
1st Quarter	2,086	417	2,502	1,510	417	1,926
				60.3%	16.6%	77.0%
2nd Quarter	2,026	455	2,481	1,486	455	1,941
				59.9%	18.3%	78.2%
3rd Quarter	1,737	381	2,118	1,293	381	1,674
				61.1%	18.0%	79.0%
4th Quarter	2,009	400	2,409	1,497	400	1,897
				62.1%	16.6%	78.7%
Total	7,857	1,652	9,509	5,786	1,652	7,437
				61%	17%	78.2%

^a Based on the combined tonnage of general solid waste generated at the Airport

Construction Waste

Two major construction projects – The Air Traffic Control Tower and Integrated Facilities and the Boarding Area E Improvement Project – generated 30,820 tons of construction and demolition waste in FY 2013. Over 99% of the construction waste was diverted from the landfill and recycled. Recycled materials included concrete, asphalt, metals, wood, and assorted construction and demolition waste. It is estimated that the diversion of these materials mitigates 4,744 tons of GHG emissions.

Table 5-3 – Summary of FY 2013 Construction Waste Recycling

Waste Type (tons)	Construction Project	
	Boarding Area E	Air Traffic Control Tower
Total Waste Generated	3,667	27,153
Diverted Waste	3,629	27,037
Concrete	2,320	25,650
Asphalt	1,020	-
Metals	43	729
Wood	39	-
C&D	207	658
Landfilled Waste	38	116

Waste Characterization

In August 2008 SFO performed a waste characterization study in which the contents of all 19 solid waste compactors deployed at various locations around the terminals, and at other Airport facilities, were individually examined at SSFSC recycling facilities during a one week period. In this investigation the net weight of the waste material in each compactor was obtained by weighing the trucks before and after dumping the compactor contents. The waste was then spread evenly on the ground and the volume and weight of the various components of the waste were estimated in up to three representative samples that were isolated from each compactor load. The results of this analysis are summarized in Table 5-3. These results indicate that food waste and other compostable materials comprise 55% of the waste material transported to SSFSC's recycling facilities from SFO. The non-recyclable refuse constitutes about 9.4% of the waste and the balance of 35.6% consists of recyclable materials. The contents of several compactors, however, were composed of up to 99% biodegradable materials. Based on the results of this study SSFSC increased the amount of SFO waste sent to compost from about 30 tons per quarter to over 800 tons per quarter starting in the fourth quarter of 2008 and the amount of waste sent to a composting facility has been increasing every year since.

Each year since 2012, SFO has conducted an overall audit to monitor the constituents of the waste deposited in the various compactors. The results of the audits show that the compactor loads contain high levels of recoverable materials. Using this information, SSFSC continues to transport compactors with high compostable content directly to the composting facility. SFO also uses the data from the waste audits to identify opportunities to improve the airport's solid management practices.

Table 5-3. Composition of Representative Samples of Solid Waste Hauled off from SFO^a

Waste Component	Weight (lbs)	Percentage
Paper	41,060	25
Plastic	3,590	2.2
Glass	11,800	7.2
Metal	2,380	1.5
Food Wastes	41,420	25.3
Other Compostable Waste Materials	47,560	29
Refuse (Non-recyclable)	15,930	10
Total	163,740	100

^a Based on visual examination of the contents of all 19 compactors deployed at SFO and transported from SFO to South San Francisco Scavenger Company's recycling facilities in a 2008 study

Management Programs

SFO has undertaken a comprehensive waste reduction program including resource conservation, source separation, and composting. The objective of these reduction measures is to achieve a recycling rate of 80% by 2017 and 100% by 2020.

Enhanced On-Site Source Separation

In FY 2013 approximately 17% of the solid waste generated at the Airport was separated on site and transported directly to the recycling facilities.

SFO Actions

To support enhanced source separation, the Airport has deployed solid waste containers, in sets of three, for depositing paper, bottles and cans, and general trash throughout the terminal spaces. Additionally, SFO has provided separate compactors and storage bins for mixed paper, cardboard, plastic bottles and cans, food waste, trash and grease in solid waste loading areas that are fully accessible by Airport employees and tenants.

Beginning in 2011, SFO started providing drain stations at the security checkpoints for emptying water bottles and depositing other bottles that could not be brought into the secure areas. These facilities have aided in reducing the disposal of partially full water bottles into waste receptacles in the Terminals. Additionally, hydration stations are provided at key locations in the terminal complex with the goal of decreasing the waste generated from single-use plastic bottles that would otherwise be discarded at the security screening stations.

In 2013, SFO provided containers for depositing compostable materials in all Commission Employees' lunchrooms to reduce the amount of landfilled waste. All employee lunchrooms are now equipped with two large 23 gallon bins- a blue bin for depositing recyclables and a green bin for depositing compostable materials. Also all large trash cans have been replaced with a 7 gallon black bin. Signage has been placed in all employee lunchrooms to inform employees on proper disposal practices and a promotional video was developed and placed on the company intranet to raise awareness about solid waste recycling objectives and proper practices.

Airline Actions

SFO has engaged the various airline staffs to encourage source separation of solid waste generated aboard the incoming aircrafts. The response of most airlines has been positive. Further consultation with airlines will be carried out to improve the rate of onboard source separation.

Improved Off-Site Separation

In FY 2013, SFO's contractor achieved a recycling rate of 61% for mixed solid waste transported off the Airport. This value represents the average rate of recycling for the combined operation of SSFSC including the offsite composting operations.

Composting

Although the composting rate is captured in the off-site recycling rate figures, it requires the support of the Airport staff and tenants. The following programs have been implemented by the Airport to promote the source separation of compostable materials.

- **Airport-Wide** In 2007, SFO initiated a program for separate collection of food waste from food vendors at the terminals. The food waste along with landscaping trimmings and wastewater treatment sludge is transported to offsite composting facilities.
- **Terminal 2** In 2011, SFO implemented an enhanced composting program for the waste generated in the Terminal 2 food court. SFO requires food vendors in Terminal 2 to supply biodegradable tableware, plates and containers, allowing the composting of 100% of the generated waste. SFO plans to phase in this program at other terminals in the future.
- **Tenant Education and Outreach** In 2012, SFO initiated a pilot program to educate food service tenants on recycling and composting in their specific areas. The outreach effort is intended to help increase the source separation of recyclable and compostable material and reduce the quantity of trash generated. Tenant spaces were also evaluated as part of the program to ensure easy access to recycling and composting bins. It is anticipated that this program will continue in 2014.

Material Use Reduction

The goal of the resource conservation program is to educate, encourage, and persuade the Airport staff, tenants, and the general public to generate less waste in the course of their daily activities at or travel through the Airport. This program includes the following elements:

- **Paper Use Reduction.** SFO staff has developed a paper use reduction program, pursuant to the Mayor's Executive Directive, by assigning a paper allocation to each Division at 80% of the previous year's consumption and requiring the submittal of a special request if the assigned allocation is prematurely exhausted.
- **Double Sided Printing and Copying.** All SFO printers and copiers have been programmed to produce double sided prints or copies. Signs have also been posted at all copying machines exhorting the users to save paper and avoid un-needed copying.
- **Electronic Document Transfer.** SFO is encouraging all staff to transmit various documents electronically.
- **Paper Towel Use Reduction.** SFO has experimented with the use of electric hand dryers in the Airport terminal restrooms. The results of the pilot program have been promising and plans are being made for widespread use of these hand dryers throughout the Airport. The use of electricity by the dryers is mitigated by the benefits derived from saving paper towels.
- **Plastic Bag Ban.** To comply with the City of San Mateo's Reusable Bag Ordinance, SFO retailers are prohibited from handing out single-use plastic bags to their customers. Retailers may provide customers with recyclable paper bags for a fee. This ordinance would help eliminate plastic bag waste in the trash compactors.

Construction and Demolition Waste Recycling

The City's Green Building Ordinance calls for recycling a minimum of 75% of non-hazardous construction and demolition waste generated at City construction projects. SFO also maintains a goal to recycle at least 75% of the waste generated at Airport's construction and demolition projects. Additionally, SFO requires all major renovations and construction projects to be LEED® Gold Certified by USGBC. USGBC's LEED® Certification process encourages contractors to recycle and/or salvage at least 50% of non-hazardous construction and demolition debris and awards additional points for achieving a recycling rate of 75% or

more. SFO consistently surpasses this goal, achieving construction and demolition waste recycling rates of over 99% this year on two major renovation projects.

Potential Solid Waste Management Measures

SFO intends to increase the rate of solid waste recycling from the current level of about 78.2% to the target level of 80% by 2015 and 85% by 2017. The potential solid waste management measures that are under consideration at SFO are summarized below.

1. **Training of Custodial Staff** All custodial staff and other employees responsible for collecting and transporting waste materials and recyclables to the appropriate bins should receive additional training on what happens to the materials once it leaves the Airport, and how to properly manage loads with high compostable content, garbage and the recyclable materials.
2. **Require the use of Compostable Tableware in all Terminals** Plastic serve-ware from food service vendors is a significant component of the wastes deposited in the compactors. Replacing disposable plastic serve-ware with compostable serve-ware would greatly reduce the amount of waste that has to be disposed of in a landfill. In addition to the food serve-ware provided to customers, the vendors should be required to use reusable or compostable service trays, food containers, cups, plates, etc. to enable composting of 100% of the waste generated by such vendors.
3. **Require Use of Clear Liner Bags:** Black plastic liner bags are still in use in some sections of the Airport. Black plastic bags filled with recyclable materials are likely to be dumped into the garbage compactors since custodial staff would not be able to visually identify the contents of these bags. Eliminating the use of black plastic bags and replacing them with clear bags will reduce the amount of source separated recyclables that would be sent to the offsite sorting facilities.
4. **Recycle materials taken off aircraft**
Some flight crews are collecting recyclables in separate bags on board the airplanes. The sorted materials, however, are then discarded with the trash by custodial contractors. Airlines should be required to train their ground crews to keep the sorted recyclables separate from the remaining trash.

Airlines should also be encouraged to discontinue or limit the offering of disposable travel kits and other giveaways (such as eye shades, sleeping socks and toothbrushes) that end up being discarded at the end of the flight without having been used.
5. **Collect materials abandoned at Security Checkpoints:** Textile and leather goods constitute up to 10% of the contents of SFO compactors by weight. Most of these items appeared to be clothing, baggage, and other accessories that may have been discarded by passengers to avoid paying excess luggage charges or for other reasons. Separate collection of these items for donation to a non-profit thrift organization could reduce the quantity of waste produced at the Airport and prevent the waste of a resource.
6. **Donate Surplus Food Items:** Surplus food items are currently deposited by food vendors into the compactors. Airport could encourage the vendors to donate such food items to a food pantry.

HDPE cooking oil containers inside cardboard boxes are also being discarded in the compactors. The feasibility of recycling these containers without removing them from the boxes should be explored.

6. Employee Commute Program

Summary

Since 1993 SFO has implemented a Transit First Policy, intended to promote the use of public transport by SFO employees and by passengers; and by the employees of airlines, airline support services, and concessionaires. Under this program biennial surveys of employees are carried out to assess the modes of transit used by SFO employees and develop appropriate measures to encourage the use of public transit by a greater number of employees. The GHG emissions from all modes of commute, by SFO's 1,842 employees (including police and fire), were estimated to be about 2,661 tons in FY 2013. Several incentive programs are currently offered to SFO employees to encourage the use of public transit, including a BART fare discount for employees, development of new public bus routes and encouraging bicycle use for on-site work related travel.

Major Accomplishments this FY consisted of:

- Completion of survey to understand employees modes of travel to and from work in further detail
- Elimination of BART Airport Surcharge for Employees, which took in effect on July 1, 2013, is expected to increase employee travel on BART by an estimated 40% Airport-wide and potentially reduce GHG emissions by 109 tons per year.

Employee Survey Results

In 2013, SFO conducted a survey of employee modes of travel to and from work. A total of 904 employees responded to this survey. The results of the survey are summarized below:

- 80% of employees drive alone to work
- 8.42% use carpool or vanpool
- 10.22 % take public transit
- 0.75% use Airport Shuttle
- 0.6% use other modes
- The average one-way commute time is 35 minutes
- Travel time and convenience are the most important factors in determining the commute mode.

GHG Emissions for Employee Commute in FY 2013

Estimates for GHG emissions from various modes of commute by SFO employees were developed on the basis of information obtained from the June 2013 employee commute survey. The GHG emission impact of the commute travel by SFO employees is summarized in Table 6-1 indicating a regional GHG emission contribution of about 2,790 tons in FY 2013 by SFO employees commuting to work.

Table 6-1. FY 2013 Annual GHG Emissions from Commute Travel by SFO Employees

Commute Mode	Percent of Employees	Miles Travelled	Total
Drive Alone ^b	80.00	6,635,621	2,427
Carpool /Vanpool ^{b,c & d}	8.42	232,800	85
Bart/Caltrain ^e	10.22	847,701	37
Bicycle	0.00	0	0
Airport Shuttle ^f	0.75	62,209	140
Other	0.60	-	-
Total	100	7,790,772	2,690
Emission Reduction for Compressed Work Week Program^g			
	0.07	60,340	29
Net GHG Emission		7,851,112	2,719

^a Percentage of employees is estimated based on the results from the 2013 SFO Employee Commute survey which included 904 survey respondents

^b Based on a total employee count of 1842 an average roundtrip commute distance of 19 miles, and 237 work days per year

^c Based on a fuel efficiency of 25 miles per gallon, and a GHG emission of 19.42 lbs per gallon of gasoline

^d Based on an assumed number of 3 passengers per car pool

^e Based on the BART emission factor equivalent to 12 percent of the personal auto emission rate

^f Based on an average fuel efficiency of 4.5 miles per gallon of diesel fuel and a GHG emission of 22.37 lbs per gallon of diesel fuel

^g Based on the participation of 36 employees in the 9/80 Compressed Work Week Program (CWWP) and 85 employees in the 4/40 CWWP in FY 2013 and using an Airport-wide average GHG emission reduction of 11.9 lbs per employee per avoided commute day

Transit First Program

The goal of SFO's Transit First Policy is to promote public and private high occupancy vehicle (HOV) access to the Airport. Implementation of this policy increases the use of shared-ride modes over driving alone, thereby reducing emissions.

The Transit First Policy includes the following Airport goals and objectives:

- Reduce traffic congestion by encouraging public transportation;

Employee Commute Program

- Develop regional transit services, including rail and ferry;
- Provide preferential parking for employee vanpools; and
- Minimize on-Airport congestion and delays by increasing the efficiency of Airport roadways and ground transportation loading zones.

New Transit First Measures

1. Elimination of BART Airport Surcharge for Employees

Beginning July 2013, the Airport initiated a program to eliminate BART's residual Airport employee surcharge of \$1.50 per trip, in order to increase employee ridership. Airport Commission employees and non-airline tenant employees must obtain a BART Discount Card to qualify for surcharge-free travel at the SFO station. Employee ridership is currently up by over 70% compared to the same month last year, before the surcharge was eliminated – greatly exceeding our 40% projection.

Existing Transit First Measures

Measures taken by SFO for reducing the GHG emissions from employee commute activities are described below:

1. City Transit Incentive Program and Tenant Commuter Benefit Regulation

Airport Commission employees can purchase up to \$130 per month in transit or vanpool value on a pre-tax basis through the City's payroll deduction program. Most tenants are required to offer a similar program, or can directly pay their employees' transit or vanpool expenses up to the value of a Municipal Railway Fast Pass with BART access (currently \$76 per month).

2. Airline Employee BART Discount

Airline employees currently have a separate discount program that provides a 25% reduction in fare to and from BART's SFO station.

3. San Mateo County Transit District (SamTrans) Public Bus Service

SamTrans serves SFO with three principal bus routes, plus two limited service routes. On January 26, 2014, largely at Airport initiative, Samtrans added local Route 140 between the SFO Rental Car Center and San Bruno, South San Francisco and Pacifica. SamTrans also provides a direct link between the terminals, North McDonnell Road, and the San Bruno BART and Caltrain stations. Partially Airport-funded, an overnight Route 397 is SFO's only transit service running between 1:00 and 5:00 a.m., which connects downtown San Francisco with Palo Alto, and Route 292 providing services between San Francisco and San Mateo during other hours.

4. Emergency Ride Home Program

The City's Emergency Ride Home Program is administered by the Department of the Environment. In any emergency, this program provides City employees with four free rides home per year, if they regularly carpool, vanpool, bicycle, walk, or use public transit in their commute. ERH eases the worry of being stranded at the office without a car.

5. Direct Terminal Access by Ground Transportation Vehicles

At SFO, passengers using shared-ride and professionally-operated ground transportation services are dropped off and picked up at each terminal, rather than a distant ground transportation center. Only BART passengers may require a transfer via the Airport's frequent, electric-powered Airtrain system. Direct terminal access is a major reason why 45% of SFO passengers use shared-ride modes for ground access and egress.

6. Curbside Management Programs

Launched in January 2000, this innovative program improved customer service and traffic flow through the taxi, limousine, and shared-ride van loading zones from early morning until after midnight. As a result, the use of shared-ride services has increased, reducing Airport and freeway congestion. Furthermore, these services are now provided mainly with hybrid-electric and compressed natural gas (CNG) vehicles.

7. Airport Information Booths

For the convenience of air passengers and Airport employees, all Airport information booths provide ground transportation information. Selected SFO booths sell public transit tickets and passes, redeem vouchers for BART transportation, and provide a computer terminal for employees to load their BART SFO Discount Cards and Clipper Cards.

8. New Employee Briefings

New Airport employees receive commute alternatives information from Human Resources when they begin employment at SFO, and then attend a new employee orientation on commute options.

9. Traffic Control Measures

An ongoing priority of Airport staff is to relieve traffic congestion and expedite ground transportation on the Airport roadways. Currently, lanes 1 and 2 of the arrivals level roadway at Terminal 1 are dedicated to taxis, Airporter and SamTrans buses at most hours, so that these services don't have to compete with private motorists. Construction projects in and around the Airport roadways are carefully coordinated to reduce traffic congestion. Project managers, traffic engineers, Landside staff and Airport Duty Managers continue to work together to minimize the effects of roadway construction projects.

10. 511.org Website and Phone Support

Besides providing traffic, transit and ridesharing information for the Bay Area, the Metropolitan Transportation Commission's 511 service also provides ground transportation information for SFO. Airport staff supports this valuable communications tool by providing 511 staff with information on major changes to Airport ground transportation and construction projects that have potential for traffic delay.

11. Compressed Work Week Program (CWWP)

Certain SFO employees may choose to work a compressed schedule of 80 hours over 9 days in each two-week period (9/80 option) or 40 hours in four days per week (4/40 option). In 2013, 36 SFO employees participated in the 9/80 CWWP and 85 employees in the 4/40 CWWP. A unit GHG emission factor of 11.9 lbs per employee per commute day was developed on the basis of the estimated FY 2013 GHG emission of 2,690 tons for commute by 1,842 employees, in the absence of a CWWP. The total GHG emission reduction for the CWWP at SFO was, therefore, estimated at 29 tons per year in FY 2013.

New Transit First Initiatives

Although established Transit First programs have served the Airport and surrounding communities very well since the Policy was adopted in 1996, several new initiatives have been implemented or are being developed, as follows:

2. Public Information

SFO effectively manages its own website and encourages both the internal and external development of mobile applications. Effective public information about Airport ground transportation involves well-designed websites and mobile applications. These will be implemented for passenger use as soon as possible.

3. Pre-Loaded Clipper Card

SFO is working with the San Francisco Municipal Transportation Agency (MTA) on the development of a visitor Clipper Card, which would be pre-loaded with sufficient value to allow its use for round-trip BART transportation between the Airport and San Francisco, plus unlimited Muni transportation within the City for several days. It would address a long-standing problem where, unlike other cities, San Francisco visitor transit passes do not cover Airport transportation costs.

4. Ferry Connection

San Francisco Bay Ferry - initiated a new peak-period ferry service between downtown Oakland, Alameda, and South San Francisco in June 2012. One goal of the service is to provide a commute alternative in case of disruptions to other modes. During two multi-day BART strikes in 2013, the Airport provided a bus link between the ferry and the Airport terminals. During non-emergency periods, the Airport encourages bicycle access to the ferry along the San Francisco Bay Trail.

5. New Public Transit Routes

In January 2014, responding to Airport outreach, Samtrans added its first-ever community bus route to SFO. Route 140 links the Airport with San Bruno, South San Francisco and Pacifica. It is targeted primarily to Airport employees that live in the areas served, but also provides connections with BART and Caltrain at San Bruno. Also in January 2014, Samtrans launched Route 398, modifying an earlier route to feed the San Bruno rail stations. Twenty-four-hour Samtrans service continues to link the Airport with southeast and downtown San Francisco on the north, and San Mateo on the south. Overnight service as far south as Palo Alto is funded in part by SFO.

6. Carpool and Vanpool Matching

The Airport is examining the potential for an ongoing carpool and vanpool matching program encompassing both City and tenant employees. This would provide an alternative to the regional 511 program for employees that may not wish to advertise regionally. It would also allow for local marketing campaigns and promotions.

7. Bicycling

SFO is the first airport in the world to deploy a shared-ride employee bicycle system, termed Flycycle. Forty bikes were supplied by SOBI under a pilot project, and are maintained by the

Airport. The Airport has marked bicycle lanes on major roadways, including McDonnell Road which is a key link between San Francisco and the South Bay. Personal bicycles from all passengers may be stored for up to 14 days at three terminal-area locations including Valet Parking, and may be assembled following air trips at two purpose-built stations.

7. Other Measures

Summary

This section covers the other sustainability activities undertaken at SFO as follows:

- SFO has a policy of securing LEED Gold certification for all new building construction and major renovation projects. In 2011, SFO obtained LEED Gold certification for Terminal 2 Renovation and for Building 575 remodeling project. SFO is currently seeking LEED Gold certification for the following projects:
 - Air Traffic Control Tower and Integrated Facility
 - Boarding Area E Renovation
 - Terminal 3 Security Checkpoint
 - Airfield Operations Building
 - West Field Cargo Building
- New PC Air and 400 Hz power supply systems have been installed at the International Terminal A and G gates, 5 gates in Boarding Area C, 6 gates in Boarding Area F, and all gates at Terminal 2. Installation of PC Air and 400 Hz power supply facilities eliminates most of the need for the use of Auxiliary Power Units (APU) on board the aircraft parked at the gates and in FY 2013 saved about over 5.5 million gallons of jet fuel for airlines and mitigated the GHG emissions by about 53,700 tons per year. During Boarding Area E renovation, completed in January 2014, PC Air and 400 Hz power units were installed at all gates.
- In 2009 SFO initiated a three-year Pilot Green Car Rental Incentive Program in conjunction with the rental car companies operating at the Airport, which provided financial incentives to rental car companies for providing fuel efficient vehicles and a \$15 discount to customers who rented a Green Car. This customer incentive ended in December 2011 and the rental agency incentive remained in effect until December 2012. In FY 2013, this program generated a net GHG emission mitigation of 4,562 tons.
- Water conservation has been practiced by SFO over many years. All Terminal complex toilets, urinals, and bathroom sinks are equipped with low flow fixtures and a dual plumbing system has been installed all in new buildings to enable the use of treated wastewater for toilet and urinal flushing purposes. In FY 2013, SFO reduced its overall water consumption to 430.8 million gallons, a 6.1% drop since FY 2010. SFO is actively developing additional water reduction measures in order to reduce water consumption by

LEED Certification Program

The US Green Building Council's Leadership in Energy and Environmental Design (LEED) certification program for New Construction and Major Renovation provides a set of performance standards for certifying the design and construction of commercial and institutional buildings. The intent of LEED ranking is to assist in the creation of high performance, healthful, durable, affordable and environmentally sound buildings. The ranking system addresses the following project elements:

- Sustainable Sites
- Water Efficiency

Other Measures

- Energy and Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation in Design

Completed Projects

Terminal 2

In 2011, SFO completed the renovation program for Terminal 2 at a cost of 383 million dollars. This project added 14 new gates for use by domestic airlines and created 640,000 square feet of terminal space for use by airlines, concessionaires, SFO, and the general public. In Calendar year 2013 3.4 million passengers were enplaned at Terminal 2. The new terminal achieved the USGBC's LEED Gold certification.

The Terminal 2 Renovation project made use of the existing terminal structure to the maximum extent possible and added new structures only where needed to meet the requirements of a modern airport terminal. The renovated terminal is expected to achieve an overall energy efficiency of 2.3% below the baseline design rating 67,079 MBTU per year. The majority of these savings are achieved by reducing the electric energy consumption by 19.6%.

The water consumption at Terminal 2 is expected to be reduced from the baseline rate of about 17 million gallons per year to 9.2 million gallons per year by installing efficient fixtures in all bathrooms. Additionally, SFO has installed a dual plumbing system in the building to enable the use of treated wastewater for toilet flushing uses when a supply line is constructed in the future. This system would reduce the fresh water consumption by an additional 8 million gallons for an overall reduction of 93.7% below the baseline consumption level.

Building 575 – SFO Business Center

SFO achieved LEED Gold Certification, under the Commercial Interiors rating system, for the recently completed renovation of Building 575 at the Airport. The scope of the renovation project included efficiency upgrades to the existing HVAC system and comprehensive lighting retrofits, resulting in over 20% lighting power reduction from 48,300 watts baseline allowance under the code to 38,330 watts. All installed lighting within 10 feet of windows is equipped with day-lighting controls capable of dimming the lights when sufficient outdoor light is available. To further reduce energy consumption in the building, Energy-Star rated appliances were procured for over 90% of the office equipment and computers. A comprehensive metering system was put in place to monitor the electricity usage in the space after occupancy. To encourage the production of off-site renewable energy sources, SFO agreed to offset 100% of the building's annual energy consumption with Green-e certified renewable energy certificates over a two-year period. Low-flow plumbing fixture used in the bathrooms and break rooms are 40% more water efficient than regular fixtures, and would result in conserving over 153,000 gallons of water per year.

During construction of Building 575 building materials made with recycled content and products that are salvaged or manufactured locally were utilized to the maximum extent possible. The majority of the furnishings in the Building 575 offices were either refurbished or reused from existing SFO offices. To promote a healthy indoor environment for the occupants, all of the finishes and materials used in the project were either low-emitting or contained zero-VOCs. Outdoor air monitors installed on the air handling units,

ensure that air quality inside the space is free of pollutants and that sufficient fresh air is introduced into the building. Prior to occupancy, the space underwent a full building flush-out to remove any contaminants that may have been generated during construction.

Boarding Area E Renovation Project

This project was undertaken to renovate and enhance the existing 100,000 square-foot boarding area. The two main objectives of this project were: 1) to enhance the functionality of the boarding area so that it would meet both passengers' needs and the SFO standard of customer care, and 2) to replace or upgrade components and systems that were obsolete or at the end of their useful life. This project aimed for LEED Gold certification under the LEED Green Building Rating System for New Construction and Major Renovation. Sustainable features include 400Hz ground power and pre-conditioned air systems for serving the aircraft parked at the gates, minor fuel system modifications, use of clerestory windows throughout the terminal, installation of Photovoltaic Panels, and making major improvements in the HVAC system.

The BAE Project included a building expansion and remodeling effort that increased the concourse floor area by approximately 18,000 square feet. The additional space was used to expand hold rooms; add concession space for food and retail; and add room for passenger amenities, including a childrens' play area and space for a Commissioned Art Exhibit. The E Tunnel from the Baggage Claim Area to the central Garage was also remodeled under this project. The security of the terminal was also improved by enhancing the access control, paging, fire protection and fire alarm systems, and installing an Internet Protocol based Closed Circuit Television (IP-CCTV) monitoring system.

A significant portion of the project involved making improvements to many terminal systems and building components that had reached the end of their useful life. Specifically, the following critical building elements were renovated or replaced:

- Building structural upgrades
- Aircraft apron paving repairs
- Utilities relocations and renovations, including plumbing
- Passenger boarding bridge replacement
- HVAC system replacement
- Enhanced fire protection and fire alarm upgrades
- New tenant wiring closets
- New fiber optic backbone cabling
- New Airport Wi-Fi infrastructure
- Common use Flight Information Display Systems (FIDS)
- Tenant leasehold electric metering
- New lighting

The processing of LEED Gold Certification for Boarding Area E Renovation Project is ongoing and is expected to be formally completed by June 2014.

Ongoing Projects

SFO is currently working on a number of major new building construction and renovation projects as described below:

Air Traffic Control Tower and Integrated Facility

SFO has embarked on a project to replace the existing seismically deficient tower and build a new Air Traffic Control Tower (ATCT) in Courtyard 2, between Terminals 1 and 2 and to improve other Airport Facilities in the project area. The existing tower will be demolished once the new ATCT is commissioned and becomes operational. The new ATCT will be an approximately 68,000 square foot facility. The scope of the project includes the following:

- The Airport Traffic Control Tower and Integrated Facility: The new Federal Aviation Administration (FAA) Air Traffic Control will house FAA and Airport support spaces (including new public restrooms) as well as Secure and Non Secure Corridors connecting Terminals 1 and 2.
- Terminal 1 / Boarding Area C Entrance Area Improvements: A portion of the existing terminal will be reconfigured to provide access to the new public restrooms and build the Secure and Non Secure Connectors of the Integrated Facility. This modification would optimize concession spaces, meet the increased security requirements and modernize the facility.
- Boarding Area C Airline Club: A new club will be constructed on Level 3 of Boarding Area C within the existing west mechanical room shell structure. The new club will occupy approximately half of the existing mechanical room floor area, and will be served by new elevators, new emergency egress stairs and a new rooftop mechanical room.
- The Secure Connector between the Integrated Facility and Terminal 2: Provide an airside secure link on Level 2 from Terminal 1 / Boarding Area C, through the Integrated Facility, to Terminal 2 / Boarding Area D, allowing passengers and employees to travel between terminals without leaving the secure area.

This project is currently in the design/build construction phase and is expected to be completed by early 2015. The FAA is expected to occupy the new air traffic control tower in early 2016. The completed tower will meet LEED Gold certification requirements and will also be equipped with a dual plumbing system for eventual use of treated wastewater for toilet and urinal flushing purposes.

Terminal 3 Security Checkpoint Project

The SFO Terminal 3 East Project is renovating the east half of Terminal 3 (T3) to add up to 10 new and expanded Security Screening Checkpoint (SSCP) lanes near Boarding Area F, bringing the total SSCP lanes in T3 to 16. The redesigned SSCP lanes will relieve landside congestion and enhance the customer experience. Additionally, the Project will expand the footprint of the entire east side of Terminal 3 to allow for additional circulation space, an expanded Concessions Program, and enhanced amenities. The Project will upgrade the 35 year-old building by seismically strengthening the structure, replacing the HVAC system

Other Measures

and electrical load centers, expanding coverage of the fire sprinklers and alarms, renovating the elevators and escalators, and modernizing building finishes.

The project's sustainable features include:

- Daylight harvesting
- HVAC and electrical system replacement
- On-site renewable energy
- Use of local materials and FSC wood
- Water use reduction
- Construction waste management
- Cool roofing for new building expansion
- Green building education and public outreach
- Photovoltaic Panels

This project will be completed in two phases. The first phase, renovations to the Mod 4 Ticket Counters and associated area, opened to the public on January 28, 2014. Phase 2 is currently in the design phase, with 50% Construction Documents completed. Construction is anticipated to start in March 2014 and Phase 2 is anticipated to be completed in summer 2015. The Project is on-track to achieve LEED® Gold Certification.

Airfield Operations Facility

SFO is currently designing a new 20,500 square foot Airfield Operations Facility (AOF) to house the entire Airfield Operations staff. This facility will also include space for support functions, emergency and impounded vehicle and equipment parking, and general parking. The construction project will incorporate site development, including utilities and VIP transit and staging facilities. This project replaces the current temporary modular facility which is inadequate for meeting the increased service and security demands and is at the end of its useful life.

Energy efficiency is a top priority for the AOF since this building will be occupied 24 hours a day, 7 days a week. One of the sustainable features of this facility consists of the use of LED fixtures which would be regulated by an automatic Lighting Control System with the capability to adjust the artificial lighting level to take advantage of natural lighting provided by wall glazing and solar tubes. This strategy will enable a significant reduction in the lighting energy demand. Additionally, the building design includes a Variable Refrigerant Volume (VRV) HVAC system with multiple zones, as well as the use of passive solar design strategies, to maximize energy efficiency. With the addition of approximately 72 KW System of roof mounted photovoltaic panels, the project is anticipated to qualify as a net zero energy facility, generating as much energy as it consumes. Other sustainable elements of this facility include water use reduction by 38-45% below the International Plumbing Code and incorporation of native plant species in the landscaping.

This project is currently under construction and is expected to be completed in April 2014. The renovated AOF is targeted to meet LEED Gold certification requirements.

West Field Cargo Facility

In order to satisfy near-term demand for cost competitive on-Airport cargo facilities, SFO decided to replace the existing Building 632 (Cargo 7) with a modern cargo facility for the West Field Cargo Area. The new

Other Measures

\$35M Cargo facility will have a total gross building area of 78,000 square feet and will include Airfield apron and other civil improvements. The new building will be built in the footprint of existing Building 632.

The project makes use of an existing brownfield site where residual soil and groundwater contamination exists following previously implemented remedial measures at or near the project site. Disposal of construction debris is on track to achieve a goal of over 95% diversion from landfill through recycling and some materials re-use. New construction materials including structural steel, reinforcing bars and concrete mixes used in the new facility will include up to 30% of recycled materials based on the overall cost of all purchased materials.

Water efficient landscaping is designed for the project by utilizing drought resistant plantings. Dual plumbing is also installed within the building to take advantage of the Airport wide reclaimed water program in the near future.

Sizable energy savings will also be realized through energy efficient design of building envelopes (utilizing 'Dynamic Glass'), and interior HVAC systems. It is worthy to note that the project is tracking enough points to earn LEED Gold without installing on site renewable energy systems.

Construction activities on this project are expected to be completed by July 2014 and the building is expected to receive LEED Gold certification.

Preconditioned Air and 400 Hz Power Supply System Installation Program

SFO currently provides preconditioned air and 400 Hz power to aircrafts at all International Terminal gates, Terminal 2 and at selected gates in Terminals 1 and 3. A survey of the various gates indicated that 10 Airport owned and 29 tenant-owned jet bridges are not currently equipped with PC Air and 400 Hz power supply units. In FY 2013, the PC Air system mitigated GHG emissions by 53,704 tons. The PC Air facilities at Boarding Areas C and F are partially owned and controlled by the tenant airlines and no credit has been taken for the portion of these facilities that are owned by the airlines. As a part of the Boarding Area E renovation, all gates in BAE were equipped with preconditioned air and 400 Hz Power.

Green Car Rental Incentive Program

In 2009 SFO implemented a three-year Green Car Rental Incentive Program that rewarded customers for renting "green" alternative-fueled vehicles. Customers renting cars with a combined EPA Greenhouse Gas and Air Pollution Ranking of 17 or higher (also known as EPA SmartWay and EPA Ultimate SmartWay), such as the Honda Civic Hybrid, Nissan Altima Hybrid and Toyota Prius, would receive a \$15 discount at the counter. This program was completed in December 2011.

Another pilot incentive was given to airport rental car companies to increase the number of fuel efficient cars (EPA SmartWay) in their rental vehicle inventory from 10% to 15%. Airport rental car companies that qualified received a 20% reduction of Airport rental fees associated with green car rentals. This program was completed in December 2012.

In FY 2013, SFO mitigated 4,562 tons of GHG emissions by providing the Green Car Rental Incentive Program for EPA SmartWay vehicle. A total of 139,722 transactions were registered, saving approximately 512,617 gallons of gasoline. The total cost of this program to SFO in FY 2013 was \$819,475 or about \$180 per ton of GHG emission mitigation claimed by SFO.

Summary information for the green car rental incentive program is shown in Table 7-1. The lower magnitude of the numbers for FY 2013 is due to the partial termination of the incentive program.

Table 7-1. Estimated Greenhouse Gas Emission Mitigated by the SFO Green Vehicle Rental Incentive Program

	EPA SmartWay		
	FY 2011	FY 2012	FY 2013 ^b
Number of Transactions	243,943	220,394	139,172
Miles Driven	53,911,414	48,707,074	30,757,012
Gasoline Saved, gallons	898,524	811,785	512,617
Greenhouse Gas Emission Mitigated^{a,b}, metric tons	7,996	7,224	4,562
Estimated Program Cost	\$1,230,543	\$1,255,236	\$819,475
Cost of Gross GHG Emission Reduction \$/ton	\$154	\$174	\$180

^a The reductions in GHG emission was estimated by using an average fuel efficiency of 20 mpg for regular rental vehicles, 30 mpg for EPA SmartWay rated vehicles, and 40 mpg for EPA Ultimate SmartWay rated vehicles; and a unit GHG emission rate of 19.42 lbs per gallon of gasoline.

^b The transactions shown in FY 2013 cover only the June 2012-December 2012 period, when the SFO Green Vehicle Rental Incentive Program for EPA Smartway vehicles was in effect.

Carbon Sequestration Program

Over the past ten years SFO has developed approximately 50 acres of landscaping around the Airport containing 2,020 trees of different species, excluding the older trees in the undeveloped areas to the west of Highway 101, as shown in Table 7-2. Each tree sequesters carbon dioxide in its biomass over the life span of the tree. The U.S. Forest Service has developed a Carbon Sequestration Model¹ for estimating the annual rate of carbon sequestration for various tree species. SFO staff calculated an estimated

sequestration rate of 121 tons per year for the 2,020 trees planted at SFO. The sequestered carbon dioxide would not be released back into the environment because the trees are expected to be sustained for a long time at SFO and the wood would be salvaged when a tree is removed.

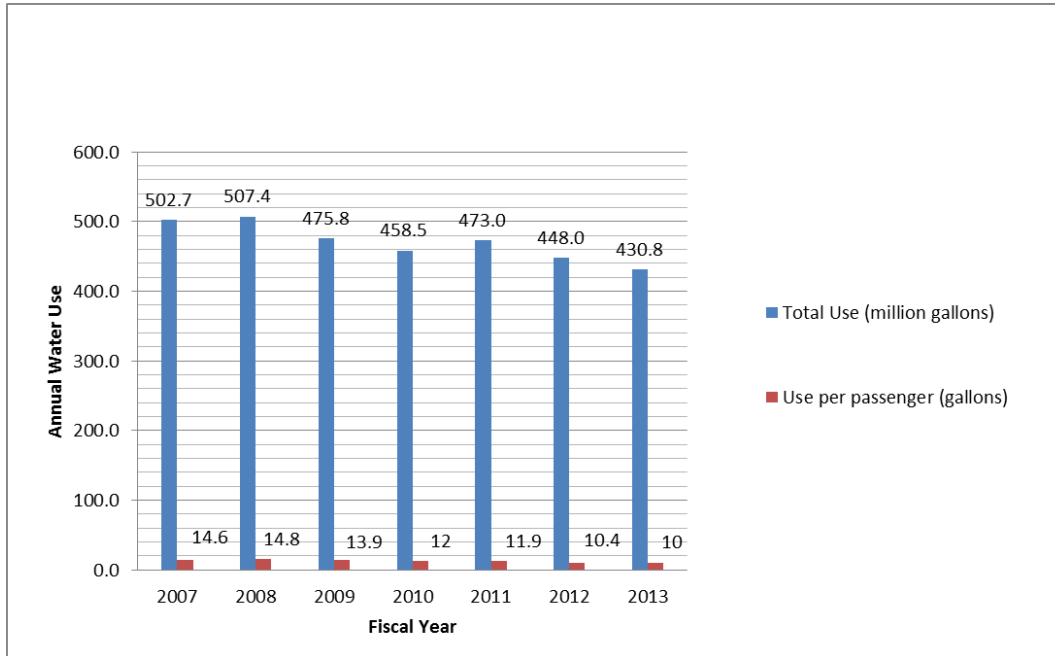
Table 7-2. Carbon Sequestration by Landscaping Tree Species Planted at SFO

Tree Species	Number Planted	CO2 Sequestration, tons/year	Tree Species	Number Planted	CO2 Sequestration, tons/year
Sequoia	694	73.88	Cypress	22	1.63
Podocarpus (conifer)	458	2.97	Vine Maple	20	0.11
Cercis Tendentis	253	2.79	Eucalyptus	16	5.49
Polar	76	9.05	Incense Cedar	15	0.76
Sycamore	66	4.33	Miscellaneous species	162	9.19
Arbutus	55	2.52	Total	2,020	120.70
Alder	54	3.32			
Prunus	42	1.14			
Buckeye	30	0.37			
Olive	30	1.38			
Melaleuca	27	1.77			

¹ Center for Urban Forest Research, Tree Carbon Calculator, Developed by the Center for Urban Forest Research, Pacific Southwest Research Station, US Forest Service, in partnership with the California Department of Forestry and fire Protection, 2009

Water Conservation Practices

Historic water use data at SFO are shown in Figure 7-1 and indicate a total water use ranging from 502.7 million gallons in FY 2007 to 430.8 million gallons in FY 2013. The variation in water use at SFO is impacted by the total number of passengers passing through the Airport. Therefore, the water use per passenger is a more effective metric for measuring water efficiency levels at SFO. Water use per passenger has gradually declined from 14.8 to 10 gallons per passenger from FY 2008 to FY 2013.

Figure 7-1. Historic Water Use at SFO

The gradual decline in the water consumption can be attributed to the renovation of new buildings and terminal spaces, where projects are typically designed to achieve 30%-40% water savings from the baseline design requirements. Water conservation strategies currently employed at SFO include the installation of water efficient fixtures and the use of landscaping plants that require little or no irrigation. In addition, all new buildings at SFO are dual plumbed for reuse of reclaimed water. SFO is now working on a Reclaimed Water Master Plan to develop reclaimed water distribution and storage facilities from the reclaimed water plant to the terminal complex. The supply of reclaimed water to the terminal areas and to other users would significantly reduce the need for potable water.

In response to the Mayors Executive Directive 14-01 Water Conservation which requires City Departments to reduce water consumption by 10%, the Airport is currently evaluating additional short-term and long-term water conservation measures. An airport-wide committee has been set up to develop and evaluate the proposed water conservation efforts. The following potential short-term measures are currently being evaluated:

1. Minimize irrigation water use
2. Reduce water use for vehicle and equipment wash
3. Reduce Fire Department and SFO weekly vehicle washing frequency
4. Reduce dead end water line flushing and flushing for fire protection systems

Other Measures

5. Work with all tenants to reduce water consumption
6. Require employees and tenant enterprises to conserve water in their daily activities
7. Send out outreach material to all users that receive water bills
8. Eliminate fire truck Water Cannon Salutes except for inaugural International Flights
9. Use recycled water generated at Mel Leong Treatment Plant for street sweeping and construction

8. Community-Wide Impacts

Summary

SFO's operations contribute to the global warming impact of the nine-county San Francisco Bay Area in proportion to the GHG emissions generated by Airport activities. In a more direct sense travel by SFO employees, air passengers, taxis, shuttle buses, delivery trucks, BART, Samtrans, etc. to and from the Airport from all parts of the Bay Area impacts the regional and local air quality and contributes to the regional emissions of greenhouse gases. Regulation and control of air quality impacts of the various modes of travel to SFO fall under the jurisdiction of Bay Area Air Quality Management District and are not directly addressed in the Climate Action Plan. However, any reductions in the emission of global warming gases would also aid in reducing the emission of other air pollutants. The global warming impact of Airport operations has been addressed in Chapter 2 of this Plan and the regional impact of these operations is recapped in this Chapter.

SFO Employees Commute Impact

SFO employee count in FY 2013 was 1,842 showing a 7.8% decrease compared to the employee level in FY 2012. These employees commute to and from work by various means including personal vehicles, BART, Samtrans, Caltrain, car pools, etc. As reported in Section 6, commute travel by SFO employees contributed to the regional GHG emission about 2,719 tons per year. SFO is currently working on developing various public transit incentives and rideshare programs to reduce the impact of vehicular emissions from SFO employee commute activities. Descriptions of these programs are also provided in Section 6.

Air Passengers Ground Travel Impact

The results of a bi-annual survey conducted by the Metropolitan Transportation Commission In 2006 are summarized in Table 8-1. These results indicate that air passengers travelled a combined total of 825 million miles to and from SFO in 2006. Travel by private vehicle drop off / pick up and private vehicles parked at the Airport accounted for about 63% of the total mileage, and travel by rental cars accounted for 14% of the total mileage. BART accounted for 6% of the total miles traveled in 2006 or about 53 million miles per year. Taxis, limousines, vans, and Airport bus service accounted for a combined 13% of the annual mileage; and hotel vans, public buses, Caltrain and chartered buses accounted for 2.2% of the total miles travelled.

Table 8-1. Summary of Air Passenger Travel Modes to SFO in 2006

Mode of Travel	All regions				GHG Emission, Tons/Year
	Miles Traveled to SFO	Miles Traveled from SFO	Total Mileage	% of Total Mileage	
Private Vehicle Drop offs	225,350,620	224,892,507	450,243,127	54.5	151,664 ^a
Private Vehicle Parked for Trip	34,248,614	34,178,990	68,427,604	8.3	22,989 ^a
Private Vehicle Disposition Not Stated	1,917,493	1,913,595	3,831,088	0.5	1,290 ^a
Rental Car	59,546,922	59,425,870	118,972,792	14.4	40,076 ^a
Taxi	17,059,919	17,025,238	34,085,156	4.1	20,016 ^b
Limousine	9,341,086	9,322,097	18,663,183	2.2	10,960 ^b
Shared-Ride Van	16,654,258	16,620,402	33,274,660	4.0	19,541 ^b
Scheduled Airport Buses	12,657,704	12,631,972	25,289,676	3.1	17,150 ^c
BART	26,711,117	26,656,817	53,367,934	6.5	2,157 ^d
Caltrain	1,464,332	1,461,355	2,925,687	0.4	118 ^d
Public Transit Bus	1,333,959	1,331,247	2,665,207	0.3	6,010 ^e
Hotel/Motel Courtesy Shuttle	5,012,322	5,002,133	10,014,454	1.2	5,881 ^b
Chartered Bus or Van	1,920,972	1,917,067	3,838,038	0.5	8,655 ^e
Total	413,219,317	412,379,289	825,598,606	100	306,507

^a Based on an assumed fuel efficiency of 23.9 miles per gallon and a GHG emission factor of 19.42 lbs per gallon of gasoline

^b Based on an assumed fuel efficiency of 15 miles per gallon and a GHG emission factor of 19.42 lbs per gallon of gasoline

^c Based on an assumed fuel efficiency of 9 miles per GGE and a GHG emission factor of 13.46 lbs per GGE

^d Based on the estimated BART GHG emission rate at 12 percent of personal vehicle travel

^e Based on an assumed fuel efficiency of 4.5 miles per gallon and a GHG emission factor of 22.37 lbs per gallon of diesel fuel

Data shown in Table 8-1 indicate a contribution of about 306,507 tons of GHG emissions per year in the nine-county San Francisco Bay Area by SFO passengers travelling to and from the Airport in 2006. The GHG emissions from this source could have increased to 408,249 tons in FY 2013, assuming a direct

correlation between these emissions and the total number of passengers at SFO for the respective years. The passenger levels were 33.56 and 44.7 million for 2006 and 2013, respectively.

Impact of Service and Trade Deliveries

Various types of service and trade deliveries are made to SFO on a daily basis. Some of the examples of these types of travel to SFO are shown below:

1. Cargo pick up from and deliveries to various cargo carriers such as Federal Express, DHL, etc.
2. U.S. Post Office mail and package pick up and deliveries
3. Deliveries of fuels and supplies to Airport, airlines, and concessionaires
4. Deliveries of various materials and equipment to various contractors working at SFO
5. Hauling of solid waste, construction demolition waste, and other waste materials from SFO
6. Other deliveries
7. Travel by car rental customers
8. Commute travel by employees of airlines, airline support service companies, and concessionaires

Estimated GHG emission for these activities is shown under Category 3 GHG emissions in Chapter 2 of this Plan.

9. Measuring Progress

Summary

As described in the preceding sections greenhouse gases generated at SFO can be classified in three distinct categories depending on the ownership and control of the operations that emit such gases.

- Category 1 – SFO Controlled GHG emissions from facilities and operations under the direct control of the Airport Commission
- Category 2 – GHG emissions by all other enterprises operating at SFO
- Category 3 – Optional GHG emissions or emissions that are consequential to the operations at SFO, such as GHG emissions from cruising aircrafts or emissions from passenger commute to and from SFO

Ordinance No. 81-08 calls for the identification and recommendation of GHG emission reduction / offset measures for: “private sector greenhouse gas emission sources regulated by the department”. Although SFO does not directly regulate any air pollutants or GHG emissions from the facilities of the enterprises operating at the Airport, nevertheless in the context of Ordinance No. 81-08 SFO staff has worked with the tenants to develop an estimate of the various GHG emissions from all such enterprises. To this effect SFO staff initially distributed a comprehensive questionnaire to all airlines and other enterprises at the Airport to collect data on the various GHG emitting operations of these enterprises in 2008. A survey was also sent out in 2013 to update the Category 2 GHG emissions.

The required steps for measuring progress in mitigating the GHG emissions for each of the above categories are described in this section.

Measuring Progress for SFO Operations

SFO will continue to monitor the rate of GHG emissions from all Airport facilities and operations and the GHG emission reduction, offset, and mitigation generated by existing and planned emission reduction measures. Specifically the following parameters will be monitored and quantified:

GHG Emission Sources

1. Electric energy consumption
2. Natural gas consumption
3. Fossil fuel consumption
4. Refrigerant gas makeup rate
5. Solid waste generation
6. SFO employees commute to and from work

GHG Emission Reduction/Offset/Mitigation Measures

1. Electric energy efficiency measures
2. Natural gas efficiency measures
3. Solid waste reduction and recycling measures
4. Employee green commute measures
5. Resource use reduction measures
6. Green purchasing program
7. LEED certification measures

8. Educational and other measures

Data for GHG emissions and for emission reduction/offset/mitigation levels for each of the above parameters will be collected and compiled regularly. These data will be analyzed for assessing the Airport's progress in reducing the Category 1 GHG emissions and the results of the analysis will be included in future revisions of the Departmental Climate Action Plan.

Measuring Progress for Category 2 and 3 Operations

The airlines, airline support services, concessionaires, and other entities operating at SFO generate GHG emissions both within and outside the physical boundaries of SFO. GHG emissions from these sources are generated by the following broad activities:

1. Electric energy and natural gas consumption
2. Fossil fuel consumption for vehicle fleets, ground services equipment, etc.
3. Jet fuel consumption for landing and take-off cycles and by cruising aircrafts
4. Fugitive refrigerant gas releases
5. Passenger commute to and from SFO
6. Enterprise employee commute to and from SFO
7. Solid waste generation and recycling
8. GHG emission by materials, supplies, and services deliveries
9. Other miscellaneous sources

SFO has developed fairly accurate information for GHG emission from electric energy and natural gas consumption for Category 2 operations based on available internal billing records. Estimates of GHG emissions for LTO cycles and for cruising aircrafts have also been developed by indirect approximation of jet fuel consumption for these operations. SFO has also collected data from the airlines and other enterprises for the remaining items on the list and these data are supplemented by EDMS Modeling and other methods as summarized under Category 3 emissions in Chapter 2 of this Plan.

In future years SFO, in cooperation with all stakeholders, plans to refine and supplement GHG emission estimates for Category 2 and Category 3 activities at the Airport. Recommendations for applicable GHG emission reduction / offset / mitigation measures will also be developed cooperatively for these operations

CLIMATE ACTION PLAN STAFF CONTACT

Climate Action Plan Staff Contact

The name, address, and phone number of SFO's Climate Action Plan staff contact is as follows:

Emily Sing
Associate Engineer
Environmental Compliance and Sustainability
San Francisco International Airport
P.O. Box 8097
San Francisco, CA 94128
650-821-7711
emily.sing@flysfo.com

APPENDIX A
CLIMATE ACTION PLAN MASTER SPREADSHEET

The Mater Spreadsheet file for this report is stored on the SFO intranet. Please contact houshang.esmaili@flysfo for access to these files.

APPENDIX B

San Francisco's Environment Code Chapter 9 Greenhouse Gas Emissions Targets and Departmental Action Plans

1. CHAPTER 9: GREENHOUSE GAS EMISSIONS TARGETS AND DEPARTMENTAL ACTION PLANS

Sec. 900. Findings and Purpose.

Sec. 901. Definitions.

Sec. 902. Greenhouse Gas Emissions Limit.

Sec. 903. Greenhouse Gas Emissions Reduction Plan.

Sec. 904. Mandatory Annual Greenhouse Gas Emissions Reporting.

Sec. 905. Enforcement.

Sec. 906. Market-Based Compliance Mechanisms.

Sec. 907. Local Energy Generation.

Sec. 908. Miscellaneous.

📖 **SEC. 900. FINDINGS AND PURPOSE.**

The Board of Supervisors finds that:

(a) In 2002, the Board of Supervisors adopted Resolution 158-02 that called for the City to develop plans to reduce its greenhouse gas emissions to 20 percent below 1990 levels by the year 2012.

(b) In 2004, the Department of the Environment and the San Francisco Public Utilities Commission issued "The Climate Action Plan For San Francisco," which included an accounting of greenhouse gas emissions associated with City activities, an accounting of greenhouse gas emissions within the City and County of San Francisco but not associated with City operations, and emission reduction recommendations for transportation, energy efficiency, renewable energy and solid waste management sectors.

(c) City Departments, under the leadership of the Department of the Environment and on their own initiative, are engaged in various undertakings to implement the recommendations in "The Climate Action Plan," and are making steady progress in certain areas toward the 2012 goal.

(d) In 2005, Governor Schwarzenegger issued Executive Order S-3-05 which established Statewide greenhouse gas emissions reduction targets for California as follows: by 2010, reduce greenhouse gas emissions to 2000 levels; by 2020, reduce greenhouse gas emissions to 1990 levels, and by 2050 reduce greenhouse gas emissions to 80 percent below 1990 levels.

(e) In 2006, California enacted AB 32, the California Global Warming Solutions Act of 2006. (CA Health and Safety Code Section 38.500 et seq.) which requires the California Air Resources Board to determine the statewide greenhouse gas emissions level in 1990, set that 1990 level as the statewide greenhouse gas emissions level to be achieved by 2020, and to adopt and implement statewide plans, protocols, rules and regulations to achieve and exceed the 2020 goals.

(f) It is the intent of the Mayor and the Board of Supervisors to protect the health and welfare in a manner that compliments state and federal efforts to improve air quality by exercising a leadership role in mandating local actions to reduce global warming, and, in particular, to call upon City departments and the private sector to integrate emission reduction measures into their standard operating procedures in order that the City meets and exceeds the greenhouse gas emissions established in this Ordinance.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 901. DEFINITIONS.

(a) "CARB" means the California Air Resources Board.

(b) "Carbon Dioxide Equivalent" means the amount of carbon dioxide by weight that would produce the same global warming impact as a given weight of another greenhouse gas, based on the best available science, as determined by the Department of the Environment.

(c) "Climate Action Plan" means the "The Climate Action Plan For San Francisco" issued in 2004 by the Department of the Environment and the San Francisco Public Utilities Commission.

(d) "GHG emission reduction measure" means programs, measures, standards, and alternative compliance mechanisms authorized pursuant to Section 903, applicable to sources or categories of sources that are designed to reduce emissions of greenhouse gases.

(e) "GHG", "Greenhouse gas" or "greenhouse gases" means and includes all of the following gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

(f) "San Francisco Greenhouse Gas Emissions limit" means the combined level of greenhouse gas emissions, expressed in tons of carbon dioxide equivalents, from all sources within the geographic limit of the City and County of San Francisco, whether or not such source is subject to regulation by local law.

(g) "SFPUC" mean the San Francisco Public Utilities Commission.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 902. GREENHOUSE GAS EMISSIONS LIMIT.

(a) The following San Francisco greenhouse gas emissions limits are hereby established:

(i) By 2008, determine 1990 City greenhouse gas emissions as provided in Section 902(c) below;

(ii) By 2017, reduce greenhouse gas emissions by 25 percent below 1990 levels;

(iii) By 2025, reduce greenhouse gas emissions by 40 percent below 1990 levels; and

(iv) By 2050, reduce greenhouse gas emissions to 80 percent below 1990 levels. These targets shall remain in effect unless otherwise amended or repealed.

(b) All City departments shall consider the effect of all decisions and activities within their jurisdiction on greenhouse gas emissions and undertake their responsibilities to the end that the City achieves the greenhouse gas emissions limits set forth in this Ordinance.

(c) No later than January 1, 2009, the Commission on the Environment, shall, after one or more public hearings, determine what the greenhouse gas emissions level within the City and County of San Francisco for City and private enterprise activities was in 1990. Such determination shall be the baseline level for determining the greenhouse gas emission limits to be achieved in 2017 and 2050, under subsection (a), above. In determining the 1990 level, the Department of the Environment shall take into consideration the inventory identified in the Climate Action Plan, the methodology adopted by the State Air Board under AB 32, and the best available scientific, technological, and economic information and shall make reasonable efforts, where appropriate, to promote consistency between its methodology and the methodology used by other international, federal and state greenhouse gas emission measurement and reporting programs.

(d) The Department of the Environment is urged to promulgate interim greenhouse gas emissions goals to facilitate the City's achievement of the 2017 and 2050 greenhouse gas emissions limits set forth in Subsection (a), above, provided, however, that such interim goals shall be for purposes of measuring the City's progress toward achieving the targets set forth in subsection (a), above and shall not be independently binding.

(e) The Department of the Environment shall, where appropriate and to the maximum extent feasible, work with other local, State And federal governmental agencies, including but not limited to the CARB, and non-profit entities to develop uniform standards and protocols for measuring, verifying and reporting on greenhouse gas emissions.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 903. GREENHOUSE GAS EMISSIONS REDUCTION PLAN.

(a) Consistent with its Charter duty regularly to produce an assessment of San Francisco's environmental condition, the Department of the Environment shall coordinate all departmental action plans, reports of actions taken, and their effectiveness in achieving the greenhouse gas emissions limits provided herein.

(b) The Department of the Environment, in cooperation with the SFPUC, shall manage the City's monitoring and reporting obligations imposed, from time to time, by Federal or State law, including but not limited to requirements imposed by the CARB under AB32.

(c) On or before January 30, 2009, all City departments shall assess GHG emissions associated with their activities and submit, in a format specified by the Department of the Environment, a written action plan that identifies and makes recommendations on GHG emission reduction measures applicable to

(i) operations of the department and other City greenhouse gas emission sources within its jurisdiction, and

(ii) private sector greenhouse gas emission sources regulated by the department. Such Plan shall identify the potential costs of identified measures and the estimated potential benefits of elements in the plan for reducing greenhouse gases, and may also identify other economic and non-economic impacts to the City's economy and environment

(d) In addition to the requirement set forth in subsection (d), above, the following requirements apply to the following City departments:

(i) The San Francisco Planning Department shall:

(A) Review the City's General Plan, including but not limited to the environmental protection, air quality, urban design and transportation elements, for consistency with this Ordinance and, as appropriate, urge the Planning Commission to recommend to the Board of Supervisors amendments to the General Plan to add the greenhouse gas emissions limits in this Ordinance and policies to achieve those targets;

(B) Include consideration of a project's impact on the San Francisco greenhouse gas emissions limits in this Ordinance as part of its review under the California Environmental Quality Act (CEQA); and

(C) In consultation with the Executive Director of the Municipal Transportation Agency, Department of Public Health, San Francisco County Transportation Authority, the Department of the Environment and other affected City departments, review City transit, pedestrian, bicycle, parking, and transportation demand management programs and requirements within their jurisdiction and, as appropriate, recommend legislation to the Board of Supervisors that will enhance the City's "transit first" policy, encourage a shift to sustainable transportation modes for trips to, from, and within the City, and reduce transportation-related emissions to achieve City greenhouse gas emissions targets set forth in this Ordinance.

(ii) The San Francisco Department of Building Inspection shall review and, as appropriate, recommend to the Board of Supervisors amendments to the Building Code or other local laws (A) to improve energy efficiency in new construction and in repairs and alterations to existing buildings, (B) to optimize energy efficiency of HVAC, lighting, and other building systems, and (C) to mandate retrofitting of buildings at time of sale.

(iii) The Department of Public Works shall:

(A) Review maintenance and construction standards, programs and requirements within its jurisdiction and, as appropriate, develop orders, regulations, or amendments to the Department's Standard Plans and Specifications to address the policies of this Ordinance and/or recommend legislation to the Board of Supervisors, including amendments to the Public Works Code or other City codes or ordinances, to achieve the greenhouse gas emissions limits set forth in this Ordinance; and

(B) in consultation with the SFPUC and other affected City Departments, review, and as appropriate recommend changes to street and other public lighting standards to enhance energy efficiency and thereby reduce City greenhouse gas emissions.

(iv) The City Administrator shall:

(A) review, in consultation with the SFPUC, the energy efficiency of City buildings and city occupied leaseholds, and, as necessary, recommend cost effective steps to increase their efficiency, and

(B) in collaboration with the Department of the Environment and other affected City departments, review, and, as appropriate, recommend amendments to City procurement laws and practices, including but not limited to Chapter 2 of this Code (Environmentally Preferable Purchasing Ordinance), to include the impact of City procurement decisions on greenhouse gas emissions.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

📌 SEC. 904. MANDATORY ANNUAL GREENHOUSE GAS EMISSIONS REPORTING.

(a) Beginning at the close of fiscal year 2008-2009, no later than 90 days after the close of each fiscal year, all City departments shall submit, in a format specified by the Department of the Environment, a written update of the plans, status of any recommendation required by Section 903, and the GHG emission reductions from actions taken to the Department of the Environment. Such updates shall, to the extent feasible, provide information to enable the Department of the Environment to calculate the City's progress toward meeting the greenhouse gas emissions limits set forth in this Ordinance.

(b) Beginning in January 2010, and annually thereafter, and based on the written reports required in Section 904(a) and such other reliable data as the Department of the Environment shall compile, the Department of the Environment shall report to the Board of Supervisors on the City's progress toward achieving the San Francisco greenhouse gas emissions limits of this Ordinance. Such annual report shall be consistent with the methodology established by the Department of the Environment under Section 903(c), except that the Department of the Environment may revise such methodology to conform to recognized protocols.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 905. ENFORCEMENT.

The Department of the Environment shall report any non-compliance with the reporting requirements of this Ordinance to the Mayor and the Board of Supervisors.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 906. MARKET-BASED COMPLIANCE MECHANISMS.

(a) The Department of the Environment, utilizing the expertise of relevant City Departments and Agencies, shall research and, as appropriate, recommend legislation to the Board of Supervisors, concerning whether and how to develop or utilize available market-based compliance mechanisms, such as greenhouse gas emissions exchanges, banking, credits, and other similar transactions governed by rules and protocols established by the City, CARB or other recognized governmental or non-profit entity as credit toward City greenhouse gas emission reductions.

(b) The Department of the Environment shall provide technical assistance, and coordinate City applications for, any approved market-based mechanisms that the City intends to use in furtherance of achieving the San Francisco greenhouse gas emissions limit.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

SEC. 907. LOCAL ENERGY GENERATION.

The Board of Supervisors urges the SFPUC to develop and to implement an energy action plan that includes at least the following:

(a) In coordination with the Department of the Environment, develop a plan to achieve the goal of San Francisco becoming fossil fuel free by 2030;

(b) In coordination with the Department of the Environment, setting annual goals for generating electricity locally through renewable generation; and

(c) Integrating the greenhouse gas emissions targets and policies of this Ordinance into the Sewer Master Plan.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

📌 **SEC. 908. MISCELLANEOUS.**

(a) **Severability.** If any section, subsection, sentence, clause, or phrase of this Ordinance is for any reason held to be invalid or unconstitutional by a decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of the Ordinance. The Board of Supervisors hereby declares that it would have passed this Ordinance and each and every section, subsection, sentence, clause, or phrase not declared invalid or unconstitutional without regard to whether any portion of this Ordinance would be subsequently declared invalid or unconstitutional.

(b) **No Conflict With Federal Or State Law.** Nothing in this Ordinance shall be interpreted or applied so as to create any requirement, power or duty in conflict with any Federal or State law. Any and all greenhouse gas reduction activities adopted and implemented under this Ordinance are intended to be complementary and nonduplicative of measures required or to be adopted by any State or Federal agency under State or Federal law. Nothing in this Ordinance shall relieve any person, entity, including any City Department or City Official of compliance with other applicable Federal, State, or local laws or regulations, including Federal or State air and water quality requirements, and other requirements for protecting public health or the environment.

(c) **Undertaking For The General Welfare.** In undertaking the implementation of this Ordinance, the City is assuming an undertaking only to promote the general welfare. It is not assuming, nor is it imposing on its officer and employees, an obligation for breach of which it is liable in money damages to any person who claims that such breach proximately caused injury.

(Added by Ord. 81-08, File No. 071294, App. 5/13/2008)

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APPENDIX C

Investment Grade Audit : Recommended Energy Efficiency Measures for SFO Terminals Complex

Appendix C Table 1. Recommended Energy Efficiency Measures for SFO Terminals Complex

Group	Proposed Energy Efficiency Measure	Annual Electricity Savings mWh/yr	Annual Gas Savings Thousand Therms/yr	Estimated Project Cost Thousand dollars	Simple Payback Period yrs	Avoided Electricity GHG Emission CO _{2e} tons	Avoided Gas GHG Emission CO _{2e} tons
1	Measures to be Completed FY 08-09:						
	EEM 4: Central Plant Cooling Towers-Apply VFDs on the Cooling Tower Fans	245	0.0	175	3.2	4	0.00
	EEM 7a: Boiler Replacement (50% complete by FY 08-09)	-29	106.7	2,521	18.8	-0.4	568
	EEM 31a: Controls – System Optimization (IT/RAC- New Front End, Honeywell Integration, Optimize Sequences; 25% complete by FY 08-09)	704	15.1	377.4	4.0	10	80
	EEM 32a: Controls - Upgrade (Corrective Actions by SFIA)	43	12.2	41	2.1	1	64.71
	EEM 33a: Controls - Install Zone Level DDC Controls (Corrective Actions by SFIA)	50	2.0	25.6	3.3	1	10.82
	EEM 36: Shut down boiler plant during summer months	10	55.5	0	0.0	0.2	295.30
	EEM 40: Air Handlers - Change Zone Setpoints	1,033	184.6	5	0.0	3	982.26
	EEM 42: Chiller Plant Shut-down during Winter Nights	849	0.0	0	0.0	13	0.00
	Group 1 Total:	2,905	376.1	3,145	3.8	43	2,001.52
2	EEM 7b: Boiler Replacement (remaining 50%)	-29	106.7	2,521	18.8	-0.4	567.89
	Group 2 Total:	-29	106.7	2,521	18.8	-0.4	567.89
3	EEM 31b: Controls - System Optimization (Implementation Phase of Optimization Project; remaining 75%)	2,113	45.4	1,132	4.0	31	241.59
	Group 3 Total:	2,113	45.4	1,132	4.0	31	241.59
4	EEM 32b: Controls - Upgrade Pneumatic Controllers to DDC	2,116	595.8	4,070	4.3	31	3,170.82
	Group 4 Total:	2,116	595.8	4,070	4.3	31	3,170.82
5	EEM 10: Chilled Water Distribution System - Remove or Modify De-couplers in Terminals to Increase System Temperature Differential	805	0.0	164	1.7	12	0.00
	EEM 11: Chilled Water Distribution System - Convert Constant Volume Tertiary Pumps to Variable Flow to Lower Pump Speed during Part-Load Operation	591	0.0	946	13.2	9	0.00
	EEM 12: Chilled Water Distribution System - Replace Three-way Air Handler Chilled Water Valves with Two-Way Valves; Clean Cooling Coils to Increase System Temperature Differential	322	0.0	406	10.4	5	0.00

Table 1 (Continued). Recommended Energy Efficiency Measures for SFO Terminals Complex

Group	Proposed Energy Efficiency Measure	Annual Electricity Savings mWh/yr	Annual Gas Savings Thousand Therms/yr	Estimated Project Cost Thousand dollars	Simple Payback Period yrs	Avoided Electricity GHG Emission CO _{2e} tons	Avoided Gas GHG Emission CO _{2e} tons
	EEM 13: Chilled Water Distribution System - Implement Chilled Water Differential Pressure Reset Control or Relocate Differential Pressure Sensors to Optimize Pump Speed Control	232	0.0	134.5	4.7	3	0.00
	EEM 14: Hot Water Distribution System - Convert Constant Volume Tertiary Pumps to Variable Flow; Balance the Speed of Parallel Pumps to Lower Pump Speed during Part-Load Operation	592	-21.0	768	19.4	9	-111.91
	EEM 15: Hot Water Distribution System - Implement Hot Water Differential Pressure Reset Control or Relocate Differential Pressure Sensors to Optimize Pump Speed Control	51	-1.3	134.5	31.7	1	-6.76
	Group 5 Total:	2,593	-22.3	2,553.5	9.1	38	-118.67
6	EEM 35: Chilled Water Distribution System - Convert Constant Volume Secondary Pumps to Variable Flow to Lower Pump Speed during Part-Load Operation	1,341	0.0	454.7	2.8	20	0.00
	EEM 8: Chilled Water Distribution System - Install Check Valve in Central Plant Bypass (De-coupler) Line to Improve Chilled Water Distribution Low Temperature Differential	161	0.0	84	4.3	2	0.00
	EEM 41: Replace Chillers 1 and 2 with three 1,500 ton Chillers and Tower-Free Cooling	3,795	0.0	6,645	11.8	56	0.00
	Group 6 Total:	5,297	0.0	7,184	9.6	78	0.00
7	EEM 33b: Controls - Install Zone Level DDC Controls (Cascaded from EEM 32)	2,447	99.6	2,530.5	6.8	36	530.28
	EEM 26: Terminal 3 Main Terminal Building - Convert to Dual Duct VAV to Increase Efficiency	17,054	155.6	8,054.8	4.0	251	828.09
	Group 7 Total:	19,501	255.3	10,585	4.5	287	1,358.37
8	EEM 2a: Central Chiller Plant - Install a Thermal Energy Storage System at the Central Plant to Generate and Store Chilled Water at Night (CHW TES)	-94	0.0	5,561	10.8	-1	0.00
	Group 8 Total:	-94	0.0	5,561	10.8	-1	0.00
9	EEM 16: PCA System - Optimize the Ice Storage System Operation	63	0.0	15	2.3	1	0.00
	EEM 17: PCA System - Improve PCA System Pumping	73	0.0	75	10.0	1	0.00
	Group 9 Total:	137	0.0	90	6.4	2	0.00
10	EEM 24a: Terminal 1- Remove Pre-Filters to Reduce Fan Energy	55	-0.2	6	0.8	1	-0.80

Table 1

(Continued). Recommended Energy Efficiency Measures for SFO Terminals Complex

Group	Proposed Energy Efficiency Measure	Annual Electricity Savings mWh/yr	Annual Gas Savings Thousand Therms/yr	Estimated Project Cost Thousand dollars	Simple Payback Period yrs	Avoided Electricity GHG Emission CO _{2e} tons	Avoided Natural Gas GHG Emission CO _{2e} tons
	Group 10 Total:	55	-0.2	6	0.8	1	-0.80
	Total (All Measures):	34,593	1,356.9	36,849	6.0	508	7,220.73
	Total Measures in Construction:	2,905	376.1	3,145	3.8	43	2,001.52
	Total Remaining Measures	31,688	980.8	33,704	6.4	456	5,219.21

* EEMs designated "New Measures" are measures added to the IGA analysis that were not analyzed during the Preliminary Energy Audit.

Note: The following factors were used to calculate CO₂ reductions:

SF Community factor 2010 (used to estimate "global system effect" of savings): 32.4 lbs eCO₂/MWh

Source: derived by SFPUC, includes all sources (PG&E, local generation, direct access, Hetch Hetchy hydro, purchased power)

Natural Gas Savings factor: 11.732 lbs eCO₂/therm

Source: CARROT (CCAR software) default factor

APPENDIX D

Lighting Efficiency Projects Implemented by SFO Division

Appendix D Table 1. Energy Efficiency Projects Implemented by SFO Facilities Division

Task No.	Project Location	Date Completed	No. of Old Fixtures	Old Load (kW)	No. of New Fixtures	New Load (kW)	Yearly Energy Reduction (kWhr)
1	T3 Mezzanine Level- 8" Downlights	Jun-04	500	103.5	500	18	748,980
2	ITB Ticket Counters	Oct-04	1,728	72.6	144	39.6	288,870
3	West Underpass - Roadway	June-03	58	12	30	6.2	25,386
4	ITB - Elevator Cab Lighting	June-02	26	31.2	26	3.9	239,148
5	ITB - 3rd Floor Above Escalators	March-03	72	8.4	72	4.2	36,372
6	FOM Engineering Building	September-01	250	60	Linear	28	210,240
7	ITB - 2nd Floor South Bridge Art Display	June-02	48	12	12	0.7	98,603
8	T3 Mezzanine Level - Uplights Pre/Post Security	March-05	820	49.2	820	34.4	129,298
9	Traffic Signal Conversion to LED	June-00	16	1	16	0.1	5,782
10	Domestic Terminal - Central Garage Parking	June-98	15,440	849.2	15440	648.5	1,758,307
11	Domestic Terminal F&B - Host Decommissioning	March-13	-	120	-	45	657,000
12	T1 - Departures Canopy	September-05	500	50	500	31	166,440
13	T3 - Arrival/Departure Level- 8" Down lights (FOM)	June-06	811	167.9	500	16	1,330,443
14	Domestic Terminal - Viaduct Lighting (#3560A)	December-06	600	124.2	600	64.8	520,344
15	T3 - Baggage Claim Area (#4200R2)	December-06	1,993	199.3	1993	123.6	663,430
16	T3 - Level 2 Pre-Security (#4200R2)	December-06	163	16.3	163	10.1	54,259
17	B/A F Connector Fluorescent (#4200R2)	June-07	234	23.4	234	14.5	77,894
18	T3 - High Level Ceiling Fluorescent (#4200R2)	June-07	1,128	112.8	1128	69.9	375,489
19	T3 - High Level Ceiling 8" Downlights (#4200R2)	October-07	116	30.7	116	12.5	159,537
20	T3 - High Level Ceiling 10" Down Lights (#4200R2)	March-08	18	7.5	18	1.9	48,408
21	T3 - Boarding Area 'E' Fluorescent (#4200R2)	March-08	558	55.8	556	34.5	186,833
22	T3 - Boarding Area 'E' 8" Downlights (#4200R2)	March-08	29	6	29	1	43,441
23	Central Garage Parking - LED Exit Signs (FOM)	June-08	135	8.1	135	0.7	65,043
24	ITB B/A G HVAC Penthouses (FOM)	June-08	70	3.9	70	2.6	11,038
25	AirTrain Maintenance - LED Exterior Lights (FOM)	December-08	11	3.1	11	1.5	7,082

26	Facilities - Fuel Station Canopy	June-09	16	6.9	10	0.6	27,822
27	Central Plant - High Bay Flourescent (#8592)	December-09	36	30.5	36	12.6	156,419
28	North Access Road - LED Roadway Fixtures (#8592)	December-09	28	7.9	28	4.8	13,490
29	North Access Road - LED Roadway Fixtures (#8592)	December-09	54	15.2	54	6.2	39,735
30	North McDonnell Road - LED Roadway Fixtures (#8592)	March-10	55	15.5	45	7.7	34,033
31	North McDonnell Road - LED Roadway Fixtures (#8592)	March-10	43	12.1	43	4.9	31,641
32	West Field Road - LED Roadway Fixtures (#8592)	March-10	5	1.4	5	0.9	2,409
33	West Field Road - LED Roadway Fixtures (#8592)	March-10	23	6.5	23	2.6	16,924
34	South Checkpoint - LED Roadway Fixtures (#8592)	March-10	14	3.9	10	1.9	8,839
35	Domestic Garage - Fluorescent Core F/G, F & E (#8771)	June-10	773	73.1	773	47.2	227,322
36	Domestic Garage - Fluorescent Core F & E (#8771)	September-10	24	2.4	24	1.5	8,234
37	T3 - Boarding Area 'F' Ramp Wall Pack (#8771)	December-10	157	44.3	157	24.6	171,915
38	T3 - Boarding Area 'F' Flourescent Departures Ceiling(#8771)	December-10	1,546	154.6	1,546	95.9	514,632
39	T3 - Boarding Area 'F' Ramp Level Low Bays (#8771)	December-10	254	69.9	275	25.9	385,440
40	Central Plant - Main Floor Flourescent (#8592)	December-10	14	2.3	14	1.5	6,328
41	T3 - Pendant Mounted MV (#8771)	April-11	270	135	270	30.7	913,668
42	T3 - Public Areas T5HO (#8771)	April-11	1968	157.4	1968	106.2	448,512
43	T3 - 8" Downlight CFL (#8771)	April-11	346	34.6	346	11.2	204,984
44	9" Downlight CFL (#8771)	April-11	44	4.4	44	1.4	26,280
45	12" Downlight MH (#8771)	April-11	117	29.3	117	11.7	154,176
46	12" Downlight CFL (#8771)	April-11	56	9.8	56	3.2	57,816
47	Wall Pack MH (#8771)	April-11	148	37	148	22.3	128,772
48	N. McDonnell Road - LED Roadway Fixtures (#8592)	June-11	67	18.9	67	14.5	38,150
49	S. McDonnell Road - LED Roadway Fixtures (#8592)	June-11	50	14.1	50	8.3	50,808
50	Domestic Garage - Stairwells Flourescent (#8592)	June-11	100	5.5	100	3.7	15,768
51	AirTrain Domestic Stations - CFL Wattage (FOM)	March-11					TBD
Total Annual Electrical Energy Saved							11,591,784

Appendix E
Supplemental Information

The purpose of this document is to summarize SFO’s efforts to comply with the Department of Environment’s expanded reporting requirements which calls for a summary of Airport activities aimed at meeting specific environmental goals and ordinances. This document is issued as a supplement the Airport’s Climate Action Plan. The Airport’s Climate Action Plan is well recognized by the aviation industry and provides a template for assessing greenhouse gas emissions at an Airport, regardless of the location of such Airport. As such, details on specific actions and responses to regulations and ordinances of the City and County of San Francisco are best presented as a standalone document rather than being embedded in the Airport’s Climate Action Plan.

Compliance with City Ordinances and Goals

The following sections summarize SFO’s activity and compliance status with respect to applicable City Ordinances and Goals.

ENERGY BENCHMARKING & COMPLIANCE WITH THE ENERGY PERFORMANCE ORDINANCE (Section 4B)

In order to comply with the Existing Commercial Buildings Energy Performance Ordinance (Ord 17-11, SF Environment Code Chapter 20), SFO assisted the SFPUC in producing the 2012 Energy Benchmarking Report for San Francisco Municipal Buildings. The 2012 Energy Benchmarking Report is available at <http://sfwater.org/modules/showdocument.aspx?documentid=4139>

The following SFO facilities were benchmarked:

Facility Type	# of Facilities Benchmarked for SFO per Facility Type	Page Number(s) in Benchmarking Report
Office	1	23
Airport	1	30

In the 2012 Benchmarking Report for San Francisco Municipal Buildings, the Airport is listed as one facility with an Energy Use Intensity of 96.1 kBtu/sq.ft. However, the entire airport complex consists of 70 individual buildings with different types of usage and occupancy. The main use of energy occurs at the terminal areas, where the Airport operates 24 hours a day, with a large volume of passengers, tenants and employees. Accurately benchmarking the Airport is a constant challenge due to the lack of submeters available and the lack of comparable facilities within the City. It is also difficult to compare against other Airports because energy consumption is heavily dependent on weather patterns for a particular region.

COMPLIANCE WITH THE COMMERCIAL LIGHTING EFFICIENCY ORDINANCE (Section 4C)

SFO is working on designing and implementing two lighting enhancement projects in Terminal 1, Domestic Garage and off-site buildings. This is an estimated \$7 million dollar lighting improvements project, with an estimated energy use reduction impact of 35%. The completion

of these projects by mid-2015 will make SFO fully compliant with San Francisco Lighting Efficiency Ordinance No. 103-10. Refer to the Climate Action Plan for a schedule of planned projects.

COMPLIANCE WITH GREEN BUILDING ORDINANCE (Section 4F)

Section 7 of the Climate Action Plan summarizes all major building projects that are completed or in the construction phase. All completed projects have achieved LEED Gold certification. All new projects are designed to achieve LEED Gold certification at a minimum. The following table is a list of all green building projects at the airport, including facilities that are being built by our tenants.

Table 1: Green Building Projects at SFO

Project Name	LEED Goal* (*awarded)	Sq. Feet	Project Budget	Notes	
Airport Owned and Operated					
SFO Terminal 2 Renovation	LEED-NC Gold*	600,061	383,000,000	LEED certification awarded	
SFO Building 575 - SFO Business Center	LEED-CI Gold*	48,300	9,400,000	LEED certification awarded	
SFO Terminal 3 BA/E Renovation	LEED-BDC Gold	118,000	\$138,000,000	Project complete, LEED certification pending	x
SFO T3 East Improvements	LEED-BDC Gold	380,000	\$215,000,000	Project construction in progress	x
SFO Airfield Operations Center	LEED-NC Gold	20,500	\$9,200,000	Project construction in progress	x
SFO Air Traffic Control Tower (ATCT) and FAA offices	LEED-BDC Gold	59,435	\$121,000,000	Project construction in progress	x
West Field Cargo Facility	LEED-BDC Gold	69,000	\$30,900,000	Project construction in progress	x
T3 to T2 Secure Connector Project	LEED-BDC v4 Targeted LEED Gold	35,000	\$70,000,000	Project in planning phase	x
SFO Consolidated Admin Campus (CAC)	LEED-BDC v4 Targeted LEED Gold	45,150??	N/A	Project in planning phase	x
Security Access and US CBP Offices	LEED-IDC 2009 Gold	9,326	\$3,431,353	Project in design phase	T1 Enabling Project

Terminal 1 Central Area	LEED-BDC v4 Targeted LEED Gold	210,800	\$280,498,000	Project in Pre-Programming phase	x
Terminal 1 South Side Development	LEED-BDC v4 Targeted LEED Gold	100,000	\$131,300,000	Project in Pre-Programming phase	x
Terminal 1 North Side Development	LEED-BDC v4 Targeted LEED Gold	160,000	\$210,080,000	Project in Pre-Programming phase	x
Boarding Area B Redevelopment	LEED-BDC v4 Targeted LEED Gold	565,258	\$571,765,000	Project in Pre-Programming phase	x
Boarding Area C Redevelopment	LEED-BDC v4 Targeted LEED Gold	97,150	\$260,000,000	Project in Pre-Programming phase	x
ITB Secure Connector	LEED-BDC v4 Targeted LEED Gold	94,900	\$159,536,000	Project in Pre-Programming phase	x
Fire House No.3	LEED-BDC v4 Targeted LEED Gold	20,500	\$15,558,000	Project in Pre-Programming phase	T1 Enabling Project
Ground Transportation Unit Relocation	LEED-BDC v4 Targeted LEED Gold	18,100	\$17,148,000	Project in Pre-Programming phase	T1 Enabling Project

Airport Tenant Operated

Signature SFO FBO Terminal/Hangars	LEED-CI Gold	58194		LEED certification awarded
Signature SFO Hangar C Facility	LEED-NC			Project in planning or design
Virgin America SFO Terminal 2 Office	LEED-IDC Platinum	10567		LEED certification awarded
American Airlines Ramp Offices SFO	LEED-IDC Gold	34343		LEED certification awarded
SFO American Express Lounge	LEED-IDC Gold	8171		Project in planning or design

SFO, in conjunction with SFPUC, has installed 59,000 square feet of solar panels on the roof of Terminal 3 and Engineering Building. The combined solar panels generate about 850,000 kWh of electricity per year.

COMPLIANCE WITH THE HEALTHY AIR AND CLEAN TRANSPORTATION ORDINANCE (Section 6A)

SFO removed 10 vehicles from our HACTO fleet this year. Due in large part to the fact that a large number of SFO's HACTO fleet are assigned to sections that perform emergency and 24-7 type functions at the airport, we were unable to significantly reduce our HACTO fleet. SFO's fleet also appears to be "underutilized" because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

SFO is not compliant with this year's Healthy Air and Clean Transportation Ordinance requirements and a waiver request was approved by the Department of the Environment. The "HACTO Submission Forms – FY 13-14" and "Waiver Request for 13-14" is shown as an attachment to this document.

TRANSIT FIRST CAMPAIGN (Section 6B)

The Airport is currently working with Department of Human Resources to implement a City reimbursement of up to \$130/month for transit commute expenses of employees that voluntarily surrender their free parking privilege at SFO. SFO developed and selected the proposed Transit Credit Initiative because it would be the first parking cash out program undertaken in the City. The program is currently being presented to Airport unions during contract negotiation. Negotiations are expected to continue through the end of the fiscal year. Following the completion of negotiations, the cashout program will be rolled out through workshops and intranet announcements early next fiscal year.

ZERO WASTE (Section 7A)

Section 5 of the Climate Action Plan is devoted to solid waste management activities at SFO. In addition to those activities, a Solid Waste subcommittee has been formed to discuss waste issues around the airport. The subcommittee consists of the zero waste coordinator, the climate liaison, custodial manager and other stakeholders around the airport. The subcommittee meets quarterly and on an as-needed basis.

SFO Goes Above and Beyond

The following section mentions other projects in progress to study sustainability and climate change. These topics are not mentioned in the Climate Action Plan because they are ongoing studies.

In addition to the Airport's Climate Action Plan, the Airport has retained a consultant, VHB, to develop an Airport Sustainability Master Plan. The purpose of the Sustainability Master Plan is to develop sustainable processes and practices for SFO. The Plan is divided into 13 elements; each element focusing on an important operational element at the airport. To date, we have completed 3 elements of the Plan as follows: the Sustainable Noise Abatement Guidelines, Sustainable Water Quality Enhancement Plan and, Sustainability Guidelines for Facilities Planning, Design, and Construction.

Also, with regard to Climate Change Adaptation, the Airport has hired a consultant Moffatt & Nichol + AGS, JV to conduct a shoreline protection feasibility study. The study was initiated to assess the feasibility of removing the Special Flood Hazard Area Zone A by protecting the Airport from 1%-annual-chance floods. The study would assess vulnerability of airport infrastructure, identify deficiencies on the existing shoreline protection system and needed developments for Airport's implementation. New implementation measures will take into account of sea level rise inundations.

2013 HACTO COMPLIANCE SUBMITTAL

HACTO Submission Forms 2013

#51

Department *	San Francisco International Airport
Name of Person Preparing Report *	Houshang Esmaili
Title of Person Preparing Report *	Senior Engineer
Email of Person Preparing Report *	houshang.esmaili@flysfo.com
Name of Department Director *	John L. Martin
Acknowledgement *	I acknowledge that the information provided is accurate.
Does your department promote or plan to promote employees to use public transit for work-related travel? *	Yes
What resources will your department offer? *	<ul style="list-style-type: none"> • Clipper Card • Reimbursement • Other
Other: *	BART discount card, transit commute reimbursement, employee briefings
From looking at last year's HACTO Plan, please describe the successes and challenges of promoting transit for work-related travel: *	<p>The implemented initiatives described in Section D below have been very successful. For example, BART usage by employees jumped by 60% when the remaining fare surcharge was removed for all SFO employees on July 1, 2013, despite the BART strikes. The increase in ridership can be attributed to the Airport's all-out promotion campaign.</p> <p>At the same time, the Airport believes we must go further and offer transit reimbursement for employees that voluntarily give up their free parking privilege.</p>
What are the reasons for not encouraging or planning to encourage employees to use public transit for work-related travel? *	
Does your department offer employees access to bicycles for work-related travels? *	Yes
Are they part of the CityCycle program? *	No
How many bicycles are available? *	40
How many locations have CityCycle bikes? *	0

From looking at last year's HACTO Plan, please describe the successes and challenges of promoting bicycles for work-related travel:

Successes: Completed first year of the Airport's bike sharing pilot program, called FlyCycle. As of 12/31/13, there were 112 registered users, 664 total trips were made, totalling to 285 miles of travel. Primary use is for "last-mile" transit between the Airport BART station and a work site located away from Airport Terminals.

Challenges: Usage is relatively low by all but two riders, who account for 67% of all trips. Roadways at Airport are not conducive to bicycle riding, particularly by less experienced riders. AirTrain makes frequent and reliable trips between most worksites, which reduces the demand for a bike option.

What are the reasons for not encouraging or planning to encourage employees to use bicycles for work-related travel? *

Does your department belong or have a plan to belong to a City vehicle pool or car-sharing program for work-related travels? * Yes

What are the reasons for not encouraging or planning to encourage employees to use car-sharing for work-related travel? *

From looking at last year's HACTO Plan, please describe the successes and challenges of promoting car-sharing for work-related travel: *

The SFOCarShare program was initiated in late October 2013. Airport has established 4 car pool locations, with a combined total of 17 vehicles in the car pool. To date approximately 175 people have signed up to use SFOCarShare, representing staff from 21 Airport departments. The Airport is continuing to promote the new program to increase usage by SFO employees.

Is your department able or have plans to host a tele-conference call? * Yes

Is your department able or have plans to be able to host a video-conference call? * Yes

What are the reasons for not encouraging or planning to encourage employees to use tele-conferencing or video-conferencing? *

Please use this space to describe in greater detail all of your department's Transit-First programs related to at work travel: *

The Airport encourages all employees to use FlyCycle or AirTrain to commute to most airport worksites. Employees are also encouraged to carpool to locations offsite which are not accessible by transit. When attending meetings at City Hall or other departments downtown, employees are encouraged to ride BART.

Does your department promote or have plans to promote the use of public transit for commuting to/from work? * Yes

How will you promote public transit? *

- Encourage participation in the Pre-Tax Commuter Benefits

program

- Offer a shuttle to nearby transit
- Other

Other: *

SFO uses a shuttle bus to transport employees to nearby transit facilities during BART strikes or extended shut downs. Also SFO is planning to provide transit cost reimbursement to employees willing to give up their free parking privilege.

What are the reasons for not encouraging or planning to encourage employees to use public transit for travel to/from work? *

Does your department promote or plan to promote the use of bicycles for commuting to/from work? *

Yes

How will you promote bicycle commuting? *

- Other

Other: *

SFO provides bike parking, including covered or monitored parking at certain locations. SFO also provides free bikesharing to employees which could be used for connecting commute trips to/from Airport BART station.

These bicycle-friendly resources are available at: *

Some locations

What are the reasons for not encouraging or planning to encourage employees to use bicycles for travel to/from work? *

Does your department plan to promote the use of ridesharing for commuting to/from work? *

Yes

How will you promote ridesharing? *

- Encourage registration in the 511-matching program
- Other

Other: *

SFO is considering the establishment of Airport employee ride-matching services.

The reserved space(s) are available at: *

From looking at last year's HACTO Plan, please describe the successes and challenges of promoting ridesharing for commuting to/from

Please see above.

work: *

What are the reasons for not encouraging or planning to encourage employees to use ridesharing for travel to/from work? *

D. Does your department offer or plan to offer tele-commuting? * No

From looking at last year's HACTO Plan, please describe the successes and challenges of promoting tele-commuting: * Please see below.

What are the reasons for not encouraging or planning to encourage employees to use tele-commuting? * Airport job classifications require employee presence at the workplace.

Please use this space to describe in greater detail all of your department's Transit-First programs related to commuting to/from work: *

- 1) A BART Discount Card for City and tenant Airport employees was introduced in 2010. Since July 1, 2013 it has offered a surcharge-free fare to/from SFO under an agreement with BART where the Airport covers any revenue losses.
- 2) The Airport is currently working with DHR to implement a City reimbursement of up to \$130/month for transit commute expenses of employees that voluntarily surrender their free parking privilege at SFO (See "Transit Credit Initiative" below).
- 3) SFO's Commuter Benefits Regulation requires all tenants to offer their employees a monthly transit subsidy equal to the current Muni Fast Pass price, or a pre-tax payroll deduction option for transit and vanpool costs.
- 4) All new Airport Commission employees receive a comprehensive briefing on commute alternatives.
- 5) To encourage air passengers to use transit, SFO has joint marketing campaigns with BART. A new information booth was established just outside the BART station.
- 6) During BART strikes (or other extended BART outages), the Airport operates free buses with luggage racks to the closest active transit hubs, such as the Millbrae Caltrain station and South San Francisco ferry terminal.
- 7) The Airport restricts private autos from using the Arrivals Level outer roadway past Terminal 1.
- 8) The Airport has linked its website with 511.org to encourage air passenger and employee trip planning via transit. New ground transportation kiosks highlight transit options.

Campaign Options *

Other

Other

SFO plans to provide transit commute cost credit to employees willing to forego the use of free parking at the Airport.

How many vehicles is your department *planning to* remove from service in FY13-14 (July 1, 2013-June 30, 2014)? *

0

How many vehicles is your department *planning to* change the status of vehicles turned in for credit toward your vehicle reduction requirement in FY13-14 (July 1, 2013-June 30, 2014)? *

10

The number of vehicles your department plans to remove is: * Fewer than the number needed to be compliant.

Your department is not in compliance with the HACTO reduction requirement. Please contact the Clean Vehicle team at HACTO@sfgov.org for assistance with the waiver process. * I confirm that I will contact the Clean Vehicle team to discuss the waiver process.

Please contact Dan Coleman, GSA Fleet Analyst, at dan.coleman@sfgov.org to resolve any discrepancies in the fleet information presented to you by Dec. 9, 2013. Please visit the site after this date to resume reporting your HACTO annual and implementation plans.

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21 Jan 2014
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21 Jan 2014
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HACTO Waiver Form - FY 2013-14

Department *	SFO
Name of Person Preparing Report *	Houshang Esmaili
Title of Person Preparing Report *	Manager, Environmental Policy & Sustainability
Email of Person Preparing Report *	houshang.esmaili@flysfso.com
Name of Department Head *	John L. Martin
Email of Department Head *	john.martin@flysfso.com
The number of fleet sections for which you are requesting waivers: *	5
Fleet Section Name *	Emergency Response
Number of vehicles included in the waiver. *	100
<p>Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet, and why Transit First options cannot meet these requirements. *</p> <p>100 vehicles covered under HACTO are assigned to sections that perform emergency operations at SFO. The departments performing emergency response include SFPD, SFFD, DUTY, OPS, and NOISE Abatement. These sections are specialized, 24/7 type operations that need dedicated vehicles to complete their assigned duties. They are also expected to be on-call and respond under short notice. Removal of any vehicle from these Sections could result in the failure of the staff of that Department or Section in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.</p>	
Does this fleet section have any underutilized vehicles?	Yes
Describe what operational requirements or work will not be met if these vehicles are removed from	These vehicles are not “underutilized” in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily

your department's fleet. functions. The removal of any vehicle could prevent timely response to an emergency call.

Would you like to request a waiver for another fleet section? * Yes

Fleet Section Name * Construction Management and Engineering

Number of vehicles included in the waiver. * 23

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet and why Transit First options cannot meet these requirements. Please be specific by vehicle type. *

23 vehicles covered under HACTO are assigned to the Engineering /Building Inspection or Project Management Sections which are involved in managing and inspecting multiple construction projects around the airport. The airport is undertaking a \$5 billion dollar capital improvement program. We have 5 major construction projects occurring at the airport including Terminal 3 Renovation, Air Traffic Control Tower and Integrated Facilities, West Field Cargo Project, Mel Leong Industrial Waste Treatment Project and FAA's Runway Safety Project. These projects, and others, are scattered around the airports 5,200 acre property.

Engineering/Inspection/Project Management staff needs vehicles to attend meetings also escort contractors to project sites in a timely manner. Also, over 100 employees share the use of these vehicles.

Does this fleet section have any underutilized vehicles? Yes

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

SFO has also implemented a car pool program to allow the sharing of a vehicle by all employees depending on availability. This program will provide data on potential redundancy of underutilized vehicles and enable a reduction in the number of such vehicles.

The car pool system currently includes 26 vehicles. Usage data will be collected for each of these vehicles with the objective of eliminating vehicles that would still remain underutilized. The Engineering Building and Project Management Building are two of the carpool sites.

Would you like to request a waiver for another fleet section? * Yes

Fleet Section Name * Administration

Number of vehicles included in the waiver. * 9

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet and why Transit First options cannot meet these requirements. Please be specific by

vehicle type. *

We are requesting a partial waiver of 9 vehicles that are used by Administrative Staff (Museum /ITT/ Aviation Management/HR)

Museum (ART Exhibit): While the museum and exhibits are located at the international terminal, the museum offices are located outside of the terminal complex. The 3 vehicles owned by the museum are used daily to transport staff and valuable collections to and from terminals. In order to ensure safe transport of collection items, public transit is not an option. The SFO Museum also needs the vehicles to transport art work to and from off-site locations.

ITT: The 4 vehicles assigned to ITT are used daily to perform repair and maintenance for ITT equipment and Telecom throughout the airport property. In many instances, ITT staff needs to haul equipment to/from these areas, which require the use of a vehicle. There are 74 ITT staffs that share these vehicles.

Aviation Management and Human Resources each use one vehicle for use in attending urgent meetings at the Airport or in the City.

Does this fleet section have any underutilized vehicles? Yes

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

SFO has also implemented a car pool program to allow the sharing of a vehicle by all employees depending on availability. This program will provide data on potential redundancy of underutilized vehicles and enable a reduction in the number of such vehicles.

The car pool system currently includes 26 vehicles. Usage data will be collected for each of these vehicles with the objective of eliminating vehicles that would still remain underutilized.

Would you like to request a waiver for another fleet section? * Yes

Fleet Section Name * Executive Management

Number of vehicles included in the waiver. * 4

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet and why Transit First options cannot meet these requirements. Please be specific by vehicle type. *

A total of four vehicles covered under HACTO are used by administrative staff. We are requesting a waiver for all four vehicles. These vehicles are used by executive management staff to respond quickly to emergency situations. One of these vehicles is designated for the Director of Media Relations. Under federal and state emergency guidelines, the Director of Media Relations is required to respond to any emergency at SFO, 24/7. Another vehicle is designated for the use of Commission Secretary who supervises mail deliveries throughout airport property. Mail is distributed to all airport sections by using

this vehicle. Removal of any vehicle from this Section could result in failure of Upper Level Management staff in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.

Does this fleet section have any underutilized vehicles? Yes

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet. These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions. The removal of any vehicle could prevent timely performance of routine tasks and/or response to an emergency situation.

Would you like to request a waiver for another fleet section? * Yes

Fleet Section Name * Trades

Number of vehicles included in the waiver. * 93

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet and why Transit First options cannot meet these requirements. Please be specific by vehicle type. *

We are requesting a full waiver of the 93 vehicles that are used by trade staff. The trade staff includes the auto shop, carpenters, electricians, gardeners, locksmiths, mechanical maintenance, paving and grounds, paint shop, sign shop, radio shop, sheet metal shop, steam shop and utilities. Vehicles are assigned to these trades for the purpose of discharging specific tasks delegated to each Section. In general, vehicles are assigned to a staff member because that person is in need of a vehicle during his/her work shift to make frequent trips to different parts of the Airport to discharge his/her assigned functions. Vehicles are outfitted to carry specialized tools and equipment that are needed by the specific trade. Removal of any vehicle from this Section could result in failure of the staff of that Department or Section in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.

We have also included 5 vehicles use by Wastewater Treatment staff and Reprographics staff under this category. These operations are located at a remote location at SFO and offsite for reprographics which necessitates availability of vehicles for performing their assigned duties.

Does this fleet section have any underutilized vehicles? Yes

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet. Although we encourage trades to use Transit-First for work-related travel, their work requires transporting specialized and heavy equipment to work-sites, which makes the use of public transit difficult. In addition, work is oftentimes requested in areas not accessible by public transit. However, staff from all Trades are encouraged to share a ride with each other whenever possible.

How many vehicles would be 33

subject to HACTO if the waiver(s) are approved? *

What is 15% of the number above? * 5

How many vehicles does your department plan to remove? * 10

The number of vehicles planned for removal is: * More than or equal to the number of vehicles needed to be compliant

Please attach the completed HACTO Base Fleet spreadsheet below: *



[sfo_fleet_draft_021214rev2_13_2014df.xlsx 356.95 kB .xlsx](#)

HACTO Waiver Request for 13-14

FY 13/14 HACTO Waiver Request Worksheet

Department Name	San Francisco International Airport
Contact Person / email / Phone	Houshang Esmaili/ Houshang.esmaili@flysfso.com /650-821-3632
Number of Vehicles in HBF	

In order to be in compliance with HACTO your department will be required to reduce its HACTO Baseline Fleet by 15%. The waiver process excludes part or all of your HACTO Baseline Fleet for the Fleet Reduction requirement of HACTO for a period of one year. This means that for every 7 vehicles you obtain a waiver for the number of vehicles you will need to remove from your HBF will be reduced by 1. We encourage you to separate the portion of your fleet you wish to request a waiver for into sections that allow you to write a justification for.

Certain departments have vehicles that travel less than 3,000 miles per year. These vehicles are considered to be underutilized, and they are highlighted in the HACTO Base Fleet spreadsheet. Underutilized vehicles that you retain in your fleet will be deducted from the number of vehicles your department is requesting a waiver for unless justification is provided.

This worksheet is provided as a tool to assist departments in filling out the form. After you have completed this worksheet you can cut and paste any information directly into the waiver portion of the [Online Reporting Form](#).

WAIVER REQUEST

Fleet Section Name	Emergency Response
---------------------------	---------------------------

Vehicles Contained in this Fleet Section (Use Google Docs as guide.)

Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
7251153	2,762	SFPD	CARTS-STREET
220F027	147	SFFD	CARTS-STREET
220F055	8,944	SFPD	CARTS-STREET
220F058	9,591	SFPD	CARTS-STREET
220F061	2,736	OPS	CARTS-STREET
220F088	5,884	SFPD	CARTS-STREET
220F092	8,407	SFPD	CARTS-STREET
725006	983	OPS	CARS
725012	269	OPS	CARS
725064	1,832	SFFD	CARS
725066	6,128	SFFD	SUV
725128	1,589	SFPD	CARS
725136	2,791	SFPD	MOTORCYCLES

725144	1,893	SFPD	MOTORCYCLES
725145	9	SFPD	SUV
725146	410	SFPD	MOTORCYCLES
725147	2,214	SFPD	MOTORCYCLES
725165	1,963	SFPD	MOTORCYCLES
725166	305	SFPD	MOTORCYCLES
725192	1,730	SFPDUC	CARS
725196	17,186	SFPD	CARS
725207	2,674	OPS	VANS
725267	1,312	OPS	VANS
725280	1,613	SFFD	CARS
725282	975	OPS	PICKUPS
725483	1,959	NOISE	VANS
7251005	12,993	SFFD	SUV
7251105	13,303	SFPD	CARS
7251110	6,138	SFPD	CARS
7251111	1,445	SFPD	CARS
7251112	4,934	SFPD	CARS
7251116	14,273	SFPD	CARS
7251124	1,710	SFPD	PICKUPS
7251131	753	SFPD	CARS
7251140	2,488	SFPD	CARS
7251143	888	SFPD	CARS
7251173	7,998	SFPD	CARS
7251189	8,140	SFPDK9	PICKUPS
7251190	5,001	SFPDK9	PICKUPS
7251193	4,416	SFPDK9	PICKUPS
7251194	2,210	SFPDK9	PICKUPS
7251195	5,649	SFPDK9	PICKUPS
7252275	13,195	OPS	PICKUPS
7254448	3,289	OPS	CARS
7254453	3,457	OPS	CARS
7254462	12,066	OPS	CARS
7254479	2,198	SAFETY	CARS
72500031	4,116	SFPDK9	CARS
72500033	3,753	SFPD	CARS
72500034	7,601	SFPD	CARS
72500035	1,114	SFFD	CARS
72500049	5,262	SFFD	SUV
72500090	7,001	SFPD	SUV
725152	3,326	SFPD	CARTS-STREET

7251147	6,598	SFPD	CARTS-STREET
7251148	8,714	SFPD	CARTS-STREET
72500081	PARTS	OPS	CARTS-STREET
72500082	23	OPS	CARTS-STREET
72500085	494	SFPD	CARTS-STREET
72500086	797	SFPD	CARTS-STREET
72500088	855	SFFD	CARTS-STREET
72500089	1,180	SFFD	CARTS-STREET
72500091	1,267	SFPD	CARTS-STREET
220F023	6,900	SFFD	CARTS-STREET
220F043	1,091	SFFD	CARTS-STREET
725163	TI 3/2011	SFPD	MOTORCYCLES
725114	340	SFPDK9	CARS
725198	TI 1/2012	SFPD	CARS
725182	TI 12/2011	SFPD	SUV
725189	TI 3/2012	SFPD	CARS
7251139	TI 11/2011	SFPD	CARS
7251176	2,927	SFPD	CARS
7251172	5,196	SFPD	CARS
725191	TI 3/2012	SFPD	CARS
725197	TI 12/2011	SFPD	CARS
725183	TI 1/2012	SFPD	SUV
725100	0	SFPD	CARS
7251191	36	SFPDK9	PICKUPS
7251122	TI 11/2011	SFPD	SUV
725063	TI 1/2011	SFFD	CARS
7251188	6,996	SFPDK9	PICKUPS
7251192	TI 12/2011	SFPD	PICKUPS
725184	TI 12/2011	SFPD	SUV
7251121	TI 12/2011	SFPD	PICKUPS
725016	TI 3/2012	SFPD	CARS
725020	TI 10/2010	OPS	CARS
725035	2,371	SFFD	SUV
725067	1,653	SFFD	SUV
725068	4,492	SFFD	SUV
725115	TI 8/2010	SFPD	CARS
725120	TI 9/2010	SFPD	CARS
725180	TI 10/2010	SFPD	SUV
725181	TI 10/2010	SFPD	SUV
725185	TI 11/1010	SFPD	SUV
725190	53	SFPDUC	CARS

725193	2,071	SFPDUC	CARS
725035	2,371	SFFD	CARS
7251101	24,702	SFPD	CARS
7251151	TI 12/2012	SFPD	CARTS-STREET
725A150	TI 12/2012	SFPD	CARTS-STREET

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

100 vehicles covered under HACTO are assigned to sections that perform emergency operations at SFO. The departments performing emergency response include SFPD, SFFD, DUTY, OPS, and NOISE Abatement. These sections are specialized, 24/7 type operations that need dedicated vehicles to complete their assigned duties. They are also expected to be on-call and respond under short notice. Removal of any vehicle from these Sections could result in the failure of the staff of that Department or Section in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.

Describe why these operational requirements can't be met utilizing Transit First tools.

Transit first options are not relevant for these sections because they are required to arrive on short notice and to areas not accessible by public transit.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions. The removal of any vehicle could prevent timely response to an emergency call.

Fleet Section Name	Construction Management and Engineering
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
725469	11	ENG	CARS
725281	2,192	ENG	CARS
725400	1,116	ENG	CARS
725402	2,209	ENG	CARS
725426	3,150	ENG	CARS
725430	4,803	ENG	PICKUPS
725436	2,485	PDC	VANS
725447	5,462	ENG	VANS
725456	11,849	BICE	PICKUPS
725457	4,167	ENG	PICKUPS
725459	2,879	ENG	CARS

725463	2,456	ENG	PICKUPS
725464	2,401	ENG	PICKUPS
725474	2,420	ENG	CARS
725476	1,543	ENG	VANS
725477	522	ENG	VANS
725480	2,786	PDC	CARS
725485	3,879	BICE	CARS
725487	17,071	ENG	CARS
725492	2,082	ENG	PICKUPS
725515	3,530	BICE	CARS
7251002	8,493	PDC	SUV
72500093	2,622	ENG	CARTS-STREET

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

23 vehicles covered under HACTO are assigned to the Engineering /Building Inspection or Project Management Sections which are involved in managing and inspecting multiple construction projects around the airport. The airport is undergoing a \$ 5 billion dollar capital improvement program. We have 5 major construction projects occurring at the airport including Terminal 3 Renovation, Air Traffic Control Tower and Integrated Facilities, West Field Cargo Project, Mel Leong Industrial Waste Treatment Project and FAA's Runway Safety Project. These projects, and others, are scattered around the airports 5,200 acre property. Engineering/Inspection/Project Management staff needs vehicles to attend meetings also escort contractors to project sites in a timely manner. Also noteworthy is that over 100 employees share the use of these vehicles.

Describe why these operational requirements can't be met utilizing Transit First tools.

Although we encourage employees to use Transit First options for work-related travel, many of our major construction projects occur in areas where no public transit options are available.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

SFO has also implemented a car pool program to allow the sharing of a vehicle by all employees depending on availability. This program will provide data on potential redundancy of underutilized vehicles and enable a reduction in the number of such vehicles.

The car pool system currently includes 26 vehicles. Usage data will be collected for each of these vehicles with the objective of eliminating vehicles that would still remain underutilized.

The Engineering Building and Project Management Building are two of the carpool sites.

Fleet Section Name	Administration
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
725024	5,154	ART	VANS
725029	922	ART	CARS
725270	2,659	ITT	PICKUPS
725419	1,598	ITT	PICKUPS
725422	732	ITT	VANS
725433	4,090	ART	VANS
725467	1,004	AVIA	CARS
725472	1,433	HR	CARS
725482	1,637	ITT	VANS

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

We are requesting a partial waiver of 9 vehicles that are used by Administrative Staff (Museum /ITT/ Aviation Management/HR)

Museum (ART): While the museum and exhibits are located at the international terminal, the museum offices are located outside of the terminal complex. The 3 vehicles owned by the museum are used daily to transport staff and valuable collections to/from terminals. In order to ensure safe movement of collection items, public transit is not an option. The SFO Museum also needs the vehicles to transport art work to and from off-site.

ITT: The 4 vehicles assigned to ITT are used daily for to provide repair and maintenance for ITT equipment and Telecom throughout the airport property. In many instances, ITT staff needs to haul equipment to/from these areas, which require the use of a vehicle. There are 74 ITT staffs that share these vehicles.

Aviation and Human Resources each use one vehicle for use in attending urgent meetings at the Airport or in the City.

Describe why these operational requirements can't be met utilizing Transit First tools.

Transit first options are not relevant for the Museum and ITT section staff because they need to travel to areas at the airport that are not accessible by public transit. In addition, these sections need to carry heavy equipment and /or valuable collections with them.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department’s fleet.

These vehicles are not “underutilized” in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

SFO has also implemented a car pool program to allow the sharing of a vehicle by all employees depending on availability. This program will provide data on potential redundancy of underutilized vehicles and enable a reduction in the number of such vehicles.

The car pool system currently includes 26 vehicles. Usage data will be collected for each of these vehicles with the objective of eliminating vehicles that would still remain underutilized.

Fleet Section Name	Upper Management
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
7251001	21,907	ADMIN	SUV
7251019	1,494	ADMIN	SUV
7251479	7,794	ADMIN	CARS
7254486	8,361	ADMIN	CARS

Describe what operational requirements or work will not be met if these vehicles are removed from your department’s fleet.

A total of four vehicles covered under HACTO are used by administrative staff. We are requesting a wavier for four of those vehicles. The four vehicles assigned to Administration are used to by upper level management to respond quickly to emergency situations. One of these vehicles is designated for the Director of Media Relations. Under federal and state emergency guidelines, the Director of Media Relations is required to respond to any emergency at SFO, 24/7. There are other vehicles assigned to Admin staff that serve a similar purpose. Another vehicle is designated for the use of Commission Secretary who supervises mail deliveries throughout airport property. Mail is distributed to all airport sections by using this vehicle. Removal of any vehicle from this Section could result in failure of Upper Level Management staff in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.

Describe why these operational requirements can't be met utilizing Transit First tools.

Transit first options are not relevant for this staff because upper level management needs to arrive on and off airport property under short notice and in a timely manner. They also need to go to areas not accessible by public transit.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions. The removal of any vehicle could prevent timely response to an emergency call.

Fleet Section Name	Trades
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
220F022	5,123	P&G	CARTS-STREET
220F048	2,311	P&G	CARTS-STREET
220F059	1,062	GARD	CARTS-STREET
220F067	1,039	P&G	CARTS-STREET
220F071	9,736	ELECT	CARTS-STREET
220F077	10,977	RADIO	CARTS-STREET
220F095	15,412	SIGN	CARTS-STREET
725002	509	CUST	CARS
725405	3,719	PAINT	VANS
725407	1,248	ELECT	PICKUPS
725409	2,269	CARP	VANS
725411	3,004	CUST	PICKUPS
725415	859	CARP	CARS
725421	2,763	MECH	PICKUPS
725429	1,626	CONC	PICKUPS
725431	2,033	SHEET	PICKUPS
725446	2,602	PAINT	VANS
725458	3,098	AUTO	CARS
725461	1,699	CONC	CARS
725468	1,983	ELECT	PICKUPS
725471	3,171	SIGN	CARS
725507	2,599	AUTO	PICKUPS
725531	3,582	CARP	PICKUPS
725532	807	LOCK	PICKUPS
725533	922	LOCK	VANS

725535	10,285	PLUMB	PICKUPS
725555	2,460	SHEET	PICKUPS
725568	2,104	SHEET	PICKUPS
725578	3,329	CARP	PICKUPS
725601	1,787	MECH	PICKUPS
725615	582	MECH	PICKUPS
725626	1,554	ELECT	VANS
725632	1,866	ELECT	PICKUPS
725634	1,668	ELECT	PICKUPS
725635	2,532	ELECT	PICKUPS
725638	1,419	ELECT	VANS
725673	2,193	ELECT	PICKUPS
725675	2,212	ELECT	PICKUPS
725679	444	ELECT	VANS
725690	3,941	ELECT	PICKUPS
725691	4,746	ELECT	PICKUPS
725693	3,848	ELECT	PICKUPS
725695	970	ELECT	VANS
725707	3,249	PAINT	VANS
725723	6,533	PAINT	PICKUPS
725731	4,355	PAINT	PICKUPS
725746	1,762	PAINT	PICKUPS
725773	5,671	CUST	PICKUPS
725774	3,620	GARD	VANS
725793	4,219	AUTO	VANS
725813	3,707	CARP	PICKUPS
725940	5,874	P&G	PICKUPS
725985	1,556	CUST	VANS
725993	845	CUST	CARS
7251003	1,051	ELECT	CARS
72500001	4,384	AUTO	PICKUPS
72500014	3,452	SHEET	CARS-PATROL
72500015	18,381	CARP	CARS-PATROL
72500037	21,151	MECH	CARS
72500078	4,293	GARD	MOTORCYCLES
72500079	705	PLUMB	MOTORCYCLES
72500142	26,872	GARD	CARS
72500163	7,997	AUTO	CARS
72500164	7,938	MECH	CARS
72500165	6,422	MECH	CARS
72500166	8,302	PAINT	CARS

72500167	14,466	MECH	CARS
72500168	7,066	P&G	CARS
72500170	24,084	CARP	CARS
72500171	2,795	STEAM	CARS-PATROL
72500229	6,083	P&G	MOTORCYCLES
72500230	2,317	PLUMB	MOTORCYCLES
725A217	3,107	UP	VANS
725A619	4,867	AUTO	PICKUPS
725A633	506	PAINT	VANS
7256647	1,797	MECH	CARTS-STREET
7257782	886	ELECT	CARTS-STREET
72500080	326	P&G	CARTS-STREET
72500083	1,194	P&G	CARTS-STREET
72500084	1,948	PAINT	CARTS-STREET
72500094	128	ELECT	CARTS-STREET
72500095	954	ELECT	CARTS-STREET
72500177	7,917	AUTO	CARTS-STREET
220F013	161	P&G	CARTS-STREET
220F064	160	P&G	CARTS-STREET
220F068	19,324	P&G	CARTS-STREET
220F086	4,495	P&G	CARTS-STREET
725A146	1,756	AUTO	CARTS-STREET

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

We are requesting a full waiver of the 88 vehicles that are used by trade staff. The trade staff includes the autoshop, carpenters, electricians, gardeners, locksmiths, mechanical maintenance, paving and grounds, paint shop, sign shop, radio shop, sheet metal shop, sign shop, steam shop and utilities. Vehicles are assigned to these trades for the purpose of discharging specific tasks delegated to each Section. In general, vehicles are assigned to a staff member because that person is in need of a vehicle during his/her work shift to make frequent trips to different parts of the Airport to discharge his/her

assigned functions. Vehicles are outfitted to carry specialized tools and equipment that are needed by the specific trade. Removal of any vehicle from this Section could result in failure of the staff of that Department or Section in getting to the place where they are needed in a timely manner. This could potentially interfere with the smooth functioning of the Airport operations.

Describe why these operational requirements can't be met utilizing Transit First tools.

Although we encourage trades to use Transit-First for work-related travel, their work requires transporting specialized and heavy equipment to work-sites, which makes the use of public transit difficult. In addition, work is oftentimes requested in areas not accessible by public transit. Trades are encouraged to share a ride with each other whenever possible.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met

if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions.

Fleet Section Name	Off-site Departments
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)
725414	1,927	WQ	PICKUPS
725478	3,393	REPRO	CARS
725490	4,297	REPRO	PICKUPS
725978	1,836	WQ	PICKUPS
725A667	1,605	WQ	PICKUPS

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

We are requesting a waiver of 5 vehicles that are used by staff located 5 miles away from the terminal complex and at sites not accessible by Public Transit. Three of these vehicles are used by Water Quality Section staff. These vehicles are used to conduct sampling throughout the airport property and also to attend meetings at the terminal complex. Reprographics operates two vehicles which are used to deliver finished products to the Airport and also to off-airport locations. This section also uses these vehicles to attend meetings throughout the airport.

Describe why these operational requirements can't be met utilizing Transit First tools.

Transit first options are not relevant for these sections because they are physically off the main airport complex and are not accessible by public transit. Employees of these sections are encouraged to share a ride with each other whenever possible.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met

if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions. Due to the physical location of these departments, they are unable to participate in a carpool program.

Fleet Section Name	>8500 GVW Vehicles
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Vehicles Identification #	Average Annual Mileage	Section	Type (Sedan/ Van /Pickup/Cart)	New Vehicle Identification Number
725209	329	OPS	VANS	TI for 72500343 >8500
725214	1,308	RADIO	VANS	TI for 72500249 > 8500
725A628	2,792	ELECT	PICKUPS	TI for 72500329 > 8500
725A753	3,326	ELECT	PICKUPS	TI for 72500327 > 8500
7252285	3,641	OPS	PICKUPS	TI for 72500433 > 8500
7251265 7252265	#N/A	OPS	PICKUPS	TI for 72500434 > 8500
725406	1,188	SIGN	PICKUPS	TI for 72500258 > 8500
725455	1,715	OPS	PICKUPS	TI for 72500549 > 8500
725566	2,162	SHEET	PICKUPS	TI for 72500011 > 8500
725796	TI 12/2012	AUTO	VANS	TI for 72500621 > 8500
725797	1,010	GARD	PICKUPS	TI for 72500041 > 8500
725A450	TI 2/2012	P&G	PICKUPS	TI for 72500571 > 8500
725A587	4,379	AUTO	PICKUPS	TI for 72500573 > 8500
725A629	1,759	SHEET	PICKUPS	TI for 72500555 > 8500
725A664	1,029	MECH	PICKUPS	TI for 72500556 > 8500
725A667	1,605	WQ	PICKUPS	TI for 72500248 > 8500

Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

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We are requesting a waiver of 16 vehicles that are greater than 8500 GVW that are no longer subject to HACTO requirements.

Describe why these operational requirements can't be met utilizing Transit First tools.

Most of these vehicles are used by the trade staff. Although we encourage trades to use Transit-First for work-related travel, their work requires transporting specialized and heavy equipment to work-sites, which makes the use of public transit difficult. In addition, work is oftentimes requested in areas not accessible by public transit. Trades are encouraged to share a ride with each other whenever possible.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

These vehicles are not "underutilized" in the SFO context because the normal operating conditions at SFO are such that all vehicles are driven over short distances to perform the required daily functions. Due to the physical location of these departments, they are unable to participate in a carpool program.

Fleet Section Name	Carpool vehicles
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Describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

SFO implemented a car pool program SFO Car Share in late October 2013 to allow the sharing of assigned vehicles by all employees depending on availability. This program will provide data on potential redundancy of underutilized vehicles and potentially enable a reduction in the number of such vehicles.

The car pool system currently includes 26 vehicles. Available data shows that over 175 users from 21 Airport departments have signed up for using the carpool program. Usage data will be collected for each of these vehicles with the objective of eliminating vehicles that would still remain underutilized. Because the carpool program has only been in operation for 3 months, we are still in the data collection phase. We will review the usage data when 12 months of usage has been compiled.

Describe why these operational requirements can't be met utilizing Transit First tools.

Urgent tasks requiring a vehicle do not always lend themselves to the use of public transit due to timing or lack of public transit at the Airport.

If this fleet section has underutilized vehicles, describe what operational requirements or work will not be met if these vehicles are removed from your department's fleet.

This determination will be made when we have compiled at least 12 months of usage data.